Engineered Materials Group Capabilities Guide

Parker

ENGINEERING YOUR SUCCESS

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Engineered Solutions

Our foundation is built on manufacturing and designing the highest quality products and systems. The equipment that moves today's industry is more reliable and highly-engineered than ever before. Parker's technologically advanced engineered solutions are designed using materials that can keep pace with tighter tolerances, higher temperatures and more aggressive chemistries.

Our solutions have a unique combination of experience and innovation built right in, and we're able to supply them quickly and cost-effectively to fit virtually any application you can think of.

Sealing & Shielding

Our seal products range from standard O-rings and extruded silicone profiles, custom molded shapes to highly complex composite seals, and metal seals for extreme application environments. Parker's shielding materials and thermal management products are used to shield sensitive electronic equipment from harmful effects of electromagnetic interference (EMI) and thermal energy. Our precision plastic and elastomeric components are used in a wide variety of medical devices.

Adhesives & Coatings

We offer a range of adhesives, utilizing acrylic, epoxy and urethane technologies, designed to endure exposure to environmental conditions to bond to a variety of substrates including bare metal, painted metal, composite, rubber-to-substrate, and more. Our highly-flexible (200-300% elongation) coatings bond to low-surface energy substrates (natural rubber, EPDM, metals, plastics, ceramics and wood) providing protection from environmental conditions such as heat, fluids and ozone.

Vibration Management

Our knowledge and experience in solving problems across a variety of industries allows us to help our customers increase productivity, reduce operating costs, improve operator comfort and safety, and increase uptime. We do this by providing innovative vibration isolation solutions and sensing systems, as well as magnetically responsive technologies that significantly reduce risk and improve product performance.

Worldwide — Where You Need Us

Around the corner or around the globe, Parker is there with engineered solutions. Your local Parker market specialist provides a single point of contact for local product support. And our worldwide headquarters, located in Cleveland, Ohio, is the hub of an established worldwide network of distributor and service center locations. This network – and the global sales and engineering support it provides – means you can always get quality products when and where you need them. It also means that sound advice from a Parker product expert is never far away.

Built for Speed and Service

Parker's local market specialists, authorized distributors and Parker Service Centers (PSCs) are your connection to Parker's engineered solutions. Over 65 years strong, this extensive network includes an elite group of Sealing Technology Centers (STCs) that are qualified by Parker to act as full-service sealing specialists in their local area. The STCs offer applications assistance, inventory management, kitting and assembly services to help you streamline operations and reduce costs.

Product Innovation

Today's engineering challenges demand innovative solutions, and nobody knows innovation better than Parker. Drawing from over six decades of engineering, material formulation and manufacturing experience, we continually develop new products for your evolving engineering needs.

Quality Initiatives

Quality isn't just a buzzword at Parker. It's a culture, based on employee empowerment, adherence to industry certifications, and a deep commitment to continuous improvement.

Certifications:

- ISO 9001
- IATF 16949
- AS 9100
- ISO 14001
- ISO 13485
- NADCAP Chemical Processing
- NADCAP Non-Destructive Testing
- FAA Certified Repair Station
- EASA 145
- CAAC 145
- OHSAS 18001

Continuous Improvement:

- Six Sigma methodology
- Lean manufacturing
- Value stream analysis
- Advanced product quality planning (APQP)
- Feasibility studies
- Kaizen events
- High performance teams
- Safety initiatives
- Zero PPM initiatives

Materials Science

Compounds

The heart of any Parker elastomeric seal is the compound from which it is manufactured. Parker compounds are among the world's most effective seal materials.

A compound is a mixture of a base polymer and a specific blend of chemical ingredients tailored for unique characteristics to optimize performance in an application. Our continuing material research at our divisions assures Parker customers that only the highest performance formulations are used.

Many Parker seals are composite products, fully utilizing the unique properties of elastomer, polymer, metal or ceramic materials, in resourceful and innovative combinations.

Specialty Elastomers

Parker has developed a wide range of specialty elastomeric materials to satisfy the unique sealing needs of customers. The many types of specialty elastomer formulations include;

- A-A-59588 qualified materials
- API 6A
- API 16C
- API 16F
- ASTM materials
- Carboxylated HSN (XHNBR)
- Carboxylated nitriles (XNBR)
- Engineered plastics
- FDA white list materials
- Fungus-resistant materials
- MIL-spec and AMS-spec materials
- NORSOK M-710 certified
- NSF Standard 61 and 51
- Perfluorinated materials
- Radiation-resistant materials
- SAE materials
- UHP materials
- UL approved base materials
- USP Class VI materials

Metal Seal Base Materials – For Extreme Environments

- Temperatures > 1800°F
- Pressures > 100,000 psi
- Vacuum < 1 x 10^{-5} torr
- Harsh chemicals

Ultra-high purity processing keeps seal materials and products clean, from start to finish.

Ultra-High Purity (UHP) Process

For semiconductor, healthcare, pharmaceutical and other applications that demand an extra level of cleanliness, we offer ultra-high purity, or UHP processing. Parker UHP processing employs totally enclosed and dedicated manufacturing areas where high purity products are mixed, tooled, molded, finished, inspected and packaged.

Elastomer Adhesives

Parker has developed an industry-leading line of specialized adhesive systems that bond elastomers to various substrates. These adhesive systems are designed to meet the harsh environmental requirements of various automotive and industrial applications.

In-House Mixing

A clean, precise mixing process is essential to the production of – as well as the resulting performance of – quality, engineered seals and sealing systems. Our in-house mixing capabilities, which employ the latest in advanced computer control technology, allow us to combine standard and custom compounds with unmatched speed and accuracy.

From powder to polymer, computer controlled mixing eliminates batch-to-batch material variations, keeping product quality consistently high.

Common Base Polymer Families

Chemical Name	Abbreviation	Temperature Range	Characteristics
Acrylic, polymethyl-methacrylate	PMMA	-40°F to 284°F (-40°C to 140°C)	Excellent metal bonding adhesive, good general purpose adhesive. Offers fast, room temperature curing.
Acrylonitrile-Butadiene (Nitrile, Buna-N)	NBR	-70°F to 275°F (-57°C to 135°C)	Most widely used polymer in the seal industry. Excellent resistance to petroleum-based fluids, good balance of physical properties and wide temperature range.
Isobutylene-Isoprene (Butyl)	IIR	-75°F to 250°F (-59°C to 121°C)	Low permeability rate and good electrical properties. Often used to seal low temperature vacuum system applications.
Chloroprene Rubber (Neoprene)	CR	-60°F to 250°F (-51°C to 121°C)	Good general purpose polymer. Exhibits good ozone, aging and chemical resistance—primarily used in refrigerants.
Epoxy	EP	40°F to 390°F (-40°C to 200°C)	Common adhesive or potting material. Typically offers excellent chemical resistance, bonding strength, and stiffness.
Ethylene Acrylate (Vamac®)	AEM	-40°F to 350°F (-40°C to 177°C)	Similar to polyacrylate with improved low temperature performance, swells more in oil than polyacrylate.
Ethylene Propylene Rubber	EPDM, EPM, EP, EPR	-65°F to 300°F (-54°C to 149°C)	Widely specified seal material—excellent resistance to alcohols, ketones, steam, brake fluid, Skydrol® and other phosphate ester based hydraulic fluids.
Fluorocarbon	FKM, FPM	-55°F to 400°F (-48°C to 204°C)	Second most popular seal material after nitrile. Wide-spectrum chemical resistance and broad temperature range. Some specialty FKM compounds have low temperature static sealing to -40°F (-40°C). Commonly used in fuels.
Fluorosilicone	FVMQ	-100°F to 350°F (-73°C to 177°C)	Combines temperature range of silicone with good resistance to petroleum-based fuels and lubricants. Applications with high heat that are combined with potential exposure to petroleum oils and/or hydrocarbon fuels.
Hifluor™	FKM	-15°F to 400°F (-26°C to 204°C)	Parker's trade name for a group of intermediate technology materials that bridge the gap between fluorocarbon and perfluoroelastomer.
Hydrogenated Nitrile	HNBR, HSN	-40°F to 300°F (-40°C to 149°C)	Similar to nitrile with improved high temperature capabilities and ozone resistance. Excellent resistance to petroleum-based fluids.
Liquid Silicone Rubber	LSR, LIM	-175°F to 450°F (-115°C to 232°C)	LSR is mixed as a two-part liquid and is pumped into an injection tool. The material's low viscosity prior to vulcanization requires a lower mold pressure and shorter vulcanization times compared to conventional injection molding.
Natural Rubber	NR	-65°F to 212°F (-53°C to 100°C)	Excellent mechanical properties and low relative cost. Often blended with other polymers to optimize properties for specific applications.
Polyamide (Nylon 6, Nylon 6, 6)	PA 6	-65°F to 250°F (-54°C to 121°C)	Well known family of plastics used as anti-extrusion devices and retainers. Resistant to a variety of petroleum and phosphate ester hydraulic fluids.
Perfluoroelastomer	FFKM, FFPM	5°F to 608°F (-15°C to 320°C)	Parker's Parofluor™ and Parofluor ULTRA™ materials combine the chemical resistance of PTFE with the elastic properties of fluorocarbon.
Polyacrylate	ACM	-5°F to 350°F (-21°C to 177°C)	Outstanding resistance to petroleum-based fuels and oils. Good resistance to oxidation, ozone and sunlight—resists flex cracking.
Polyetheretherketone	PEEK	-80°F to 450°F (-62°C to 232°C)	High-temperature-resistant plastic used where extrusion resistance, high-temperature capability and a broad resistance to chemical environments is needed. Available in unmodified or glass-filled formulations.
Polytetrafluoroethylene	PTFE	-450°F to 550°F (-268°C to 288°C)	Stable polymer with extremely good resistance to almost all known chemicals. Parker's proprietary polytetrafluoroethylene material is called Polon®.
Polyurethane	AU, EU	-40°F to 300°F (-40°C to 149°C)	Tough, abrasion and wear-resistant material, well suited for hydraulic and pneumatic rod or piston applications. Parker's proprietary materials, Molythane®, Resilon® and Ultrathan® deliver the best overall sealing performance of all commercial polyurethane formulations. Ultra clean medical and optical grades are also available.
Silicone	VMQ, PVMQ, PMQ	-175°F to 450°F (-115°C to 232°C)	Exceptional heat and compression set resistance, good insulating properties, tends to be physiologically neutral and is useful in wide temperature extremes. Relatively poor tensile strength, tear and abrasion resistance.
Styrene Butadiene Rubber	SBR	-20°F to 220°F (-28°C to 104°C)	Typically blended with natural rubber to modify characteristics including hot tear resistance and processability.
Tetrafluoroethylene-Propylene (Aflas®)	TFE/P	15°F to 450°F (-9°C to 232°C)	High-temperature stability, resistance to broad range of chemicals, including bases, amines, sour gas, hydrocarbon blends and brake fluid. Its poor low temperature flexibility and compression set resistance has limited a more widespread use of the material.

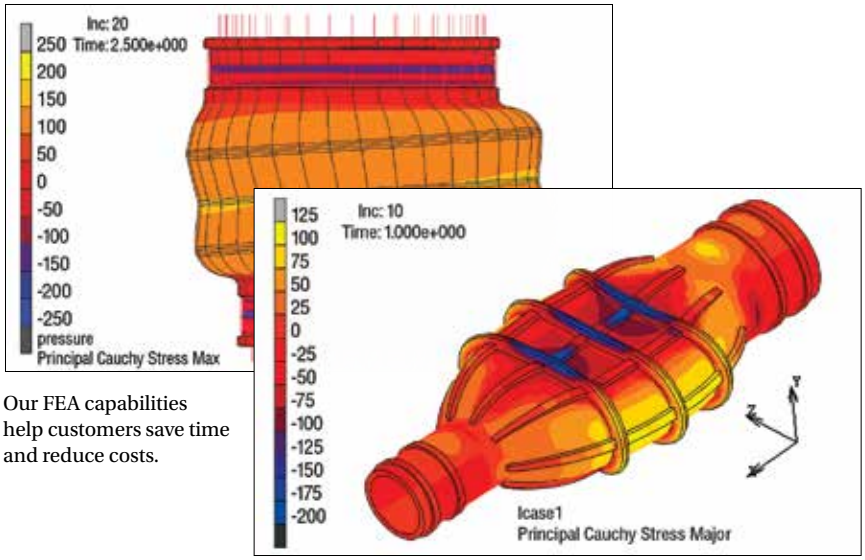
Engineering and Innovation

Innovative Solutions

Parker is focused on advancing our market-driven product lines to present our customers with the best solutions. Our new product innovation process includes a number of stages, starting with brainstorming product ideas, and continues to the actual product launch. Our customers benefit from our lean thinking and the six sigma analysis tools that we're applying during the process – ensuring high quality, cost effectiveness and speed to market.

Applications Engineering Assistance

Our team of application engineers can help you find the most reliable, cost-effective sealing and bonding solutions for your application. These engineers are experts, combining decades of experience in real-world sealing and bonding with a full complement of technology-driven design tools, including AutoCAD®, Autodesk Inventor®, CATIA®, Solid Works® and others, working to produce the results you need. In addition, our adhesives application engineers routinely work directly with customers to effectively troubleshoot any bonding issues that are encountered. This includes in-house bond analysis, adhesive application/testing, and on-site audits and trials. We also offer hands-on training options to our customers.



Our FEA capabilities help customers save time and reduce costs.

Advanced Computer Simulation

Utilizing advanced non-linear Finite Element Analysis (FEA) software our engineers can perform extremely accurate virtual simulations to determine optimum geometry based on specific compound test data. These simulations eliminate the need for multiple iterations of costly prototype tooling, and dramatically reduce development lead times. They also ensure first-time selection of the best material and geometry for your application.

FEA allows us to predict and analyze the following:

- Stress and strain distribution
- Pressure
- Load
- Stability
- Deformation/displacement
- Installation and removal forces

Engineering and Innovation

Accredited Material Test Labs

All of our products are designed, developed and manufactured using the most advanced in-house compound, engineering, testing and process technology.

Testing the physical properties of our compounds is an integral part of seal compound development, as well quality assurance. Compound purity and identity are crucial prerequisites for product quality and reliability.

Parker chemists develop, analyze and carefully test our materials or modify our existing compounds to expand their application potential, in our ISO 17025 accredited material test labs. Gaining accurate and detailed information about an elastomeric compound involves the use of scientific analytical methods, such as infrared spectroscopy or thermogravimetry.

Material Technology

Our team of skilled chemists, engineers and technicians can offer you assistance with material selection to print specifications and/or functional requirements. We also offer feasibility, process development and advanced product quality planning, or APQP support. Best of all, we can develop a material solution for you if one doesn't already exist.

World-Class Testing

In our world-class testing labs, we can evaluate a seal's performance under a variety of physical and environmental conditions. And in our EMC test facilities, we can check your products for compliance with the latest U.S. and European standards.

O-Ring Selector

Parker's O-Ring Selector is an engineering tool that offers O-ring material and size selection combined in one tool. Both are interlinked, thus ensuring the best possible combination of the calculated O-ring size and material choice. The O-Ring Selector covers both imperial and metric standards.

Ask an Engineer

Live assistance is available to help you evaluate and select the best products for your application. Ask an Engineer options are featured on all Engineered Materials Group division websites.

LIVE HELP
ASK AN ENGINEER

Engineered Materials Group division websites:

Assembly Protection Solutions Division
www.parker.com/aps

Chomerics Division
www.parker.com/cho

Composite Sealing Systems Division
www.parker.com/css

Elastomer Process Materials Division
www.parker.com/epm

Engineered Polymer Systems Division
www.parker.com/eps

Noise, Vibration and Harshness Division
www.parker.com/nvh

O-Ring & Engineered Seals Division
www.parker.com/oes

Prädifa Technology Division
www.parker.com/praedifa

Sealing Technologies Asia Division
www.parker.com/sta

Value Added Services

At Parker, our commitment to customer satisfaction doesn't end with the manufacture and delivery of superior engineered materials solutions. It extends to the development of valuable services and support tools that will help you simplify your design and specification experience.

Connect with us:

www.parker.com/emg

@ParkerSealing
@ParkerChomerics
@LORDCorporation

Parker Sealing and Shielding Technology
Parker Chomerics
LORD Corporation, a part of Parker Hannifin

Blog.Parker.com
LORD.com/Blog

Fast Samples and Prototyping

Whether you're developing a new product, or looking for a solution to an existing problem, it helps to have fast access to material and product choices. Our in-house prototyping and tooling capabilities enable us to turn out new solutions and samples quickly—within hours in some cases.

Assemblies, Subsystems and Kitting

To help you reduce your vendor base and eliminate unnecessary labor costs, we can provide partial or complete assemblies of products for sealing, isolation and other applications. We can also create kits and subkits to your exact specifications, consolidating Engineered Materials Group products, other Parker components and related hardware into one convenient package.

Our kits can reduce labor costs and speed production.

Part Marking

Our part marking capabilities include both permanent and non-permanent part identification from part numbers to customer logos, part identification helps to ensure the correct part is used in today's fast paced, integrated production lines.

Electronic Ordering

To manage your supply chain efficiently, you need up-to-the-minute information on stock levels and an ordering system that minimizes paperwork. Parker offers state-of-the-art ordering systems like ANSI X12 EDI, PHconnect and PHast, all designed to improve efficiency. We also utilize a system which combines powerful inventory management software with a convenient hand-held scanner, allowing you to place orders directly to your local distributor or Parker Service Center. And our Internet-based EDI capabilities allow you to track your orders in real-time from anywhere in the world.

Strategic Market Focus

Parker Hannifin Corporation is the world's leading diversified manufacturer of motion and control technologies and systems. Our products play an important role in the safe and reliable operation of critical equipment in hospitals, laboratories, and in everything from semiconductor processing fabs to airplanes and heavy-duty trucks. Additionally, our precision plastic and elastomeric components are used in a variety of medical devices and healthcare equipment.

Our shielding and grounding products protect critical electronics from the harmful effects of electromagnetic interference (EMI). In addition, our thermally conductive fillers, gels and interface materials cool hot microprocessors and power supplies. Parker's broad range of adhesives deliver structural integrity and resistance to environmental extremes. Finally, our vibration isolation and advanced sensing technologies provide risk mitigation while delivering superior comfort and performance.

We are strategically focused on providing engineered solutions to the following key markets:

Aerospace
Vehicles moving through air and space.

Automotive
Vehicles and components associated with propelling and stopping vehicles, and electrification.

Chemical Industry
Chemical processing producing a wide variety of sold, liquid and gaseous materials.

Consumer
Appliances, consumer electronics, water systems and food & beverage equipment.

Mobile Industrial
Hydraulic and pneumatic systems or components.

General Industrial
Manufacturing or processing of products or components.

Information Technology
Computer systems, peripherals and components.

Life Sciences
Medical devices, diagnostic & lab equipment and pharmaceutical manufacturing.

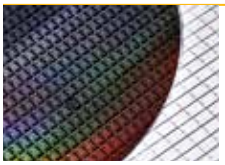
Defense
Government weapons, vehicles, surveillance and security.

Oil & Gas
Oil and natural gas exploration, drilling, extraction and conveyance.

Other Transportation
Railways, subways and marine.

Power Generation
Electrical power generation facilities.

Renewable Energy
Naturally replenished energy from sunlight, wind, rain, tides and geothermal services.



Semiconductor
Design and fabrication of semiconductor devices.

Telecommunications
Transmission of signals over a distance for the purpose of communications.

Worldwide Manufacturing Locations

North America

United Sates of America
Fontana, California
San Diego, California
North Haven, Connecticut
Elgin, Illinois
Peoria, Illinois
Woodridge, Illinois
Goshen, Indiana
Indianapolis, Indiana
Merrillville, Indiana
Syracuse, Indiana
Lexington, Kentucky
Bowling Green, Kentucky
Woburn, Massachusetts
Wixom, Michigan
Gothenburg, Nebraska
Hudson, New Hampshire
Cranford, New Jersey
Amherst, New York
Fairport, New York
Marion, New York
Cary, North Carolina
Blacklick, Ohio
Dayton, Ohio
Cambridge Springs, Pennsylvania
Erie, Pennsylvania
Saegertown, Pennsylvania
Spartanburg, South Carolina
Lebanon, Tennessee
Livingston, Tennessee
Houston, Texas
Nacogdoches, Texas
Spring, Texas (Houston Area)
Salt Lake City, Utah
Williston, Vermont
Lynchburg, Virginia

Mexico
Apodaca, Monterrey
Matamoros, Tamaulipas
Mexico City, Federal District
Queretaro, Mexico
Tijuana, Baja California
Zapopan, Jalisco

South America

Brazil
São Paulo

Around the Corner and Around the Globe

Parker's full line of sealing, shielding, vibration control and adhesive technologies are manufactured in Parker facilities around the globe.

In addition to our manufacturing facilities, local sales and distributor locations provide you with engineered solutions where you need them.

Europe

Belgium
Boom
Brussels

Czech Republic
Sadska

France
Saint-Ouen l'Aumone
Saint-Vallier Cedex
Valbonne

Germany
Bietigheim-Bissingen
Hilden
Hückelhoven-Baal
Leuna
Osterode
Pleidelsheim

Italy
Monzambano (MN)

Netherlands
Amsterdam

Poland
Gryfino
Warsaw

Russia
Moscow

Scotland
Glasgow

Slovakia
Brataslava

Spain
Barcelona

Sweden
Stockholm

Switzerland
Geneva

Turkey
Istanbul

United Kingdom
Grantham
High Wycombe
Manchester

Worldwide Manufacturing Locations

Asia

China
Beijing
Dongguan-Guangdong
Shanghai
Shenzhen
Tianjin
Wuxi

Hong Kong
Kowloon
Wanchai

India
Bengaluru
Chennai, Tamil Nadu
Gurgaon
Mumbai
Satpur

Indonesia
Jawa Barat
Kota Bekasi-Bekasi Selatan

Japan
Tokyo
Yamanashi
Nagoya

Malaysia
Selangor Darul Ehsan
Shah Alam

New Zealand
Auckland

South Korea
Kyounggi-Do
Seoul

Taiwan
Taipei

Thailand
Samut Prakan

Vietnam
Dong Nai, Vietnam
Vinh Cuu

Africa

Israel
Omer

Parker Engineered Materials Group Divisions

Assembly Protection Solutions Division

The Assembly Protection Solutions Division designs and manufactures adhesives, coatings, specialty chemicals and thermal management materials for the electric vehicle, industrial, sign, transportation and renewable energy markets.

Manufacturing Capabilities/Technologies

- Structural bonding
- UV-cured adhesive
- Electronic thermal management
- Electronic device protection
- Adhesion science
- Surface science
- Polymer science
- Material science

Assembly Protection Solutions Division Products

Structural Adhesives

- Automotive aftermarket repair adhesives
- Industrial assembly adhesives
- Automotive assembly adhesives

Electronic Materials

- Thermal management materials
- Potting and encapsulation materials
- Semiconductor packaging materials
- Thick film materials

Specialty Materials

www.parker.com/aps

Parker Engineered Materials Group Divisions

Chomerics Division

Chomerics Division is part of the Parker Hannifin Corporation Engineered Materials Group, and is a global leader in the development and application of electrically conductive and thermal interface materials. Engineers and designers from every industry including aviation, telecommunications, medical devices, defense, commercial and consumer electronics choose Parker Chomerics for its strong product portfolio, utilizing technology built on core competencies in material science and process technology.

Manufacturing Capabilities/Technologies

Compression and injection molded conductive elastomers; highly-engineered, electrically conductive or non-conductive injection molded plastic solutions; conductive silicone-to-metal & conductive silicone-to-plastic overmolding; conductive elastomeric extruding and splicing; automated form-in-place gasket dispensing and painting, laminating, coating, single-knife slitting, rotary die-cutting, male/female and steel rule die cutting, wrapped foam gasketing, metallic conformal coating, in-house tooling, glass and laminating, cutting, optical bonding and assembly.

Chomerics Division Products

EMI Shielding

- CHOFORM® and ParPHorm™ form-in-place elastomer gaskets
- CHO-BOND® and CHO-SHIELD® conductive adhesives, coatings and sealants
- CHO-MUTE® microwave absorbers
- CHO-SEAL® conductive elastomer gaskets
- PREMIER® conductive plastic shielding solutions
- SOFT-SHIELD® low closure force EMI gaskets
- Wire mesh gaskets STREAMSHIELD™ shielded vents
- SPRING-LINE® BeCu fingerstock, CHO-SORB® ferrites

Thermal Management

- T-WING® and C-WING™ heat spreaders
- THERMFLOW® phase-change thermal interface materials
- THERMATTACH® thermally conductive adhesive tapes
- THERM-A-GAP™ thermally conductive gap fillers and insulation pads
- CHO-THERM® thermally conductive insulating pads
- THERM-A-FORM™ thermally conductive silicone adhesives and caulks
- THERMA-A-GAP thermally conductive dispensable gels

Integrated System Solutions

- Integrated solutions plastic/metal housings or optical display with companion products and supply chain components

Custom Molded Plastics

- Injection molded plastics

Optical Display Products

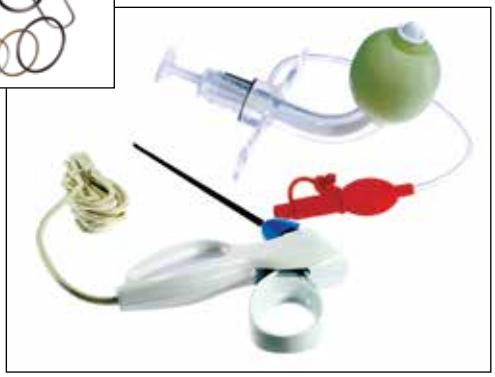
- Glass, polycarbonate, acrylic, cast (allyl diglycol carbonate) and specialty viewing substrates, optical bonding
- Shielded windows

Parker Engineered Materials Group Divisions

Composite Sealing Systems Division

The Composite Sealing Systems Division designs and manufactures engineered seals and sealing systems consisting of metal and composite retained elastomeric combinations for static face seal applications and metal seals for extreme sealing environments. Additionally, our in-house prototype and production tooling capabilities offer medical and pharmaceutical original equipment manufacturers a wide range of medical-grade molding solutions.

We also produce highly loaded metal matrix composites (MMC) made via advanced pressure infiltration casting. Engineered material solutions include low expansion, high thermal conductivity MMCs for high heat flux semiconductor microelectronic packaging and high specific-stiffness fiber-reinforced aluminum, offering excellent wear and strength retention at elevated temperatures.



Manufacturing Capabilities/Technologies

Liquid silicone injection molding (LIM/LSR), liquid silicone injection and flashless molding, organic rubber injection and flashless molding, thermoplastic and TPE injection molding, machining, stamping, compression, transfer and injection molding, rubber-to-metal and composite bonding, vacuum heat-treatment, electroplating, roll-forming, welding and lapping, class 10,000 and 100,000 cleanrooms, mechanical, chemical and functional testing. MMC advanced pressure infiltration casting, net shape, and hybrid preform composite structures and components.

Composite Sealing Systems Division Products

Composite Seals
- Gask-O-Seal® volume/void seals
- Integral Seal™ edge molded seals
- Stat-O-Seal® fastener and fitting seals
- ThredSeal™ fastener and fitting seals

Dissolvable Material
- Aluminum based

Fabric Reinforced Elastomeric Seals
- Air ducts and breather tubes
- Fireproof and fire-resistant seals
- Aerodynamic and door seals
- Diaphragms

Metal Seals
- EnerRing® resilient metal seals (O, C, E, U and V cross-sections)
- Metal jacketed gaskets
- Corrugated gaskets
- Chevron seals
- Flat metal gaskets
- Port seals
- AS1895/7 and AS1895/23
- Air duct seals
- Metal beaded gaskets
- Machined seals
- Retainer seals

Sealing Systems
- Composite sealing systems including seal, sealing interface and system design and manufacture
- Seal and manifold assemblies

Medical Component Manufacturing
- Flashless organic and silicone molding
- Insert & over-molding
- Liquid silicone molding
- Organic rubber injection molding
- Thermoplastic & TPE molding

Medical Device & Instrument Assembly
- Class I, II and III medical devices
  - In-vitro diagnostic assembly, testing, packaging, sterilization and distribution
  - Non-sterile reusable devices
  - Single-use devices
- Silicone medical device assembly

Medical Grade Silicone Extrusions
- Color-coded tubing & rods
- Profiled tubing & rods
- Striping and multicolor/multilayer coextrusion
- Wire-reinforced tubing
- X-ray striped & X-ray opaque tubing

Medical Instrumentation
- Packaging, printing & sterilization

Metal matrix composites
- MetGraf Al and Cu alloys reinforced with high-modulus graphite fiber

R&D products
- Fiber reinforced aluminum (FRA)—Al_2O_3 FRA for lightweight, high-strength aerospace components
- CuDia—Net-shape copper-diamond composites for high heat flux GaN semiconductor packaging.

www.parker.com/css

Parker Engineered Materials Group Divisions

Elastomer Process Materials Division

The Elastomer Process Materials Division designs and manufactures adhesives for rubber-to-substrate bonding, coatings, additives and emulsions. Markets served include automotive and transportation; agriculture; fluid management; infrastructure; power distribution; oil and gas; and mining.

Manufacturing Capabilities/Technologies

- Elastomer bonding and coating
- Adhesion science
- Surface science
- Polymer science
- Material science

Elastomer Process Materials Division Products

Bonding Solutions

- Vulcanizing adhesives
- Cold-bond adhesives
- Silicone adhesives, additives and primers

Coatings for Rubber Bonding

- High performance coatings
- Heat reflective coatings
- Flame-resistant coatings
- Magnet coatings

Rubber Processing Solutions

- Cross-linkers
- Latex materials
- Mold release agent
- Chemical cleaning solutions

Weatherstrip and Glass Solutions

- Weatherstrip coatings
- Flock adhesives
- Glass encapsulation adhesives

Parker Engineered Materials Group Divisions

Engineered Polymer Systems Division

The Engineered Polymer Systems Division designs and manufactures engineered elastomeric, polymeric and plastic seals and sealing systems for dynamic applications.

Manufacturing Capabilities/Technologies

- Plastics injection molding
- Urethane reactive extrusion
- Plastics compounding
- Polyurethane polymerization
- Rubber compression, transfer, and injection-compression molding
- In-house elastomeric mixing
- Elastomer-to-metal bonding
- PTFE blending, molding and sintering
- CNC precision machining and milling
- In-house tool design and production
- Rapid prototypes
- In-house material analysis and characterization lab
- Finite element analysis
- Validation and performance test labs

Engineered Polymer Systems Division Products

Packings

- Rod and piston seals for hydraulics and pneumatics
- Symmetrical PolyPak® seals
- Resilon® polyurethane seals
- Wear rings and bearings
- Wipers and scrapers
- T-Seals
- V-Packing
- Back-up rings
- Polyurethane O-rings and D-rings
- Valve seals
- Accumulator seals

Rotary Shaft Seals

- Clipper® oil seals
- Parker oil seals
- FlexiLip™ PTFE rotary seals
- ProTech™ bearing isolators (labyrinth seals)

PTFE Seals

- FlexiSeal® spring energized lip seals
- Sleeve-and-slice automotive rings
- Fluid power PTFE caps seals
- PTFE valve seats and stem packings
- Custom PTFE seals
- PTFE O-rings

Oilfield Products

- Gimbal bearings & brackets
- Riser clamps
- End protectors
- Crown bumpers
- Subsea and rig side flex elements
- Mud and frac pump sealing components
- Subsea riser & connector seals
- Choke and kill seals
- Hydraulic seals for tensions
- Flow-line seals
- Telescoping joint packers
- Auxiliary line seals
- Control valve seals & stem packings
- Well service packing
- Drilling and well-servicing plugs, wipers, diaphragms, cups
- Ram & shear rubbers
- BOP elements

Custom Products

- Custom molded and machined shapes
- Energy management shock pads
- Polyurethane bumpers
- Polymer springs
- Tadpole tape & firewall sheet
- Optical grade polyurethane

Parker Engineered Materials Group Divisions

Noise, Vibration and Harshness Division

The Noise, Vibration and Harshness Division designs and manufactures noise and vibration isolation devices and sensing technologies that reduce risk and improve product performance. Markets served include aerospace and defense; industrial; and oil and gas.

Manufacturing Capabilities/Technologies

- Elastomeric vibration isolation and damping
- Active vibration control
- Fluid vibration isolation and damping
- Mechanical design
- Dynamic systems
- Control systems
- Wireless sensing
- Energy harvesting
- Inertial/orientation technologies

Noise, Vibration and Harshness Division Products

Aerospace and Defense

- Electromechanical solutions
  - Active vibration control systems
  - Electromechanical actuators
  - MRO services
- Mechanical solutions
  - Rotor hubs, bearings and dampers
  - Engine and auxiliary power attachment systems
  - Vibration isolator and engine mount systems
  - Equipment and avionics isolations systems
  - MRO services

Industrial Equipment

- Electromechanical solutions
  - Steer-by-wire tactile feedback devices
  - Magneto-rheological semi-active suspension systems
- Mechanical solutions
  - Engine, gearbox and transmission mounting systems
  - Cab mounting and suspension systems
  - Elastomeric driveline couplings
  - Equipment and electronics isolations solutions

Oil and Gas

- Offshore elastomeric products
  - Telescopic joint (TJ) packers
  - Flexible joints
  - Riser tensioner bearings
  - Gimbal bearing assemblies and pads
  - Tendon Bearings
- Downhole shock mitigation
  - Axial isolator
  - SoftShoe isolator
  - Lateral isolator
  - Snubbers

Sensing Systems

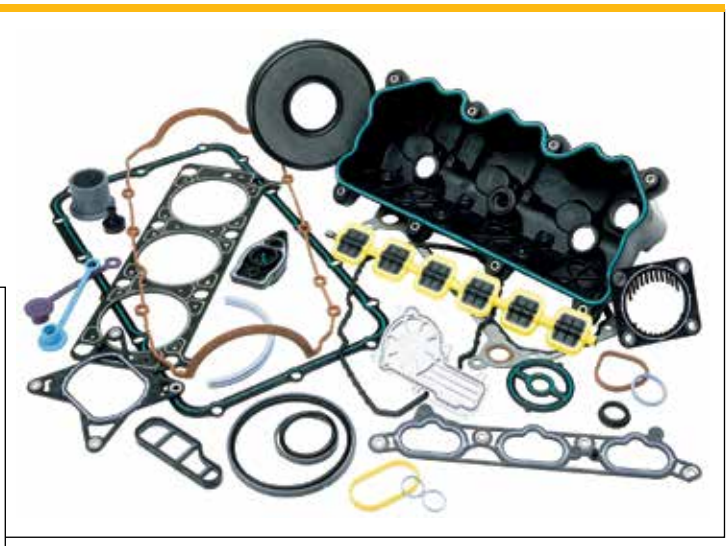
- Inertial sensors
  - Inertial measurement unit (IMU)
  - Attitude and heading reference systems (AHRS)
  - Vertical reference unit (VRU)
  - Inertial navigation systems (INS)
- Wireless sensor networks
  - Wireless sensor nodes
  - Wireless gateways
- Displacement sensors
  - Free core LVDT
  - Gauging LVDT
  - Non-contact LVDT
  - Signal conditioners
- Software
  - Robotic operating system (ROS)
  - SensorConnect
  - SensorCloud
  - MicroStrain communication library (MSCL)

www.parker.com/nvh

Parker Engineered Materials Group Divisions

O-Ring & Engineered Seals Division

The O-Ring & Engineered Seals Division is a leading manufacturer of engineered elastomeric shapes (both homogeneous and inserted) for sealing systems and isolation applications.



Manufacturing Capabilities/Technologies

In-house elastomeric mixing and tooling, in-house functional test lab, system and sub-system assembly, homogeneous molding and over-molding expertise, precision cutting, splicing and fabricating, custom extruded profiles, computer-controlled compression and injection molding, transfer injection, liquid injection molding (LIM), automated visual inspection, specialty machining operations, cleanroom manufacturing, USP Class VI and FDA white-listed, UL and NSF 61 certified materials, co-injection molding. Oil & Gas approvals by NORSOK M-710, API 6A, ISO 23936 and Total.

O-Ring & Engineered Seals Division Products

Composite Seals

- Over-molded rubber-to-plastic composite carrier seals
- Over-molded rubber-to-plastic filter seals
- Bonded piston seals
- Fluid transfer seals
- Pipe seals
- Cluster seals
- Bearing seals
- Custom seals and isolators
- Hay rake tines and other agricultural equipment components

Custom Molded Seals

- Turbine shaft seals
- Machined lip seals
- Isolation mounts
- Grommets
- Connector seals
- Diaphragms
- Bellows
- Poultry picking fingers
- Filter seals
- Fuel management seals
- Wire connector boots
- Aerosol valve seals
- D-rings and low-drag D-rings
- Packer elements
- Press-in-place diamond seal
- Dovetail retrofit EZ-Lok™ and WEAR-Lok™
- Press-in-place seals
- Isolator mounts and grommets
- Integrated sealing systems for cam cover, oil pan, water outlet connector and breather applications
- Lip seals
- X-rings
- Low-torque articulating seal
- Check valve seal

Extruded Products

- Small-diameter precision cut seals
- Large-diameter lathe cut seals
- ParFab™ extruded profiles
- ParFab spliced/fabricated gaskets (hollow and solid rings/gaskets, 4-corner “picture frame” gaskets, compression limited gaskets)
- TetraSeal® circular lathe cut seals
- Spin-on oil filter seals
- Industrial drive belts
- Special lathe cut profiles (D-rings, V-seals, L-seals, double chamfers, short lip seals, etc.)
- Long-length extruded seals
- Anti-drain back seals
- Sweeper belts
- Oilfield packer elements

(Continued on page 19)

Parker Engineered Materials Group Divisions

O-Ring & Engineered Seals Division *(Continued from page 18)*

O-Ring & Engineered Seals Division Products *(Continued)*

Packings

- ChemCast piston seals and wear rings

O-Rings

- O-ring seals in fluorocarbon, fluorosilicone, silicone, ethylene propylene, nitrile, HNBR, neoprene, butyl, polyacrylate, ethylene acrylate, polyurethane, AFLAS
- O-ring seals in Hifluor™ and specialty perfluorinated elastomer formulations, such as ULTRA™
- UL, NSF, FDA, USDA, USP Class VI and USP Class 87, AMS, NAS and MIL-spec approved O-ring materials
- Large-diameter continuous molded O-rings
- Parbak® Back-up rings
- Drive belts
- X-rings

O-Ring Accessories

- Standard and custom O-ring kits
- O-ring installation lubricants and tools
- O-Lube and Super O-Lube

Parker Engineered Materials Group Divisions

Prädifa Technology Division

The Prädifa Technology Division designs and manufactures engineered sealing elements and sealing systems made from polymeric materials for static and dynamic applications. Additionally, the product portfolio encompasses a wide range of molded shapes, composite parts, continuous profiles as well as other engineered components, in- and outside sealing technology.

Furthermore, the Prädifa Technology Division offers a variety of services such as testing, kitting, product identification and much more.

Manufacturing Capabilities/Technologies

Material science

- Development and mixing of rubber elastomers
- Plastics compounding
- Polyurethane polyaddition
- Material and validation laboratories

Processing techniques

- Thermoplastics injection molding
- Rubber compression, transfer, and injection-compression molding
- Silicone processing
- Composite bonding technology
- Ultrasonic welding
- Plasma-activation
- Stamping
- Lamination
- PTFE lathe-processing
- Tool design and production
- Automated vision inspection
- Automated process technology
- Cleanroom production
- Rapid prototyping

Sealing Solutions

Static seals

- O-rings
- Back-up rings
- Press-in-Place Seals
- Stat-O-Seal® fastener and fitting seals
- Customized sealing plates
- Molded shapes
- 2K rubber-plastic moldings
- Cut seals
- Flange seals
- Head seals
- Packer elements

Seals for translatory movement / cylinder seals

- Cylinder rod and piston seals
- Wiper rings
- Cushioning seals for pneumatic cylinders
- Integrated pneumatic pistons
- Anti-rotation rod and piston seals
- Slipper Seals® (elastomer-energized PTFE seals)
- FlexiSeal® spring-energized lip seals
- Sealing systems for high-pressure water pumps
- Accumulator seals
- Valve seals
- T-seals
- S-seals
- Chevron V-packings
- Customized seal designs

(Continued on page 21)

Parker Engineered Materials Group Divisions

Prädifa Technology Division *(Continued from page 20)*

Sealing Solutions *(Continued)*

Seals for rotary movement:

- Radial shaft seals
- High-pressure rotary seals
- ProTech® bearing isolators (labyrinth seals)

Guiding elements

- Guiding rings
- Guiding tapes (endless or cut to length)

Diaphragms

- Elastomer diaphragms
- Metal E-seals
- Elastomer bellows

Custom solutions

- Seals and sealing systems
- Engineered components

Engineered Polymer Products

- Individual solutions according to customer specification
- Energy absorption elements
- Engineered thermoplastic components
- Engineered rubber components
- Engineered multi-component molded shapes and profiles
- Customized single-use container systems
- Endless extruded profiles
- XXL size seals and molded parts
- Laminated products
- Stamped products

Single-Use Fluid Management Systems for Biopharma Applications

- Custom container solutions
- Custom manifold systems
- Flex Caps

Brand Names

- Polon®
- Slipper Seals®
- FlexiSeal®
- FlexiCase®
- Ultrathan®
- Stat-O-Seal®
- Roll2Seal®
- Caveseal®
- nobrox®
- Parbak®
- HiFluor®
- Park-O-Pak®
- Parofluor®
- O-Lube®
- Super O-Lube®

Parker Engineered Materials Group Divisions

Sealing Technologies Asia Division

The Sealing Technologies Asia Division creates a wide variety of customized precision elastomeric components, materials and processes. The Division is supported by fully integrated in-house tool design and fabrication, R&D laboratory, rubber mixing, dedicated manufacturing cells and accredited chemical and mechanical testing services.

Manufacturing Capabilities/Technologies

Micro molding; compression, transfer and over molding; liquid injection molding (LIM/LSR); class 100,000 cleanroom manufacturing; high speed CNC machining center; in-house mixing, chemical and mechanical testing.

Sealing Technologies Asia Division Products

- Custom precision elastomeric components
- Miniature elastomer seals
- O-rings and custom molded gaskets for automotive & truck applications including:
  - Fuel tank seals
  - Intake manifold gaskets and lip seals
  - Electric vehicle E-Axle and battery pack seals
  - HVAC sealing washers
  - Steering gaskets
  - Automatic transmissions D-rings and fluid transfer seals
  - Braking system O-rings
- Hard disk drive crash stops, gaskets & dampers
- Variety of custom molded elastomeric parts for medical devices including:
  - Infusion pump gaskets
  - Oximeter sensor pads
  - Hearing aid domes and suspensions
  - Stoppers for syringes and blood collection tubes
  - Trocar sealing elements
  - Vial caps
- Hydraulic and pneumatic cylinder rod and piston seals
- Hydraulic and pneumatic cylinder wipers and scrapers
- Hydraulic and pneumatic cylinder guiding elements
- Hydraulic cylinder head seals
- Flange seals and O-rings
- PTFE seals
- Lip seals
- Rubber-metal bonded seals
- TPU-metal bonded seals
- Static seals for gear pumps/motors
- Seal kits for hydraulic or pneumatic actuators.

Product Overview

Composites

Gask-O-Seals

Gask-O-Seals are very reliable elastomer bonded-to-metal or plastic sealing devices intended for applications requiring extreme reliability, longevity, and durability.

Integral Seals

Integral seals are best suited for high-volume OEM or retrofit applications in automotive, industrial, aerospace and military applications.

Bonded Piston Seals

Used in automatic transmission applications, differentials and braking systems.

Carrier Gaskets

Our custom designed carrier gaskets are comprised of an elastomeric seal over-molded onto one or both sides of a thermoplastic nylon carrier.

Fastener and Fitting Seals

Fastener and fitting seals provide reliable static sealing for screws, bolts, tube fittings and other fasteners. Available in a wide range of sizes, materials, compounds and surface finishes.

Active Runner Intake Manifold Valves

Commonly referred to as Short Runner Valves (SRV) or Charge Motion Control Valves (CMCV), these assemblies vary the air flow rate into a manifold to maximize fuel efficiency and horsepower in vehicles.

Hygienic Sanitary Gaskets

Compression controlled gaskets offering excellent wear performance, complete material traceability and easy installation.

Custom Molded Seals

Custom Molded or Machined Shapes

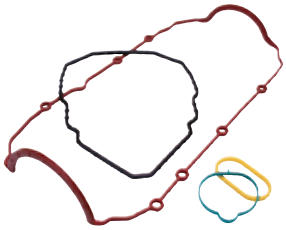
Our custom molded and machined seals are available in a virtually infinite range of shapes and cross sections.

Diaphragms and Directional Valve Seals

Diaphragms and directional valve seals are used in a variety of media types and can be designed for extreme temperature conditions.

Over-Molded Seals and Sub-Assemblies

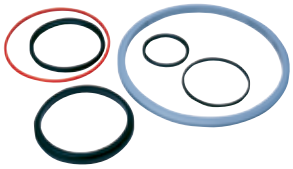
Over-molded seals and sub- assemblies provide a value added design solution, often eliminating components in a finished assembly.



Press-in-Place Seals

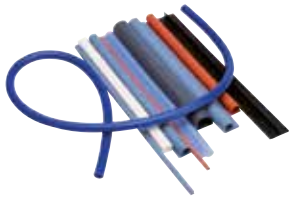
Press-in-place seal design technology provides simple seal retention in straight-walled or dove-tail grooves.

Extruded Products



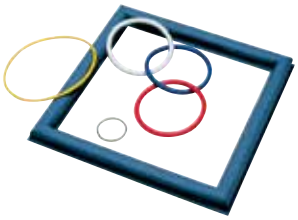
Standard and Custom Lathe-Cuts

Cross-sections such as double chamfers, D-rings, L-gaskets, external U-sections, angle L-seals and short lip seals are available from any of the major polymer families.



ParFab Extruded Profiles

Standard extruded profiles are available in many configurations, such as solid and hollow-O, solid and hollow-D, U-channel, rectangular, solid and hollow square and hollow-dart configuration profiles.



ParFab Spliced / Fabricated Products

ParFab products can be fabricated into low closure force seals, large diameter O-rings, non-standard O-rings and custom profiles. They are an ideal, cost-effective sealing solution for many applications.

Non-Sealing Extruded Products

Non-sealing products include sleeves, bumpers, tubing, pills, grips, rollers and many other configurations extruded from a variety of basic rubber and thermoplastic materials.

Continuous Profiles

Customized continuous profiles for sealing, damping, protecting and to simplify assembly processes. They are produced from elastic materials that are precisely adapted to the respective purpose. Material options are compact elastomers, sponge rubber, thermoplastics and combinations of those materials.

The final product is either cut to length or delivered on rolls, which makes it ideally suited for automated processing. Finishing options are lamination and kiss-cutting.

Metal Seals

Semi-Dynamic Metal Seals

Frequently selected for high-pressure/high-temperature (HPHT) service, dynamic seals excel under extreme environments.

Ultra-High-Temperature Metallic Seals

Parker metal seals are available in advanced nickel-based superalloys, turbine blade alloys, and with optional integral thermal insulation.

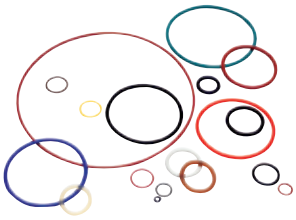
Metal Seals and Gaskets

Our resilient metal seals are available in a wide range of base metals and plating finishes. Applications include cryogenic, high vacuum, ultra-low leakage, high radiation and significant thermally induced movements.

Air Duct Seals

Parker's air duct seals for heavy-duty engines feature a single-piece, easy-to-install metal design that provides lower leak rates than seals from traditional competitors. The continuous, single-piece metal seal design is enhanced with the use of TriCom-HT, Parker's proprietary high-temperature, anti-wear coating.

O-Rings



O-Rings

O-rings are available in all AS568 inch sizes as well as a wide range of metric sizes to DIN 3771, ISO 3601 and JIS B2401. Over 1,500 non-standard O-ring sizes are available for special order.

O-Ring Accessories

To assist in the installation of O-ring seals, Parker provides a number of useful items for use in sizing, installing and lubricating O-rings.

Packings

Rod Seals

The PolyPak line of fluid power rod and piston seals has been the industry standard for over 40 years.

Wipers and Scrapers

Complete line of canned, energized and snap-in rod wipers. Single and double lip snap-in wipers also available.

Piston Seals

Our diverse range of piston seal profiles suit a broad range of hydraulic and pneumatic applications.

ChemCast Piston Seals

Providing flawless sealing at temperatures over 300° F (149° C) and pressures exceeding 50,000 psi.

Urethane Piston Seals

Complete line of urethane single and bi-directional piston seals. Parker's Molythane and Resilon materials are industry known for the highest performance and quality.

PTFE Piston Seals

Complete line of PTFE energized piston seals are offered in various PTFE compounds including bronze, glass and graphite loaded solutions

(Continued on page 29)

Packings *(Continued from page 28)*

Piston Seals *(Continued from page 28)*

Wear Rings and Bearings

Offered in a variety of heights, thicknesses and cut, our full line of wear rings and bearing products maximize value for cylinder manufacturers.

V-Packings

Wide range of V-pack solutions from homogenous rubber, fabric reinforced rubber, PTFE, PEEK and other engineered materials.

T-Seals

Elastomer seal elements with nylon or PTFE back-up rings, prevent seals from extruding or rolling in the groove.

PTFE Seals

PTFE FlexiSeals

Utilizing a variety of jacket profiles, PTFE compounds, spring types, and lip configurations, these seals can be designed to meet the requirements of the most demanding seal environments.

PTFE Fluid Power Seals

Including piston seals, rod seals, buffer seal rings, rod wipers, rotary swivel seals and wear rings. Proprietary high-performance compounds are available for especially demanding applications.

PTFE FlexiLip and FlexiCase Rotary Seals

FlexiLip high-speed PTFE lip seals are designed for rotary applications where elastomer lip seals fail, and mechanical seals are too costly.

Rotary Shaft Seals

Rotary Shaft Oil Seals

Complete line of oil seal products including the proprietary Clipper® Oil Seal design, with integrally precision-molded rubber/aramid fiber outer case and elastomeric inner lip. Available in a wide range of configurations.

ProTech Bearing Isolators

ProTech bearing isolators are the ultimate in bearing protection with their unitized, two-piece non-contact design providing zero lubricant leakage and total exclusion of contaminants.

High Speed Shaft Seals

FlexiLip high-speed PTFE lip seals are designed for rotary applications where elastomer lip seals fail, and mechanical seals are too costly. Designed to run in dry and abrasive media environments and available in single, double and triple sealing lip designs.

Fabric Reinforced Products

Fabric Reinforced Products

Parker uses our material expertise to design fabric reinforced products n a wide variety of custom shapes and sizes. The products perform in applications with vibration, shock, and movement with resistance to fuels and solvents.

Specialty Rubber Products

Oil & Gas Elastomer Products

Parker's drilling and well-servicing products span a broad range – including blowout preventers, packing elements, diaphragms, drill pipe/casing protectors, hammer union seals, packer cups, cement plugs, liner wipers, flex plugs, oil saver rubbers, pipe wipers, rod strippers, swab cups, pulsation dampeners, test cups and water saver rubbers.

Medical Component Manufacturing

Liquid Silicone Molding

Parker's Life Sciences Business Unit uses USP Class VI and biomedical-grade liquid silicone rubber materials from key material suppliers for molding elastomeric medical components. Capabilities include:

- Complex geometries
- Small components / Micro-molding
- Semi- and fully-automatic liquid injection molding
- Multi-stream additives, color, self-bleed oil, and others
- Antimicrobial materials

Thermoplastic & TPE Molding

Parker's Life Sciences Business Unit offers medical thermoplastic and thermoplastic elastomer injection molding capabilities, including 2K overmolding. Material selection includes:

- ABS
- Acetal
- Acrylic
- Carbon fiber composites
- EVA
- LCP
- Nylons including glass filled
- PEEK
- Polycarbonate
- Polyetherimide (PEI)
- Polypropylene
- Polystyrene
- PTFE
- PVC
- Thermoplastic elastomers with a wide range of hardness

Medical-Grade Compression Molding

Parker's Life Sciences Business Unit uses tested and certified medical grade elastomers in whiteroom environments to support a wide range of applications.

Applications

- Septums
- Duckbills / directional valves
- Vial stoppers
- Syringe plungers

Materials

- Polyisoprene
- Nitrile
- Fluorocarbon
- Silicone
- EPDM
- Butyl

Medical Device & Instrument Assembly

Silicone Medical Device Assembly

Parker's extensive silicone device assembly, fabrication and packaging is completed at our FDA Registered ISO 13485 certified manufacturing facilities. We contract manufacture the following types of silicone devices in either ISO 7 (Class 10,000) or ISO 8 (Class 100,000) certified clean rooms.

- Cardiovascular catheters
- Endotracheal catheters
- Feeding catheters & devices
- Multi-port urological catheters
- Nasal airways with single & dual balloons
- Orthopedic devices
- Pediatric catheters
- Peritoneal dialysis catheters
- Surgical wound drainage tubes
- Trachestomy catheters
- Wire-reinforced diagnostic catheters

General Medical Devices

We offer single use devices, non-sterile reusable devices and in-vitro diagnostic assembly, testing, packaging, sterilization and distribution. **Class I, II and III medical devices:**

- Audiology
- Cardiac cath lab
- Cardiology
- Chronic care
- Clinical laboratory
- Critical care
- Dialysis
- Labor and delivery
- Neurology
- Oncology
- Operating room
- Respiratory therapy
- Sleep labs

Medical Grade Silicone Extrusions & Packaging

Single and Multi-Lumen Tubing

Wide range of medical grade single and multi-lumen tubing and extruded profiles.

- Color coded tubing & rods
- Continuous laser monitoring of tubing size during extrusion
- Custom and standard sizes
- Medical grade silicones from all major suppliers
- On-line cutting to length & 50 ft. coils
- Profiled tubing & rods
- Striping and multicolor/multilayer coextrusion
- Wire-reinforced tubing
- X-ray striped & X-ray opaque tubing

Packaging

We assist in all aspects of packaging selection and utilize vendors who deliver quality materials, on time and at reasonable prices. We arrange D.O.T.-approved transit testing for your product as requested, and manage the sterilization process for turnkey product and device support.

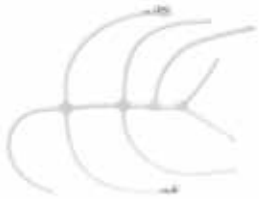
Single-Use Fluid Management Systems

Parker Prädifa offers custom single-use systems, sealing and fluid handling components for biopharma laboratory and manufacturing applications, supporting customers from product design to finished devices, including regulatory matters.

They considerably mitigate the risk of contamination, allow for integration of pre-validated components and help reduce overall system costs.

Custom Container Solutions

Customizable container solutions using our proprietary overmolding technology include tube-to-container interfaces, tube-to-tube connections, in-container tube management, anti-foam feature, tamper evidence seal, tube fixation and protection caps.



Custom Manifold Systems

Customized manifold systems which implement all common single-use pharma components and mitigate the risk of contamination through excellent fluid path management.

Flex Caps

Multi-functional cap solutions provide fully customizable tube-to-unit interfaces with innovative fluid management capabilities. They mitigate the risk of contamination and allow for integration of previously validated components such as tubing.

EMI Shielding - Gaskets

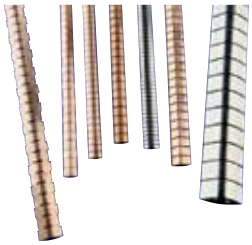
Parker Chomerics EMI shielding gaskets has an extensive selection of gasketing choices for elastomeric seals, corrosion resistance, environmental seals, and cost effective electronic shielding.

CHOFORM Form-In-Place Electrically Conductive Materials

CHOFORM Form-In-Place (FIP) robotically dispensed EMI shielding gaskets provide the lowest total cost of ownership for small cross section and complex pattern applications.

SOFT-SHIELD® Fabric-Over-Foam EMI Shielding Gaskets

SOFT-SHIELD® EMI gaskets provides a selection of strip and sheet stock commercial EMI gasket solutions suitable for most all indoor EMI shielding and grounding applications. These products rely on the unique construction of a conductivity-plated fabric or wire mesh, wrapped or knitted over a low closure force urethane foam.



SPRING-LINE Fingerstock EMI Gaskets

Parker Chomerics beryllium-copper (BeCu) and stainless steel fingerstock EMI gaskets combine high levels of shielding effectiveness with a broad deflection range and low closure force properties

CHO-SEAL Electrically Conductive Elastomer Gaskets

CHO-SEAL electrically conductive elastomer gaskets are the superior choice for corrosion resistance, environmental sealing, and cost-effective EMI shielding. Available as molded sheets or parts, or extruded into strips and either offered as cord stock at length or spliced (fused) to form a continuous seal.

(Continued on page 36)

EMI Shielding - Gaskets *(Continued from page 35)*

WIRE MESH EMI Gaskets

Parker Chomerics MESH STRIP® mesh gaskets consist of highly resilient knit metal mesh used to provide EMI/EMP shielding and electrical grounding along enclosure seams.

PORCUPINE METALASTIC™ EMI Gaskets with Pressure Seals

Parker Chomerics PORCUPINE METALASTIC™ consists of expanded Monel or Aluminum foil and provides EMI shielding as well as optional pressure sealing.

Metalastic EXP-URE Corrosion Resistant EMI Gasket

Metalastic EXP-URE urethane filled expanded aluminum gaskets provide an electrically conductive, fluid and pressure sealing solution for exterior mounted accessories.

POLA® SOLID and POLA® SPONGE Oriented Wire EMI Gaskets

Parker Chomerics POLA® SOLID consists of oriented wire in a silicone elastomer providing EMI shielding and weather sealing at a fraction of the cost of alternative products.

EMI Shielding

CHO-SHIELD and PRO-SHIELD EMI Shielding Paints

Designed for application on a wide variety of surfaces for challenging environments when a conductive surface is desired.

CHO-BOND, PRO-SHIELD and TECKNIT Electrically Conductive Sealants

Used to provide EMI shielding for gaps and seams of electronic enclosures.

CHO-BOND, PRO-SHIELD and TECKNIT Electrically Conductive Adhesives

Formulated to provide a strong bond and electrical pathway between mating surfaces.

EMI Shielded Air Ventilation Panels

Provide air flow for cooling in electronic enclosures while preserving necessary EMI shielding.

PREMIER Electrically Conductive Plastics

Electrically conductive thermoplastics for plastic enclosure EMI shielding solutions.

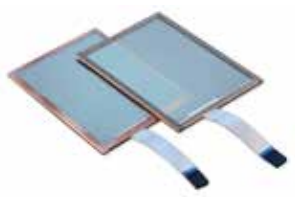
CHO-SHRINK Electrically Conductive Heat Shrink Tubing

Low cost, light weight, 360° EMI shielding for cables, transitions, connectors and terminations.

CHO-MUTE Microwave Absorber Materials

These materials provide RF absorption performance over a broadband frequency range.

Optical Display Products & Integrated Systems



Integrated Display Solutions

Parker Chomerics offers a wide variety of touchscreen, window and LCD solutions for military, medical, aerospace, and industrial display applications. Providing turnkey solutions with integrated assemblies aids in fast design cycles and fast to market product development cycles.

Integrated System Solutions

An integrated system solution for EMI shielding and thermal management applications. Our in-house core competencies for thermoplastic injection molding, metal fabrication, EMI shielding and thermal management products, optical displays, test services and supply chain management can be fully leveraged to provide a complete one-stop solution.

Thermal Management

Wide variety of Thermal Interface Materials enables designers to create thermal management solutions for their most challenging electronics packaging needs.

THERMFLOW Thermally Conductive Phase-Change Materials

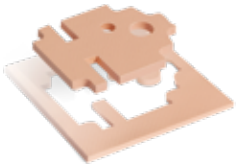
THERMFLOW phase-change materials are designed to displace entrapped air between power dissipating electronic components. Phase-change materials maximize heat sink performance and improve component reliability. THERMFLOW pads soften as they reach component operating temperatures.

THERMATTACH® Thermally Conductive Adhesive Tapes

THERMATTACH® tapes are formulated with acrylic or silicone based pressure sensitive adhesive (PSA) loaded with thermally conductive fillers. They are designed to securely bond heat sinks to power dissipating components without an additional clamping mechanism.

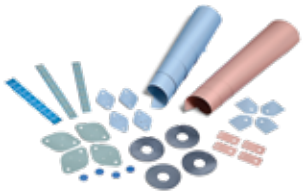
T-WING Heat Spreaders

Parker Chomerics family of thin heat spreaders provides a low-cost, effective means of cooling IC devices in restricted spaces where conventional heat sinks are inappropriate.



THERM-A-GAP™ Thermally Conductive Gap Filler Pads

THERM-A-GAP™ gap filler pads are a family of low soft, thermally conductive silicone and non-silicone elastomers for applications where heat must be conducted over a large and variant gap between a semiconductor component and a heat dissipating surface.



CHO-THERM® Thermally Conductive Insulators

CHO-THERM® Thermal Insulator Pads are designed for use as alternatives to greased mica insulators between discrete power devices and heat sinks. These products are offered as dry pads, or with an optional acrylic adhesive (PSA) layer for attachment.

MetGraf CTE Matched High Thermal Conductivity Metal Matrix Composites

MetGraf metal matrix composites are a family of aluminum and copper alloys reinforced with high modulus pitch based graphite fibers. MetGraf composites are made via pressure infiltration manufacturing technology and provide performance enhancements over traditional materials where low-density, high thermal conductivity, and tailored thermal expansion is needed to dissipate heat away from semiconductors mounted inside high watt density micro-electronic packages. MetGraf composites are easily machined to tight tolerance and surface finish using conventional CNC milling techniques. Large thin sheets (12" x 18") of Cu MetGraf are routinely made for high heat flux printed circuit board thermal control.

(Continued on page 40)

Thermal Management *(Continued from page 39)*

Thermally Conductive Greases

Parker Chomerics thermal greases offer a range of performance covering the simplest to the most demanding thermal requirements. These materials are screened, stenciled or dispensed and require virtually no compressive force to conform under typical assembly pressures.

THERM-A-FORM™ Thermally Conductive Cure-In-Place Compounds

THERM-A-FORM™ thermally conductive silicone elastomer products are dispensable form in- place compounds designed for heat transfer without excessive compressive force in electronics cooling applications. These versatile liquid reactive materials can be dispensed and then cured into complex geometries for cooling of multi-height components on a PCB without the expense of a molded sheet.

THERM-A-GAP™ Thermally Conductive Gels

THERM-A-GAP™ GELs are supplied as pre-cured, single component compounds that can be dispensed over the heat generating component. These unique gel materials result in much lower mechanical stress on delicate components than even the softest gap-filling pads. They are ideal for filling variable gaps between multiple components and a common heat sink.

CoolTherm® Gap Fillers

Our CoolTherm® liquid-dispense, cure-in-place gap fillers couple high thermal conductivity and low viscosity. Applications include on-board chargers, battery packs and power electronics.

CoolTherm® Thermally Conductive Adhesives

We offer solutions that combine structural and thermal requirements for battery packs, cooling plates and charging systems. Our CoolTherm® adhesives provide high-bond strength and thermal conductivity.

CoolTherm® Potting & Encapsulants

Potting and encapsulation products deliver a robust thermal interface resulting in reliable electronics. These CoolTherm® solutions improve performance by dissipating heat, protecting fragile components and reducing stress.

Structural Adhesives

LORD® Adhesives

Compared to traditional fastening methods such as rivets, welds and tapes, our adhesives offer superior adhesion to a variety of substrates – eliminating costs associated with metal preparation and finishing operations to improve your manufacturing processes. We're proven in a variety of industries including transportation, off-highway and industrial.

Automotive Assembly Adhesives

Build lightweight vehicles, lower emissions and replace mechanical fasteners with LORD® adhesives. Enable lower-cost assembly of automotive closure panels with Versilok® hem-flange adhesives. Our solutions are suitable for a wide variety of substrates and maintain their strength and durability.

Fusor® Repair Adhesives

We collaborate with our customers to provide OEM-approved and recommended products for the collision repair market. Our repair adhesives offer high standards of quality and performance that reduce cycle times for an increase in productivity. Fusor adhesives utilize various chemistries to meet your application needs.

Bonding Solutions

Chemlok® Adhesives

Rubber-to-metal and rubber-to-substrate bonding adhesives stand up to any challenge – across any industry, in any application – delivering reliable value to your business.

Chemlok® Cold-Bond Adhesives

Save money and work safer with cold-bond adhesives that bond vulcanized rubber-to-metal and rubber-to-rubber at ambient temperatures.

Silicone Additives, Primers & Adhesives

When you need high-performance peroxide- or platinum-cured silicone adhesives, primers or additives, choose the ultimate supplier in elastomer bonding technology. We offer a range of HTV silicone bonding products depending on your process and design requirements. Our solutions are proven across a variety of industries including industrial, automotive, electronics and aerospace.

Coatings

High Performance Coatings (HPC)

HPCs provide excellent fluid, ozone and solvent resistance for applications where high strain and fatigue resistance are important.

Heat Reflective Coatings (HRC)

Protect your parts longevity, reflect radiant heat and provide protection against ozone and fluids.

Specialty Coatings

Sipiol® FR and LORD® Magnet coatings are just a few of our specialty products designed for applications that require specific attributes.

Rubber Processing Solutions

Cross-Linkers

LORD® quinone dioxime technology can be added in the production of adhesives, tapes and rubber cross-linker additive packages or dispersions.

LokRelease™ Mold Release

Mold release agent designed for use with molded elastomers. LokRelease provides a semi-permanent, anti-stick surface coating for fast, easy part removal from molds.

LokRelease™ Chemical Cleaning Solution

Eliminate the need for risky and unsafe cleaning procedures when removing dried-on adhesives from mixing equipment and fixtures.

Weatherstrip & Glass Coatings and Adhesives

Sipiol® Weatherstrip Coatings

Improve automotive sealing durability and performance for primary and secondary doors, trunks, hoods and sunroofs. Our coatings offer high abrasion resistance, UV stability and noise reduction.

Flocklok® Flock Adhesives

Flock adhesives form a dependable barrier against the elements to adhere polyester or nylon flock fibers to automotive sealings.

Rotary Wing

Active Vibration Control Systems

Our AVCS reduces vibration in the helicopter fuselage and provides patented algorithms that control steady state and transient vibration, even during start up. This means reduced weight on the aircraft, less vibration-induced fatigue of structures and equipment, and improved comfort for pilot and occupants.

Engine Mounts and Attachments

The best solutions for your aircraft including elastomeric and non-elastomeric mounts, full structures, yokes and attachments. Rapid installation with lower part count to eliminate noise and vibration.

Rotor Bearings and Dampers

Managing noise, vibration and weight is critical to flight. We offer a full complement of engineering tools, including a fully accredited dynamic test lab, plus all major design and analysis software, to provide components and systems that extend the life of a helicopter.

Rotor Hubs and Sub-Assemblies

We have the engineering capability and expertise to deliver major sub-assembly solutions, including pitch link assemblies, rod end assemblies, entire main and tail rotor hubs and rotor sub-components.

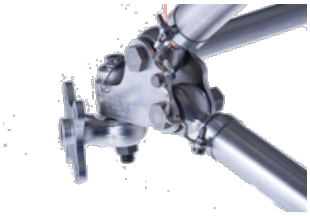
Tension Torsion Straps

As the PMA holder, designer and manufacturer we have engineered TT straps for more than 20 different aircraft applications and have manufactured more than 300,000 straps. This experience, coupled with on-going investment in manufacturing facilities and equipment, gives our customers confidence in the quality and reliability of our product.

Pylon and Equipment Isolators

Our pylon mounts isolate helicopter machinery from the aircraft structure, improving comfort and providing critical dynamic properties. Our aerospace equipment vibration isolators set the standard for compact, high-load, high-capacity vibration isolation mounts.

Fixed Wing

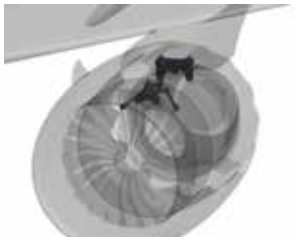


Auxiliary Power Unit Attachment Systems

Reduced weight and lower piece-count mounting systems with easy installation, low maintenance and long lifecycles for superior noise and vibration isolation.

General Aviation Engine Mounts

Specifically designed to maximize durability, our elastomeric mounts provide excellent isolation of engine vibration, resulting in a smoother, quieter flight. Our systems are designed with a stronger load control to take thrust and G-loads instead of the engine core. Rapid installation, minimal maintenance, and flexibility for multiple engines and configurations.



Turbofan and Turboprops Engine Attach Systems

Innovative technologies include mounts, full structures and yokes, resulting in lower risk and total cost. Our tangential system is 10-20 percent lighter, takes up less space and allows engines to be attached or removed in less than 10 minutes without load-leveling equipment or special tools.

General Aviation Shimmy Dampers

Our fluid-free shimmy damper offers high-performance damping and vibration control with a zero-maintenance design. Surface-effect technology provides consistent damping for fixed and retractable landing nose gears instead of using fluids to resist motion. Since there is no fluid, this damper will never leak.

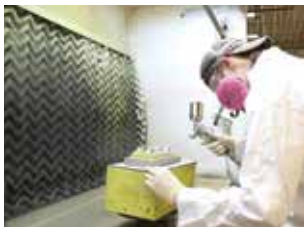
Vibration Isolators and Mounts

Designed to support and protect avionics equipment in all types of aircraft and defense systems, we provide compact, high-load, high-capacity vibration isolation mounts made with specially compounded silicone elastomers which exhibit excellent resonant control and linear deflection characteristics.

Maintenance, Repair and Overhaul

Building on almost 100 years of vibration and motion control, we offer a wide array of innovative solutions including fixed wing, rotary wing, and sensing solutions for the aerospace and defense sector. Parker LORD solutions can be found on various aircraft manufactured by leading aerospace and defense OEMs. Since 1978, we have provided MRO services to aircraft operators through our certified FAA/JAA Repair Station (No. GV1R180K).

Aftermarket and MRO



We provide repair and overhaul services, STC upgrades, and PMA replacement parts. We keep your aircraft in the air and generating revenue. We also reduce your maintenance costs. Our exchange pools provide rapid response on high usage items, enabling you to keep a smaller spares inventory. Our repair station (GV1R180K) is co-located within the factory and supports complex aviation parts such as helicopter rotor components, engine isolator assemblies, actuators and active vibration control systems.

Industrial Equipment

Flexible Couplings

Our Dynaflex® drivetrain couplings use elastomeric damping to protect drivelines from high transient start-up torques and misalignment. They optimize powertrain performance and component longevity, as well as increase vehicle uptime and productivity. Also maintenance-free, these couplings require no lubrication or other maintenance throughout their service life.

Viscous Cab Mounts

Our viscous mount technology provides superior damping and control in operator cab suspensions. Viscous cab mounts combine elastomeric and viscous fluid damping technology to reduce cab noise and vibration levels measurably better than conventional rubber mounts. Our customers experience decreased noise and vibration and increased operator safety and comfort across a variety of severe-duty applications.

Vibration Isolators

Designed to support and protect equipment in all types of industrial applications, our customizable portfolio of elastomeric mounts and bushings provide reliable and cost-effective solutions to isolate vibration and shock, accommodate motion, and decrease noise. Our vibration isolators are applied as engine, cab and various other vehicle accessory mounts.

(Continued on page 47)

Industrial Equipment *(Continued from page 48)*

Steer-by-Wire Tactile Feedback Devices

This integrated solution combines bearing support, steering position sensing, communication and continuously variable resistive steering torque to deliver high-fidelity tactile feedback and maximum control to the operator. Our TFD® steering unit is maintenance free and will never require inspection or adjustment during the expected service life. Very few moving parts greatly enhance durability. All of this adds up to a compact, robust, low power, easy-to-install, and maintenance-free design.

Semi-Active Suspension

We leverage our proprietary Magneto-Rheological (MR) fluid technology in every adaptive damper we make to continuously alter suspension settings in real time to suit different driving or road surface conditions providing improved dynamic stability. This damper technology is used in a variety of applications, including seat, cab, and sprayer boom suspensions.

Sensing Systems

Inertial sensors provide attitude feedback for control, navigation, precision and autonomous vehicle operation. Wireless sensing systems enable measurement of critical parameters for condition-based maintenance. Pressure, displacement, load, torque and temperature sensors are also available.

Oil & Gas – Downhole

Axial Isolator

Targeting low-frequency shock events, our field-proven axial isolator can extend the life of MWD tools and protect downhole electronics in a broad range of operating conditions by significantly reducing the magnitude and quantity of shock events.

SoftShoe Isolators

Targeting high-frequency shock events, the SoftShoe isolator provides cost-effective shock protection when used alone in the vertical section and mitigates full spectrum of drilling-related axial shocks when used in conjunction with the Axial Isolator.

Snubbers

Snubbers are isolators for downhole tools, acting as MWD shock absorbers to protect MWD electronics from excessive shock and vibration. Snubbers feature broad frequency range isolation and high-temperature variants to withstand hot hole conditions.

Oil & Gas – Offshore

Telescopic Joint (TJ) Packers

Certified to the second edition of API 16F, telescopic joint (or slip joint) packers feature wear-resistant nitrile that lasts 20x longer than traditional nitrile.

Flexible Joints

Flexible joints accommodate the motion of the rig relative to the subsea wellhead. Featured flexible joints include:

- Completion Workover Riser (CWOR)
- Drilling Riser
- Steel Catenary Riser (SCR)

Gimbal Bearing Assemblies and Pads

Gimbal pads and assemblies are designed to handle extreme loading and environmental conditions. By reducing strain and minimizing elastomer degradation, customers achieve improved pad life.

Diverter Elements

Diverter elements seal against a drill pipe or an open hole to handle shallow gas kicks on offshore floating and jackup drilling rigs and come in insert-style and annular packers capable of complete shutoff (CSO).

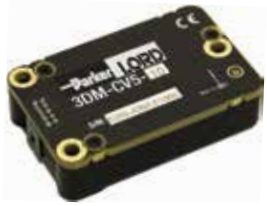
Inertial Sensors

M-Series

Gyro-stabilized inclinometer, delivering precision measurements of dynamic inclination, acceleration, and angular rate in challenging environments.

G-Series

High-performance, industrial-grade inertial sensors for a wide range of triaxial inertial measurements and computed attitude and navigation solutions.



C-Series

Industrial-grade, OEM inertial sensors provides a wide range of triaxial inertial measurements and computed attitude and navigation solutions.

Wireless Sensing Systems

SG-Link-200

Wireless 3-channel analog input node with rugged, weatherproof enclosure. Ideal for precise measurement of voltage, strain gauges, load cells and pressure.

Torque-Link-200

Wireless node transforms standard into wireless torque transducers by application of one strain bridge.

G-Link®-200

Wireless 3-axis accelerometer with rugged, weatherproof enclosure. Fully calibrated and low noise. Ideal for vibration, impact and tilt.

V-Link®-200

Wireless 8-channel analog input node for precise measurement of voltage, strain gages, load cells and pressure transducers.

Displacement Sensors

S-Series LVDT

Robust and highly accurate subminiature displacement sensor for high-accuracy position measurements up to 38 mm.

M-Series LVDT

Microminiature LVDT sensor for high-accuracy critical linear displacement position measurements up to 9 mm.

LS-LVDT

Robust and highly accurate displacement sensor with submicron resolution and revolutionary stroke-body length ratio, ideal for linear control and precision measurement applications.

Sensor Software

The MicroStrain® suite of software solutions allow you to configure devices, start networks and collect and analyze massive amounts of data in real-time from our wireless and inertial products.

SensorConnect®

SensorCloud®

Your Local Authorized Parker Distributor

⚠ WARNING: These products can expose you to chemicals including carbon black (airborne and extracts), antimony trioxide, titanium dioxide, silica (crystalline), di(2-ethylhexyl)phthalate, ethylene thiourea, acrylonitrile, 1,3-butadiene, epichlorohydrin, toluene diisocyanate, tetrafluoroethylene, ethylbenzene, formaldehyde, furfuryl alcohol, glass fibers, methyl isobutyl ketone, nickel (metallic and compounds), lead and lead compounds which are known to the state of California to cause cancer; and 1,3-butadiene, epichlorohydrin, di(2-ethylhexyl)phthalate, di-isodecyl phthalate, ethylene thiourea, methyl isobutyl ketone, methanol, toluene, lead and lead compounds which are known to the state of California to cause birth defects and other reproductive harm. For more information go to www.P65Warnings.ca.gov.

EMG 5000 MK 11/20

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