

HIGH PERFORMANCE SEALING TECHNOLOGY

ENGINEERED SOLUTIONS FOR DEMANDING ENVIRONMENTS®

Technetics
GROUP



Unparalleled in extreme conditions

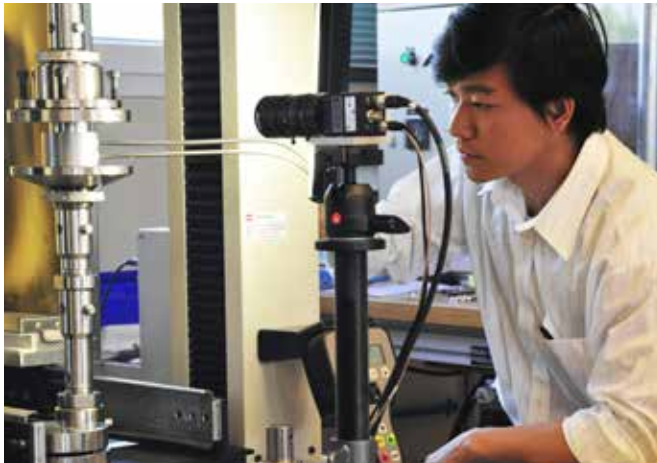
PRECISION-ENGINEERED FOR EXCEPTIONAL PERFORMANCE

Technetics high performance sealing solutions combine state-of-the-art engineering with advanced materials design to deliver unrivaled reliability in the most critical, demanding conditions. When failure simply isn't an option, trust your designs to our sealing solutions.



ENGINEERING SOLUTIONS

At Technetics, we have engineering teams dedicated to the design and R&D of custom seal and component solutions. This experience is augmented by close partnerships with leading industry OEMs and long-standing relationships with government research agencies, renowned universities, independent research firms, and national laboratories.



ADVANCED DESIGN TOOLS

Our engineering teams are proficient in a number of design and analysis platforms. Our expertise allows us to accelerate the design cycle time, which allows our customers to be faster to market and realize significant savings.

Capabilities include:

- In-depth experience in FEA modeling and analysis of static and dynamic structures
- Expertise in the science of comprehensive fluid numeric analysis
- Proprietary material models for simulating real world characteristics to ensure a more accurate solution and improved product performance



R&D INNOVATION

The challenges that we take on every day push the boundaries of technology. They are linked to increasingly difficult operating conditions, which can combine different constraints, such as high pressure and temperature, complex mechanical stresses, interactions between materials and, in relation to fluids, bacterial aggressiveness.

Our laboratory, *maestral*, offers a multi-scale scientific approach, combining tests, characterization and simulation in order to develop sealing solutions that meet present and future needs. *maestral* is the result of a unique partnership between CEA (French Alternative Energies and Atomic Energy Commission) and Technetics, characterized by a shared patent portfolio and synergy in terms of teams and resources.



Metal Seals

HELICOFLEX®



FEATURES AND BENEFITS

- Useful elastic recovery up to 0.5 mm (0.02 in)
- Corrosion resistance to all media (acids and bases)
- Pressure: from ultra high vacuum to 2,500 bar (36,259 PSI)
- Temperature from -273°C to 800°C (-460°F to 1472°F)
- Lifetime: above 100 years
- Leak tightness 10^{-11} Pa.m ³/s Helium
- Range of materials (aluminum, silver, copper, stainless steel, INCONEL® and other exotic metals)
- Design can be adapted to any type of assembly
- Good creep resistance

APPLICATIONS INCLUDE:

- **Nuclear:** reactor pressure vessels, control rods, primary pumps, pressurizers, spent fuel casks
- **Valves:** body/bonnet sealing, seat sealing
- **Oil and gas:** hydraulics, subsea couplings, subsea christmas trees, subsea compressors, electronic submersible pumps, flow meters
- **Life sciences:** imaging & scanning systems
- **Ultra high vacuum:** accelerators & fusion research
- PVD/CVD/etch equipment
- Gas/chemical delivery systems
- **Automotive:** engine, exhaust gas

O-FLEX™



FEATURES AND BENEFITS

- Cross section and wall thickness designed to control loading
- Available for internal and external pressure
- Styles: regular and vented/pressure balanced
- Pressure: from high vacuum to 500+ bar (7,252+ PSI)
- Temperature from -273°C to 650°C (-460°F to 1200°F)
- Range of materials (SS 321, Alloy 600, X750, 718) - others available
- Platings and coatings: silver, gold, nickel, PTFE (others available)
- Custom shapes and sizes available

APPLICATIONS INCLUDE:

- **Nuclear:** reactor pressure vessels, control rods, spent fuel casks
- **Plastics/film:** extrusion, spinnerets, filters, hot runners
- **Industrial:** compressors, waste heat
- **Automotive:** head/cylinder sealing
- **Defense/military:** MS O-rings

C-FLEX™



FEATURES AND BENEFITS

- Pressure energized
- Cross section and wall thickness designed to control loading
- Available for internal, external and axial pressure
- Pressure: from medium vacuum to 2,000 bar (29,008 PSI)
- Temperature from -273°C to 730°C (-460°F to 1350°F)
- Range of materials (Alloy X750, 718, Waspaloy and other exotic metals)
- Platings and coatings: silver, gold, PTFE (others available)
- Custom shapes and sizes available

APPLICATIONS INCLUDE:

- **Oil & gas:** down hole drilling/MWD
- **Industrial turbines:** fuel systems/nozzles
- **Valves:** body/bonnet, back seat sealing
- **Aerospace/space:** turbo pump, fuel systems, nozzles/injectors, cryogenics
- **Automotive:** turbo chargers, exhaust

E-FLEX™



FEATURES AND BENEFITS

- High springback/low load
- Seal profile and wall thickness designed to control loading and springback
- Available for internal and external pressure
- Large and segmented diameters available (>2000 mm/ >78.74 in)
- Pressure: 100+ bar (1,450 PSI)
- Temperature from -273°C to 730°C (-460°F to 1350°F)
- Range of materials (Alloy X750, 718, Waspaloy and other exotic metals)
- Tribological wear resistant coatings available
- Custom profiles and sizes available

APPLICATIONS INCLUDE:

- **Aerospace:** bleed air systems, AS1895/7
- **Industrial turbines:** casings, end covers, segmented sections

Machined Metal Seals

K-PORT, ULTRATECH SERIES, NAFLEX, SEAL SAVER



FEATURES AND BENEFITS

- Suitable for applications that require a metal seal that is difficult to manufacture in certain sizes or require a special geometry profile
- Pressure up to 241 bar (3,495 PSI)
- Temperature up to 1,200°C (2,200°F)
- Platings and coatings: silver, gold, PTFE

APPLICATIONS INCLUDE:

- **Aerospace:** fuel systems, pumps, valves, standard fittings (AS-933 for fluid fittings, AS-5202 for boss ports)
- Extremely corrosive and radioactive environments
- Replacement or repair seal for hydraulic tube fittings

Inflatable Seals

CEFIL'AIR®, BIO-GUARDIAN®



FEATURES AND BENEFITS

- Expand and retract with movement of fluids (pneumatic or hydraulic)
- No seal stress during opening and closing phases
- Large material selection: Silicone, SBR, EPDM, FKM, HNBR, which offer highly resistant mechanical and physical properties to ensure a long lifetime and numerous operating cycles
- Pressure: from 10⁻³mm Hg to 12 bar
- Temperatures from -50°C to +360°C (-148°F to 482°F)
- Highly flexible design: available in a large selection of shapes and sizes
- BIO-GUARDIAN® elastomers prevent the development of bacteria and biofilm formation
- Can be used for moving, handling, holding or clamping, particularly large, fragile or complex objects

APPLICATIONS INCLUDE:

- Movable cofferdam bulkheads
- Storage and Transport containers
- Leak-tight panels (naval, aerospace industry)
- Nuclear vessels (equipment or personnel chambers)
- Isothermal chambers
- Clean rooms
- Phonic isolation
- Sliding or quick-locking doors (autoclaves, sterilizers)
- Centrifugal filters (access doors and drainage hoppers)
- Aircraft access doors
- Cockpit canopies
- Portholes
- Cofferdams
- Pneumatic conveyors (bagging hoppers, valve gates)

Elastomer Seals



FEATURES AND BENEFITS

- Large material selection: BIO-GUARDIAN®, Silicone, EPDM, FKM, HNBR all known for resistance to temperature from -100°C to 300°C (212°F to 572°F)
- High chemical inertia and compatibility with food and pharmaceutical applications
- Elastomer with antibacterial properties
- Flexible design and custom applications
- Adaptation to environment and service conditions
- Large range of operating conditions: from few mbar to 100+ bar / various fluids

APPLICATIONS INCLUDE:

- Movable cofferdam bulkheads
- Storage containers
- Transport containers
- Leak-tight panels (naval, aerospace industry)
- Nuclear vessels (equipment or personnel chambers)
- Isothermal chambers
- Clean rooms
- Sliding or quick-locking doors (autoclaves, sterilizers)
- Centrifugal filters (access doors and drainage hoppers)
- Aircraft access doors
- Cockpit canopies
- Portholes
- Cofferdams
- Pneumatic conveyors (bagging hoppers, valve gates)
- Phonic isolation

Plate Seals



FEATURES AND BENEFITS

- Elastomeric seals over molded in grooves of anodized or nickel plated aluminum retainers allow for perfect positioning between elements to seal, regardless of accessibility and joint orientation
- FKM, Silicone and Fluorosilicone seal materials
- Specific design features (metal-to-metal concept, special seal profile) contribute to safe static sealing of aircraft fuel systems
- Can also be used in dynamic applications (relief valve, poppet valve)
- Up to 250°C (482°F) in air and 200°C (392°F) in oil and with pressures up to 200 bar (2,901 PSI)

APPLICATIONS INCLUDE:

- Nuclear
- Pharmaceutical
- Food and beverage
- Aerospace applications

Sealing Systems

QDS, KENOL[®], BOLTED FLANGES, TRI-CLAMPS



FEATURES AND BENEFITS

- Quick tightening
- Space saving
- Easy assembling
- Remote handling
- Temperatures from -196°C to 600°C (-321°F to 1112°F)
- Pressure: from vacuum to high pressure (500 bar/ 7,252 PSI)
- Standard and engineering design
- Extensive life time (over 10 years)
- Complete validation of assembly with FEA (Finite Element Analysis)
- Non-magnetic (optional)
- No twisting torque on pipe
- Large dimension range from pipe DN 10 to DN 600

APPLICATIONS INCLUDE:

- **Nuclear:** primary loop, filters, thermocouple nozzles, removable, flanges for cavity filling
- **Ultra-high vacuum:** accelerators & fusion research
- PVD/CVD/etch equipment
- Gas/chemical delivery
- **Pressure vessels:** design of pressure equipment closings

Laminated Seals

LAMELFLEX[®]



FEATURES AND BENEFITS

- Lamination of special material (graphite, PTFE) and metal, offering a combination of compressible and resilient materials
- Available in sizes from 25.4 mm to 2,438.4 mm (1 in to 96 in)
- Temperature between -196°C to 500°C (-320°F to 932°F)
- Pressure up to 150 bar (2,176 PSI)
- Special designs available with exotic materials according to specified requirements
- Can achieve bidirectional ANSI Class VI shut-off, the most stringent leakage performance standard as tested with liquid nitrogen

APPLICATIONS INCLUDE:

- **Valves:** seat sealing, butterfly triplet offset
- Oil & gas
- Cryogenic
- Nuclear power
- Industrial

Graphite Seals

ORIGRAF®



FEATURES AND BENEFITS

- Elastic recovery up to 50% of the compression
- Low creep and relaxation
- Temperature from -196°C up to 2,500°C (-321°F to 4,532°F) (inert atmosphere)
- Pressure up to 400 bar (5,802 PSI)
- Good resistance to radiation (nuclear application)
- Chemical resistance
- Withstand differential radial motion

APPLICATIONS INCLUDE:

- Steam generator, pressurizer
- Shut off valves, adjustment and regulation in linear movement, and quarter rotation
- Heat exchanger
- Piping connecting flange and boiler devices
- Piping shutters
- Rotating machinery: interior of pumps and compressors
- Device closings with autoclave systems
- Hot air and other gas circuit
- Cryogenic applications
- **Valves:** body/bonnet sealing, seat sealing

Spiral Wound Gaskets

VITAFLEX®



FEATURES AND BENEFITS

- Design adaptable for all types of assemblies
- Wide choice of materials (Inox, INCONEL®, Monel, PTFE or fibers)
- Sealing up to 10⁻⁵ Pa.m 3/s helium
- Temperature up to 900°C (1,652°F)
- Pressure up to 350 bar (5,076 PSI)
- Standard range meets the requirements of flange standards ASME B16.5 or NF EN 1759-1 but also NF EN 1092-1

APPLICATIONS INCLUDE:

- **Chemical and petrochemical:** catalytic synthesis, heat exchangers, vessel gaskets, piping, valves, and storage
- **Nuclear:** cooling systems, valves, manholes, handholes, and heat exchanger with or without partition walls
- **General:** high and low pressure steam systems, autoclaves, heat exchangers, heat transfer fluids, high pressure, hydraulic piping, valves, compressors and pumps

Mechanical Seals

CEFILAC GPA®, GULLIVER®



FEATURES AND BENEFITS

- Pressure up to 20 bar (290 PSI), rotating speed up to 100 m/s (328 ft/s)
- Temperature up to 200°C (392°F)
- Unique design for abrasive, corrosive and clogging media
- No additional lubrication required
- Reliable and durable solution
- High quality materials

APPLICATIONS INCLUDE:

- Alumina processing
- Mining
- Paper industry
- Mixers
- Agitators
- Centrifugal pumps
- Water pumps
- Bottling machines
- Chemical pumps
- Hydraulic turbines
- Gearboxes
- Sprayers
- Cooling pumps

CARBON FACE SEALS (WITH METAL BELLOWS)



FEATURES AND BENEFITS

- Operates up to 540°C (1004°F) and at speeds up to 70,000 RPM
- Good vibration performance
- Can accommodate high shaft movement (radial and axial)
- Maintenance free

APPLICATIONS INCLUDE:

- Propulsion engine & APU shaft sealing
- Gearboxes
- Oil and gas pumps
- Power generators
- Wind turbines
- Drilling machinery
- Compressors

HYDRODYNAMIC LIFT-OFF SEALS



FEATURES AND BENEFITS

- Operates in wide range of temperatures between cryogenic and 538.8°C (1,000°F) for bellows-energized seals and -53.9°C and 204.4°C (-65°F and 400°F) for spring-energized seals
- Withstands pressures up to 150 psi (10 bar)
- Excellent high-altitude performance with low leakage rates
- Service life of more than 20,000 hours
- Sizes: 25.4 mm to 152.4 mm (1 in to 6 in) in diameter
- FAA certified

APPLICATIONS INCLUDE:

- Propulsion engines
- APU's
- Gearboxes
- Generators
- Compressors

PEEK

RINGS, PLATES, DISCS, CUSTOM SHAPES



FEATURES AND BENEFITS

- Large dimension range from diameter 787 mm to 5,000 mm (from 31 in to 196.85 in)
- Excellent high temperature performance
- High abrasion and cut through resistance combined with a low coefficient of friction
- Withstands a wide range of acids, bases, hydrocarbons and organic solvents
- Low moisture absorption, resistant to steam, water and sea water, with low permeability
- Electrical properties which are maintained over a wide frequency and temperature range
- Inherently flame retardant without the use of additives. Low toxicity of combustion gases
- Lightweight, fully recyclable, halogen-free, RoHS compliant

APPLICATIONS INCLUDE:

- Large diameter rings for FPSO swivel stacks & other oil & gas applications
- Back-up rings
- Connectors
- Housings and covers
- Pumps
- Bearings
- Cogwheels
- Medical components and tools
- Formula 1 racing components
- Aerospace components
- Wind turbine components
- Inserts for seal reinforcement and easier installation

Brush Seals

FELTMETAL™ METAL BRUSH SEALS



FEATURES AND BENEFITS

- Absorbs radial deflections between the shaft and rotor during transient operation
- Reduces leakage 5 to 17 times by replacing labyrinth seals with brush seals, providing significant turbo-machinery efficiency and output gains
- Diameter ranging from 50.8 mm to 2,794 mm (2 in to 110 in)
- Manufacturing methods include machining, brazing, plating, welding, & heat treating

APPLICATIONS INCLUDE:

- Static and rotating
- Gas and fluid
- Aircraft engines
- Gas turbines
- Steam turbines
- Industrial compressors

HELICOCARB® CARBON BRUSH SEALS



FEATURES AND BENEFITS

- Prevents erosion effect on the shaft
- Copes with shaft misalignment of 0.1 mm to 0.3 mm (0.004 in to 0.012 in)
- Outperforms labyrinth seals on aircraft engines
- Oil leakage reduction (depending on conditions, until 90% of gain compared to labyrinth seals)
- Weight reduction
- Easy to integrate and customizable design, for optimized integration within your assembly (can be easily integrated thanks to its accurate machined casing)
- No significant torque resistance
- Pressure: tested up to 1 bar (14.5 PSI) ΔP
- Temperature: 450°C (842°F) (if higher temperatures are required, please contact us)
- Speed: 160 m/s (524.9 ft/s)

APPLICATIONS INCLUDE:

- Main shaft
- Gearbox
- Compressor
- APU
- Bearing seals

Abradable Seals

FELTMETAL™, BLADESAFE®



FEATURES AND BENEFITS

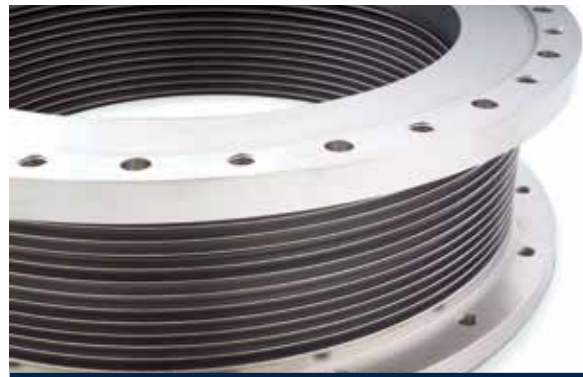
- Micron size fiber sinter bonded into a continuous felt
- Typically Hast-X or FeCrAlY
- Clean cutting with minimal blade wear
- Erosion resistance
- Max tip speed: 426 m/s (1,400 ft/s)
- Max temperature: 704°C (1300°F)

APPLICATIONS INCLUDE:

- Outer gas path seals for compressor and turbine blades (shroud seals, tip seals, rub strips)
- Inner seals below the gas path for interstage sealing
- Labyrinth seals

BELFAB® Metal Bellows

EDGE-WELDED METAL BELLOWS



FEATURES AND BENEFITS

- Permit flexible engagement and misalignment with positive spring force machined bellows
- One-piece construction (flanges included)
- High spring rate, very low tolerance for axial displacement
- Variable wall thickness and thick wall possible

APPLICATIONS INCLUDE:

- **Aerospace:** reservoirs, toggle switches, cold plate assemblies, fuel drains, engine kiss seals
- **Oil & Gas:** actuators, connectors, couplings, feed throughs, gas lines, reservoirs, sensors
- **Semiconductor:** actuators, beam lines, connectors, feed throughs, leak detectors, sensors, wafer handlers
- **Medical:** batteries, cardiovascular devices, implants, drug delivery, monitoring devices, vacuum pumps, valves

Safety & Quality

Technetics' culture of safety places a relentless focus on creating a healthy work environment. Our health and safety goal is clear — to have the world's safest employees. We believe every accident can be prevented, and our safety framework is designed to eliminate all incidents associated with Technetics activities, products and services.

OPERATIONAL EXCELLENCE

The continuous improvement culture at Technetics is focused on customer satisfaction and driving operational efficiencies across all of our businesses. Specific activities include Six Sigma Training and Certification, CI and Lean Manufacturing.



CERTIFICATIONS

The certifications held by Technetics manufacturing facilities include ISO 9000, AS 9100, Title 10 CFR 50 Appendix B, ANSI / ASME N45.2, Favorable Audits by NUPIC Members, ANSI / ASME NQA-1, and KTA 1401.



STATIC SEALING TESTING CAPABILITIES

We maintain a full range of in-house testing equipment to ensure every one of our sealing solutions meets your demanding requirements. These capabilities include:

- Hydraulic load frames for static tests to >4500 kN (1,000,000 lbs)
- Servo-hydraulic load frames for semi-static tests
- Test machine capable of dynamically cycling seals at elevated temperatures up to 1,093°C (2,000°F)
- “Real world” simulation of environment, displacements down to 0.013mm (0.0005 in), frequency to 20 Hz
- Pressure testing of up to 2,068 bar (30,000 PSI), inert gas pressure compatible with He and N
- “Real time” load vs. leakage vs. deflection
- Liquid penetrant testing
- Coordinate Measuring Machine (CMM) and Faro Arm with laser scanning



DYNAMIC SEAL TESTING

Our test rigs will help ensure accuracy and safe operation to save you time, money and improve speed of development. Capabilities include:

- Contacting and non-contacting dynamic seal testing up to 65,000 RPM
- Simulation of aerospace engine/turbine conditions for abradable seal testing
- Acoustic attenuation testing
- General tribology



FLUID SEALING TESTING CAPABILITIES

- Hydraulic and gas testing
- Fatigue analysis
- Pressure simulations to replicate deep sea conditions
- Vibrational analysis

For more information on how Technetics Group supports high performance sealing technology, visit technetics.com

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