

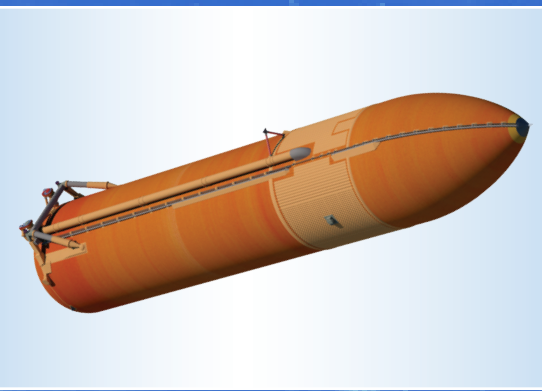


Space 
Industry
Handbook



Beyond the boundaries of
POSSIBLE





Fuel & Oxidizer Tank

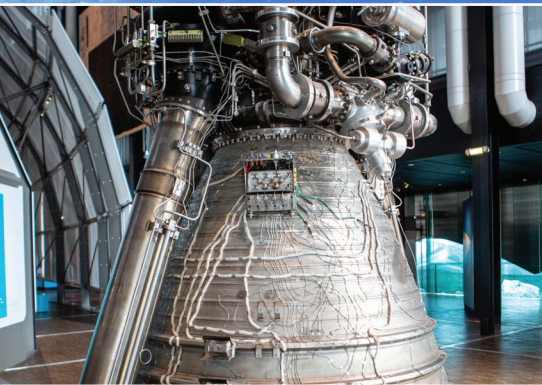
Application: Flange and chamber joints, lining of fuel and oxidizer tank door

- Fluid: Fuel (LH2, Hydrazine, MMH, UDMH, RP-1, etc.) and Oxidizer (LOX, GOX, Peroxide, Nitrogen Tetroxide, Oxygen Difluoride, etc.)
- Temperature: -253°C to +38°C (-424°F to +100°F)
- Pressure: Up to 21 bar (300 psi)
- Sealing: Static face seal

Our Solution: Omniseal® polymer and metal seals

Our Technology Advantages:

- Cryogenic sealing of very large diameter areas
- Seal manufacturing not constrained by diameter of the seal ranging up to several feet
- Proven RACO® spring-energized seal and metal C-Seal designs



Combustion Chamber

Application: Launch Vehicle Combustion Chamber

- Fluid: Combustion gas & Hydrogen peroxide
- Temperature: up to +700°C (+1292°F)
- Pressure: 60 bar (870 psi)
- Sealing: Static face seal

Our Solution: Omniseal® metal seal

Our Technology Advantages:

- Temperature capability up to +930°C (+1706°F)
- Very low leak rates possible



Thruster

Application: Hypergolic fluid injection in payload thrusters

- Fluid: Monomethyl hydrazine (MMH) and nitrogen tetroxide (TTO)
- Temperature: +10°C to +38°C (+50°F to +100°F)
- Pressure: 21 bar (300 psi)
- Sealing: Static rod/piston seal

Our Solution: Omniseal® polymer seals

Our Technology Advantages:

- Fluid compatibility with corrosive, toxic and difficult to handle hypergolic fluids

Sub-orbital Launch Vehicle

Application: Valves in methane fuel lines

- Fluid: Natural gas
- Temperature: -73°C to +204°C (-100°F to +400°F)
- Pressure: 172 bar (2800 psi)
- Sealing: Static

Our Solution: Omniseal® polymer and metal seals

Our Technology Advantages:

- High pressure sealing in low temperature
- Sealing in a wide temperature range



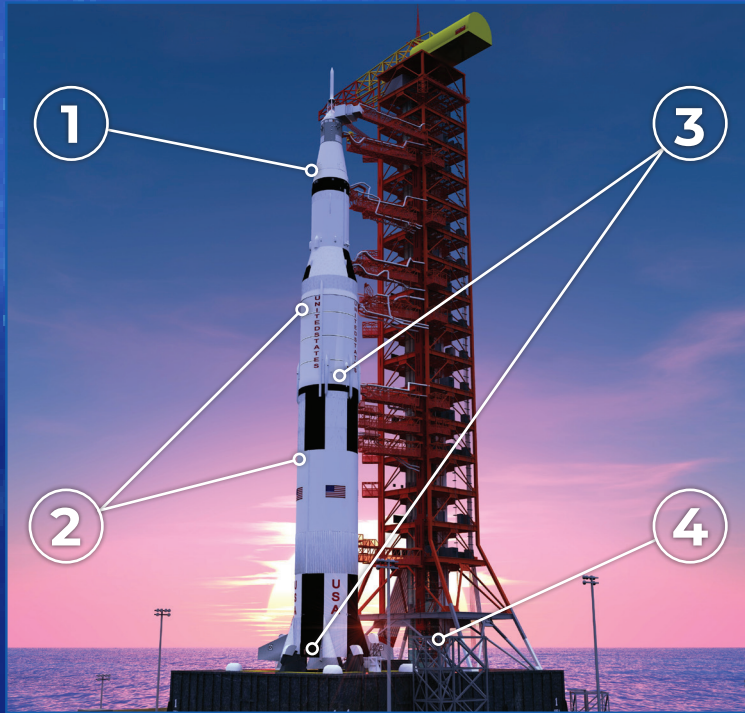
GOING BEYOND WITH SEALING & MATERIAL SOLUTIONS

Payload & Guidance:

- Spacecraft
- Satellite
- Launch abort system

Structure & Tanks:

- Frame
- Fuel and oxidizer tanks
- Landing gears



Propulsion (Engines & Auxiliaries):

- Engines
- Pumps
- Valves
- Injectors
- Manifolds
- Pipes, ducts, flanges, feed lines and actuators

Ground Support System:

- Fuel & oxidizer storage and delivery
- Launch pad

OUR SPACE JOURNEY

From manned and unmanned space programs to countless other sub-orbital, orbital and outer space programs...

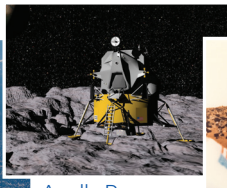
From our Omniseal®, RACO® and TEC Ring seals with Fluorocarbon Company, Furon and now Omniseal Solutions.



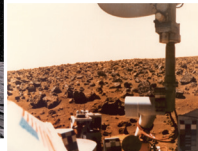
Project Mercury (1959-1963)



Project Gemini (1963-1966)



Apollo Program (1961-1972)



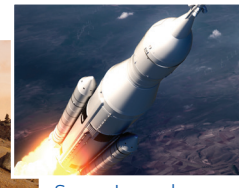
Viking Program (1975)



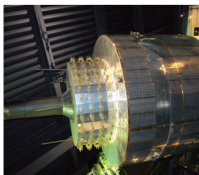
Space Shuttle Program (1981-2011)



Mars Exploration Program (1993-ongoing)



Space Launch System SLS (2011-ongoing)



Meteosat Satellites (2004-ongoing)



Ariane 5 Program (2003-2023)



Ariane 6 Program (2024-ongoing)



Orion / Artemis Program (2022-ongoing)



New Space Missions (Future)

Supporting all major space projects from civil to military to commercial and emergent space.

Proven in the Past...

Building upon three initial unique polymer designs – Omniseal®, RACO® and TEC Ring spring-energized seals – as well as resilient metal seal designs, we have been recognized as a leading designer and manufacturer of high-performance sealing solutions for the past 65 years. Each successful launch is proof of our improved sealing performance over soft elastomeric seals and hard metal gaskets in applications involving cryogenic liquid propellants in various rocket engine programs. Our Meldin® thermoset polyimide material is ideal as finished machined components in high temperature as well as a lightweight and dimensionally stable bushing, piston ring, guide ring, split ring type applications and other custom shapes.

... Prepared for the Future

Valves

Application: Valves in flow control and fluid handling

- POGO suppression, engine control, anti-blowout, isolation, throttle, cryogenic, OIV, FIV, ball valves, butterfly valves, relief valves, check valves, main valves, etc.
- Fluid: Fuels and oxidizers, hypergolic fuels, etc.
- Temperature: Cryogenic to a few hundred degrees F
- Pressure: Up to a few thousand psi
- Sealing: Reciprocating rod/shaft seal and static face seal

Our Solution: Omniseal® polymer and metal seals

Our Technology Advantages:

- Cryogenic sealing
- Low friction and wear in oscillating/vibrating environments
- Seal design prevents seal blowout

Fluid Transfer Line

Application: Slip joint ducts and fittings

- Fluid: Helium, O₂, H₂, N₂, etc.
- Temperature: -112°C to +213°C (-170°F to +416°F)
- Pressure: 55 bar (800 psi)
- Sealing: Static seat seal, dynamic rod/piston seal and bushing

Our Solution: Omniseal® seal with guide rings and Meldin® components

Our Technology Advantages:

- Able to withstand oscillation and vibrations
- Lightweight polyimide replacing metal bushing

Space Exploration Vehicle

Application: Analytical chemistry equipment

- Fluid: Martian atmosphere, Sulfur Hexafluoride (SF₆)
- Temperature: -130°C to +120°C (-202°F to +248°F)
- Pressure: Up to 1 bar (14 psi)
- Sealing: Static rod/shaft seal

Our Solution: Omniseal® seal and Rulon® ball bearings

Our Technology Advantages:

- Sealing over a wide temperature range
- Wear and abrasion resistance in harsh sand/dust environment

Rocket Motor

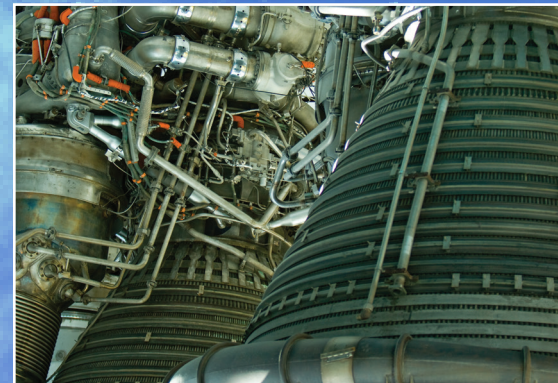
Application: Port to tube fitting

- Fluid: Hypergolic and cryogenic
- Temperature: -240°C to +260°C (-420°F to +500°F)
- Pressure: 172 bar (2500 psi)
- Sealing: Static face

Our Solution: Omniseal® metal boss seals and metal C-Seals

Our Technology Advantages:

- Temperature capability from -269°C to +816°C (-453°F to +1500°F)
- PTFE coated metal jacket and crush ring for robust sealing



OUR ADDED VALUE IN SPACE APPLICATIONS

Cryogenic Sealing

- Omniseal® spring-energized seals provide excellent cryogenic sealing (T < -150°C/-238°F)
- Metal C-Seals and spring-energized C-Seals are available for extremely tight leakage requirements or thermal cycling to high temperatures (> +300°C/+572°F)



Chemical Compatibility

- Omniseal® seals are inert to almost all chemicals and compatible with aggressive and corrosive fuels without swelling
- LOX cleaning and clean room assembly



Low Friction and Wear & Light Weight

- Seals offer the lowest CoF
- Excellent wear characteristics
- Excellent in oscillating/vibrating and high pressure engine environments
- Light weight compared to other seal options and bushings



Proven Pedigree

- Protecting numerous historical launch programs in US, Europe and Asia
- RACO® seal referenced in NASA Reliability Preferred Practices: PRACTICE NO. PD-ED-1208, Static Cryogenic Seals for Launch Vehicles

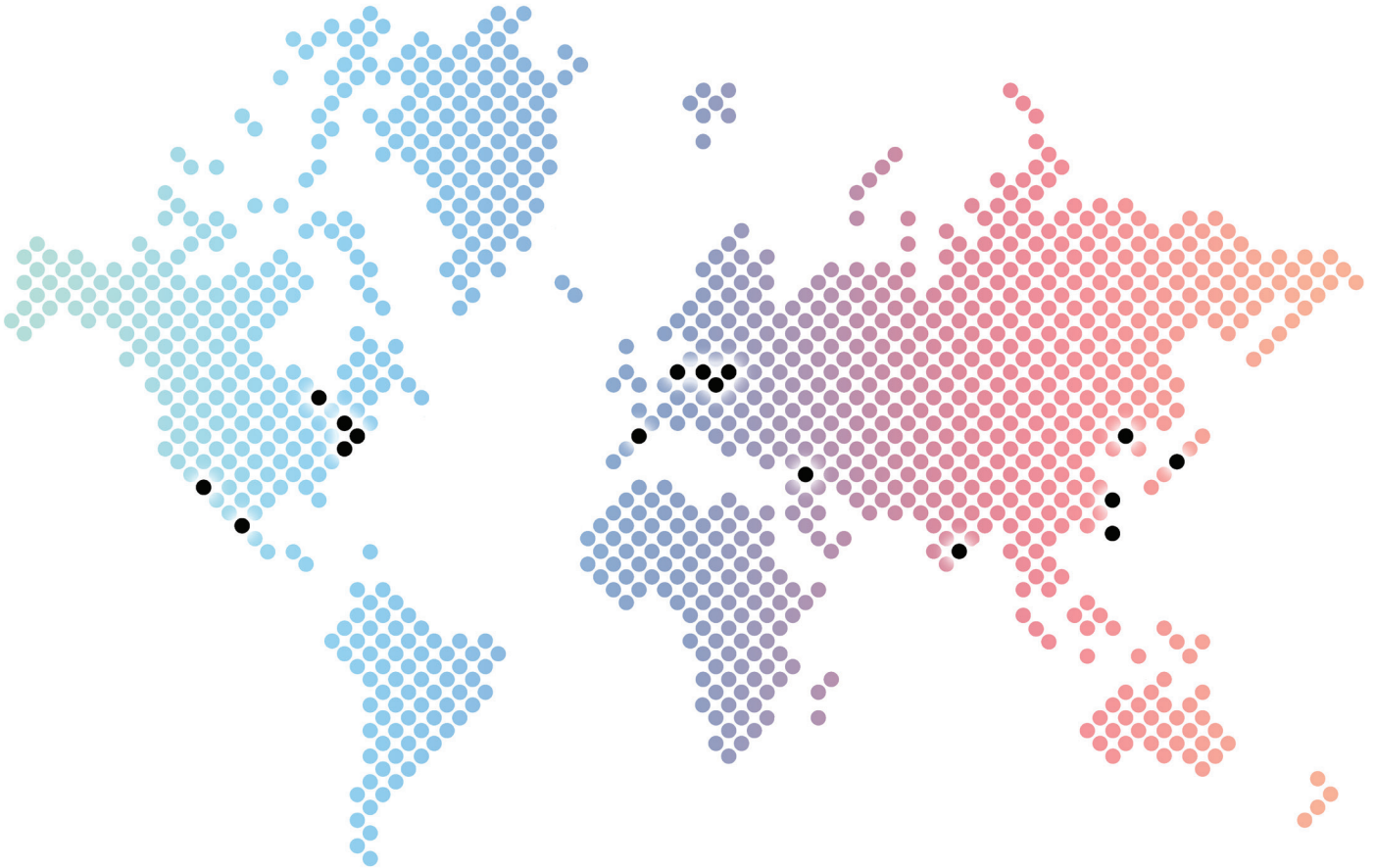


Sealing Solutions

Main Features

OMNISEAL® POLYMERS	High-Performance Spring-Energized Seals	<ul style="list-style-type: none"> • Temperatures from -210°C to +316°C (-346°F to +600°F) • Pressure: Vacuum up to 3,448 bar (50,000 psi) • Low and controlled friction • Broad chemical resistance
	High-Performance PTFE Rotary Lip Seals	<ul style="list-style-type: none"> • Temperatures from -53°C to +232°C (-65°F to +450°F) • Shaft speed in excess of 36 m/s (7000 fpm) • Pressures up to 35 bar (508 psi)
RULON® FLUOROPOLYMERS	High-Performance Fluoropolymer Compounds	<ul style="list-style-type: none"> • Temperatures from -268°C to +316°C (-450°F to +600°F) • Low friction, high wear life and broad chemical resistance
MELDIN® POLYIMIDES	High-Performance Thermoset Polyimide Materials	<ul style="list-style-type: none"> • Temperatures from cryogenic through +316°C (+600°F) intermittently up to +482°C (+900°F) • Superior strength and rigidity combined with self-lubrication properties
OMNISEAL® METALS	High-Performance Metal Seals	<ul style="list-style-type: none"> • Temperatures from cryogenic up to +1093°C (+2000°F) • From ultra-high vacuum to 6,894 bar (100,000 psi) • Leakage performances as low as 10⁻¹⁰ sccs with GHe • Broad chemical resistance due to wide range of base materials and custom electro platings

ONE GLOBAL TEAM... A DEDICATED CUSTOMER FOCUS



GLOBAL & LOCAL PRESENCE

With 17 manufacturing facilities in 10 different countries, Omniseal Solutions is a diverse group that is committed to being customer centric.

Contact our team of experts for more information. We have local resources to support you!

- **Americas:** Garden Grove, CA, USA; Bristol, RI, USA; Orange, CT, USA; Cleveland, OH, USA; Northboro, MA; Saltillo, MX
- **Europe:** Kontich, Belgium; Vimercate, IT; La Rioja, Spain; Kolo, Poland; Willich, Germany
- **Asia:** Shanghai, China; Bangalore & Chennai, India; Suwa & Tokyo, Japan; Seoul & Songdo, South Korea; Taipei & Lung Te, Taiwan

help@omniseal-solutions.com

www.omniseal-solutions.com

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