



# AEROSPACE

FREUDENBERG-NOK  
SEALING TECHNOLOGIES

**FREUDENBERG-NOK**  
INNOVATING TOGETHER



## SOARING INTO THE FUTURE

The continuous quest for faster, safer, more efficient air travel demands ongoing innovation. The industry continues to strive for improved performance, reduced environmental impact, operational efficiency, and reductions in weight and cost. Aircraft are being designed to fly higher in the atmosphere at colder temperatures, and aircraft engines will operate at higher temperatures with leaner and more environmentally friendly fuel mixtures.

Considering fuel efficiency, reduced emissions, and light-weight aircraft, emerging trends and structural changes are constant. In fact, the International Air Transport Association's (IATA) goal of zero carbon emissions is slated to be in effect

by the year 2050, thus requiring many airports to start using alternate fuels such as kerosene and biofuel. As the aviation industry evolves, efforts to produce aircraft with innovative materials and leading technology solutions will continue to advance.

Freudenberg-NOK Sealing Technologies is leading the aerospace industry into the future. With our global expertise in aerospace materials and solutions customized to nearly any application, we can support the trends of tomorrow and help you soar into the future.

## GLOBAL REACH WITH LOCAL PERCEPTION

Safety, performance, and innovation in the aerospace industry rely on high-quality, dependable seals in a variety of applications. That's why aerospace leaders count on Freudenberg-NOK, a joint venture partnership between Freudenberg & Co. in Germany and NOK in Japan, for reliable solutions in nearly every application, everywhere in the world.

Our company offers a broad product range and a global support network of experts to be your single-source sealing and service provider. We drive innovation with research, development, and production teams integrated across our global operations to meet the demands of worldwide and local markets.

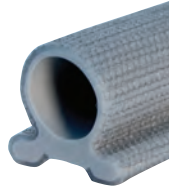


# FUEL EFFICIENCY

**Take control of fuel costs** by achieving ultimate fuel efficiency. Our ingenious sealing solutions are capable of improving fuel efficiency as well as extending the life cycle of your application.

## AERODYNAMIC SEALS

**Innovative designs and materials** provide comprehensive sealing for aircraft cabin doors, windows, hatches, and performance seals. By utilizing proprietary low-friction surface treatments and low-density materials, we contribute to the customer's goal of improved efficiency.



## PTFE SEALS

**With dependable resistance to all fluids and media**, these seals exceed the standard life cycle. PTFE seals also offer improved leakage control and optimized contact pressure, and they are designed for reduced friction.



## RADIAL SHAFT SEALS

**With imperial and metric sizes** for use in engines, gearboxes, flight controls, fuel controls, and wheel and brakes, we provide the widest selection of seals with a large choice of materials.



## RFN COATINGS

**With Reduced Friction by Nanotechnology® (RFN) coatings**, seal performance is maintained with no compromise to the physical properties of the elastomer. When you need a low coefficient of friction, lower torque and loading, media resistance, and flexibility down to  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ), then look to RFN coatings.

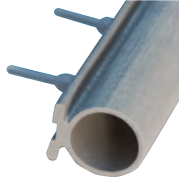


# EXTREME TEMPERATURES

From the Sahara desert to Antarctica, we have you covered. Not only do we offer fire-resistant products that withstand 2000°F (1093°C), we also provide solutions for temperatures as low as -85°F (-65°C).

## FIRE-RESISTANT/ FIREPROOF SEALS

Our fireproof proprietary silicone compounds are able to withstand temperatures up to 2000°F (1093°C). With or without fabric reinforcement, we deliver fire-resistant seals that stand up to the heat.



## O-RINGS

Our O-Rings provide reliable performance over a wide range of temperatures in all aircraft applications, including engines, wheels and brakes, flight controls, hydraulic actuators, and fuel controls. We offer elastomer materials in standard AS568 and BS1806 sizes as well as metric sizes.



## PLATE SEALS

Cost-effective and versatile, plate seals are available in application-specific materials to withstand extreme temperatures in aircraft engines and fuel systems. Our innovative designs provide an alternative sealing methodology that improves assembly time and lowers costs.



## SELF-FUSING SILICONE TAPES

Permanently bonded within 24 hours, this silicone tape forms an airtight, watertight seal around electrical wire harness connections. Due to unique adhesive-free technology, this allows for clean re-entry. In addition, our flame-retardant versions secure insulation to hot-air ducting.





## SAFETY

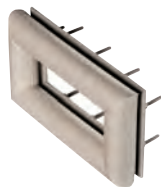
**Exceed your local safety standards** by choosing excellent sealing solutions for your next project. We use the most advanced testing to provide peace of mind to our customers and innovative materials that deliver both safety and reliability.

## MATERIALS EXPERTISE

Our extensive history of materials expertise, paired with certified manufacturing processes, assures you of the safest and most effective sealing solutions. We offer more than 100 aerospace-specific compounds in conjunction with state-of-the-art FEA simulations and a variety of diagnostic test equipment to deliver fail-safe sealing.

## FIRE-RESISTANT/ FIREPROOF SEALING

Designed for durability and long life, our fire-resistant/fireproof sealing solutions are tested to the extremes. In the event of an emergency, our seals will act as a fireproof barrier to hold back a fire of 2000°F (1093°C), providing up to 15 minutes for necessary corrective action.



## O-RINGS

With Six Sigma quality, we deliver O-Rings with superior temperature and chemical resistance and offer a complete range of AMS-, MIL-, AS-, and NAS-approved materials including NBR, EPDM, silicone, fluorocarbon, fluorosilicone, and our proprietary SIMRIZ® perfluoroelastomer.



## DIAPHRAGMS

With our in-house application test facility, we are able to design and test custom diaphragms, accurately assessing and verifying product behavior during development. Diaphragms are available with custom-formulated high-and/or low-temperature compounds and fabric reinforcement.







# WORLDWIDE QUALITY ASSURANCE

Whether you need a custom-engineered solution or standard parts, you want to know the seals you order will match your exact specifications. We have the expertise, innovation, equipment, and materials to meet your demands.

## Expertise

- Highest industry certifications and quality standards
- Extensive materials knowledge
- In-house raw material mixing
- Custom mold production
- Automated vision measurement

With a global network of manufacturing, we produce and supply parts rapidly where you need them:

- Faster response time
- Lower total cost
- Reliable and consistent quality worldwide
- On-site design and validation
- Materials expertise
- Customized product development

## DESIGN AND TESTING

Freudenberg's design expertise is equaled only by the extensive testing regimen that ensures the quality of the end result. Our CAD design offers extremely detailed rendering of not only individual parts, but also the surrounding components. Beyond that, Finite Element Analysis (FEA) simulates the environmental conditions each seal will experience in actual operation. We verify results of the computer models through actual product testing.

### Test capabilities include:

- Fluid compatibility
- Temperature
- Air aging
- Pressures
- Static/dynamic testing
- Durability, fire, and environmental testing
- Physical properties (tensile, elongation, modulus, compression set, etc.)

# PORTFOLIO

SEAL TYPE	ENGINE	FLIGHT CONTROLS	LANDING GEAR/ WHEEL AND BRAKE	AIRFRAME
Aerodynamic seals				+
Air inlet screens	+			
Cabin door seals				+
Control surface seals				+
Diaphragms	+	+		+
Elastomeric ducting and shrouds	+			+
Elastomeric gaskets	+	+	+	+
Electrical connector seals	+	+	+	+
EMI seals				+
Fire-resistant/high-temp seals	+			+
Firewall seals				+
Fuel line shrouds	+			+
Fuel seals	+			+
Hydraulic seals		+	+	
Inlet, plenum, and exhaust seals	+			+
Loading hatch seals				+
Low-friction radial shaft seals (RSS)	+	+	+	
Nacelle seals	+			
O-Rings	+	+	+	
Plate seals	+	+		+
PTFE seals		+	+	
Self-fusing silicone tape	+	+		+
Thrust reverser seals	+			
Transfer tubes	+	+		+
Vane grommets	+			
Ventilation ducting	+			+
Window seals				+

## CERTIFICATIONS

- EN ISO 9001: 2008
- EN ISO 14001: 2004
- BS OHSAS 18001: 2007
- AS9100
- AS9120
- Nadcap
- A2LA Laboratory
- EN9100
- Qualifas EASE

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