



The Aerospace & Defense O-Ring and Seal Specification Manual

Pneu-Draulics specializes in providing a wide variety of sealing devices, including O-rings, seals, and packings. Our core competencies encompass design consultation, product engineering, custom seals and gaskets, and specialized packaging and labeling solutions.

This comprehensive guide details Military Specification (Mil-Spec) requirements for O-rings and metal-bonded seals, offering a deep dive into the technical specifications for reliable, compliant sealing solutions in mission-critical aerospace and defense applications.

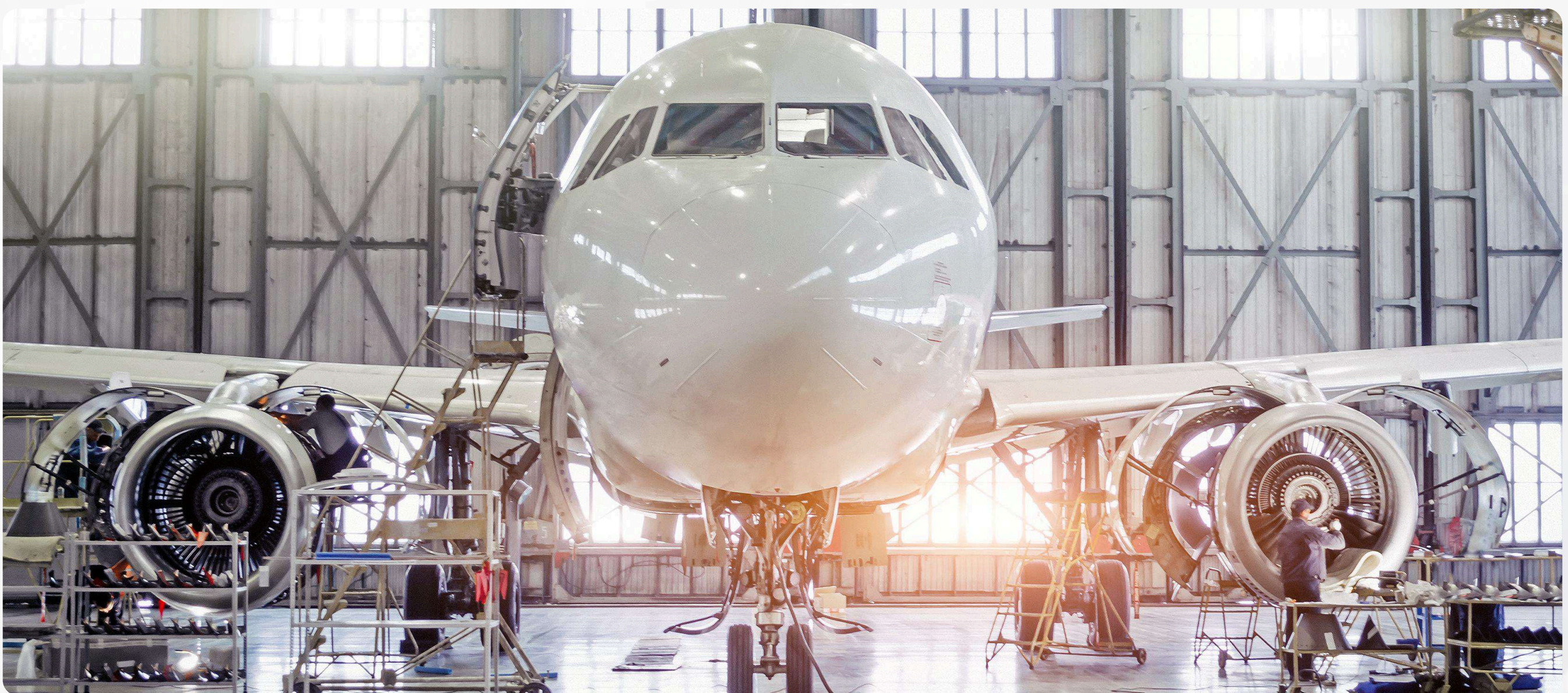




Why Seal Selection Is Mission-Critical in Aerospace & Defense

System integrity, safety, and mission success rely on durable sealing materials that can support reliable performance under extreme pressures and temperatures. Specifying the right O-ring or seal can significantly reduce maintenance requirements and support long-term durability in high-stakes aerospace and defense systems.

NAICS code 339991 is a standard that covers the manufacturing of gaskets, packing, and sealing devices (including O-rings) from various materials. Meeting these requirements means ensuring oil seals, O-rings, and various packing materials can meet requirements for high-stakes applications. Companies involved in space-based technologies and hypersonic technologies especially rely on advanced materials and seals that are capable of managing extreme heat and pressure.



The AS568 Standard: Understanding Aerospace O-Ring Sizing

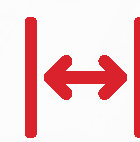
The AS568 standard ensures reliable sealing performance, interchangeability, and compatibility across aerospace, pneumatic, and hydraulic systems found in aircraft and related equipment. It establishes standardized aerospace O-ring sizes for:



Inside Diameter (ID)

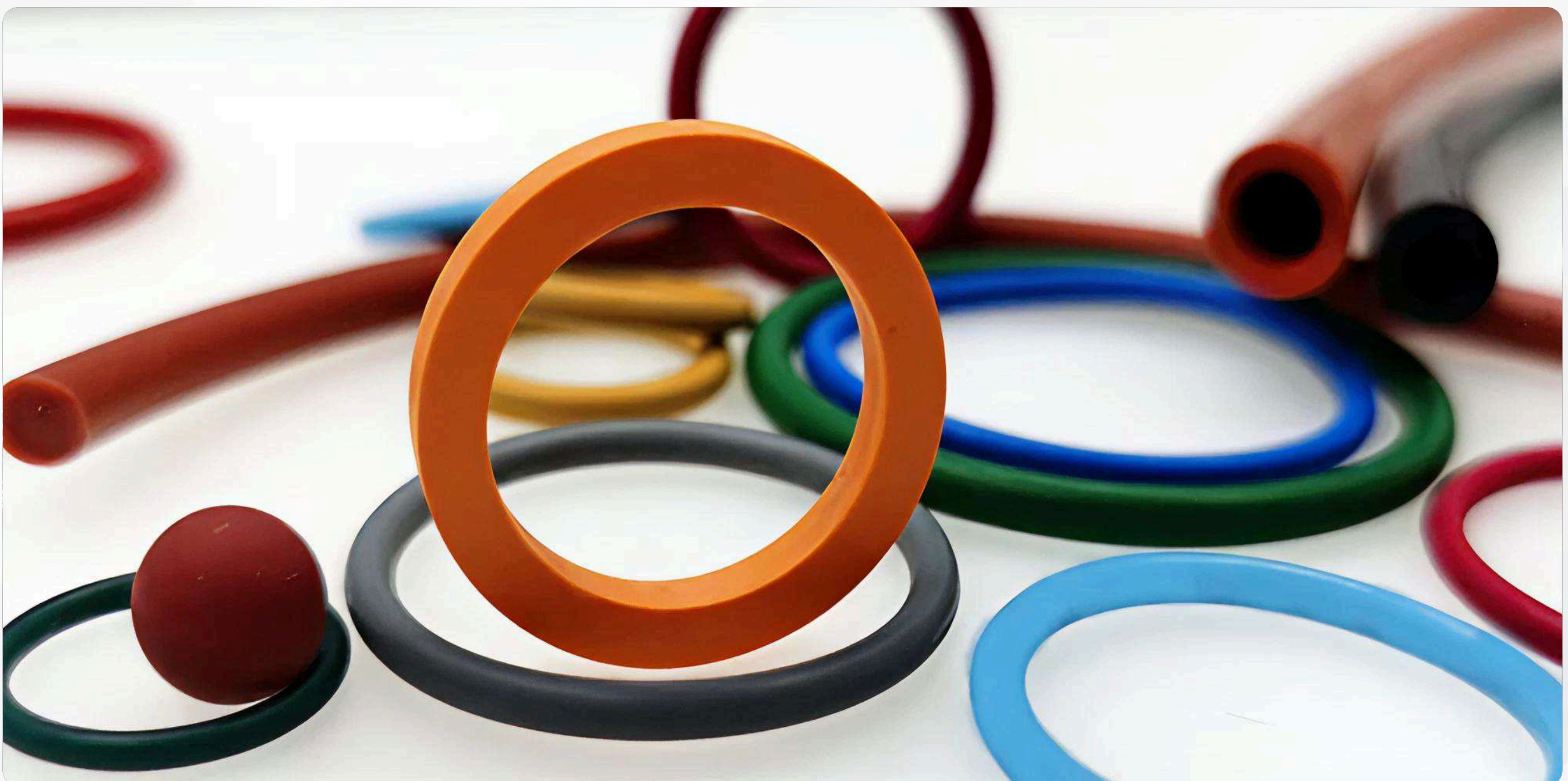


Cross-Section (CS)



Width

Standard sizing is crucial for determining proper gland fill to prevent premature failure, especially in high-performance or high-pressure aerospace environments.



Elastomer Materials for Aerospace: A Spec-by- Spec Guide

Elastomer materials are commonly used in O-rings and seals for the aerospace industry due to their ability to withstand extreme pressures, temperatures, and fuels. Examples include:

EPDM. Excellent resistance to steam, water, and phosphate-ester hydraulic fluids.

Fluorocarbon (FKM / Viton). Excellent resistance to high temperatures and aviation fuels.

Fluorosilicone (FVMQ). Exhibits low-temperature flexibility with good fuel resistance.

Nitrile (NBR / Buna-N). Used for fuel exposure and hydraulic systems.

Perfluoro elastomer (FFKM). Extreme temperature and chemical resistance for critical aerospace applications.

Silicone (VMQ). Outstanding low/high temperature performance with limited fuel resistance.

These materials are selected based on fluid compatibility, temperature range, pressure, and mission-specific requirements.

Decoding Mil-Spec O-Ring & Packing Specifications

O-rings used for military applications must adhere to different Mil-Spec requirements and design specifications. Specifications for O-rings include MIL-R-25988 and AMS-P-83461 for aerospace fuel, oil, extreme temperatures and other application-specific variables.



MIL-PRF-25988

Mil-PRF-25988 applies to dynamic and static seals facing exposure to aviation fuels:

- **Material type.** Fluorosilicone (FVMQ)
- **Key properties.** Excellent fuel resistance with low-temperature flexibility
- **Uses.** Fuel systems, tanks, and aircraft fuel pumps

AMS 7276

This standard defines high-performance sealing for high-temperature and aggressive chemical environments:

- **Material type.** Fluorocarbon (FKM)
- **Key properties.** Resistance to solvents and fuel with low compression set
- **Uses.** Used where cold performance and jet fuel computability are essential

AMS-P-83461

AMS-P-83461 covers O-rings designed for aerospace dynamic hydraulic service:

- **Type.** FKM / Viton
- **Use.** High-temperature oil and fuel sealing (Fuel systems, hydraulic equipment, engines)
- **Key properties.** Excellent heat and chemical resistance

NAS 1611/1612/1613

This aerospace O-ring standard series defines materials and usage:

- **NAS 1611.** General O-ring specification
- **NAS 1612.** Specific to FVMQ O-rings
- **NAS 1613.** Specific to FKM /Viton O-rings

Gland Design Standards for Aerospace Seal Applications

The following are aerospace gland (groove) design standards used for O-ring sealing systems.

AS4716

AS4716 defines standard gland dimensions for O-rings commonly used in aerospace hardware based on AS568 O-ring sizing. Key parameters for static and dynamic seal groove geometry include:

- Extrusion and clearance gaps
- Compression and stretch limits
- Groove width and depth

AS5857

AS5857 provides engineering guidance for O-ring gland design and performance with a key focus on:

- Extrusion prevention
- Pressure effects
- Volume fill
- Seal squeeze
- Thermal expansion

AS6235

This is an SAE International Aerospace Standard that defines gland design dimensions and criteria for O-ring seal applications, providing:

- Installation considerations
- Material compatibility
- Static vs. dynamic sealing recommendations
- Surface finish requirements



Bonded Seals, Custom & Specialty Sealing Solutions

Custom and specialty sealing capabilities are key for developing specialty sealing solutions for non-standard port configurations, high-vibration environments, and other defense and aerospace design requirements. Pneu-Draulics meets requirements like these through our experience designing and distributing tight, leak-free seals for complex mechanical and industrial systems.

Custom gaskets can incorporate specific materials, geometries, and environments, ensuring reliable sealing in high-pressure and extreme temperature operating conditions. Examples include combining elastomer seals with metal carriers to improve alignment, strength, and pressure resistance, meeting the unique demands of challenging aerospace applications.



Certifications & Compliance: What Defense Contractors Require From Seal Suppliers

Defense contractors also require suppliers to meet the following compliance and certification standards to ensure reliable performance:

- **Lot control**
- **Material traceability**
- **Quality systems (ISO 9001)**
- **Testing documentation**

The Qualified Products List (QPL) process verifies that seal products are in compliance with U.S. defense specifications. Before use in military systems, manufacturers must submit materials and test data to the Defense Logistics Agency for authorization. Approved products are listed for procurement, ensuring consistent traceability and compliance with military standards across aerospace and defense programs.

NAICS Codes, CAGE Codes & Delivery Contracts

For defense contractors in expanding markets, procurement efficiency is as important as hardware reliability. Suppliers must maintain active CAGE codes and align with NAICS 339991 to qualify for prime contract awards and sub-tier requisitions. By maintaining these administrative credentials, seal suppliers provide the streamlined procurement path necessary for the accelerated acquisition cycles typical of modern orbital and satellite defense programs.



Testing, Qualification & Failure Analysis for Aerospace Seals

Testing, qualification, and failure analysis typically include:



Aging tests



Compression set



Fluid compatibility



Pressure testing



Temperature cycling

Standards such as SAE AS5316 and SAE AS568 dictate storage considerations. Seals must be stored in a dark, cool environment away from UV light, chemicals, and ozone.





Sealing Solutions for Aerospace Corridor & Space Force Programs

Pneu-Draulics is a provider of sealing solutions for Huntsville's aerospace corridor, supporting engineers with reliable supply chains for critical U.S. Space Force programs. Our expertise in custom O-rings, gaskets, and metal-bonded seals ensures mission-ready performance and long-term durability for challenging applications. We can meet critical requirements while supporting supply chain reliability in line with critical aerospace and defense requirements.

[Contact us](#) or [request a quote](#) today to learn more about our comprehensive range of sealing solutions for the aerospace and defense industries.

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About PNEU-DRAULICS

Established in 1982, Pneu-Draulics has become an industry leader in the distribution of o-rings and other seal profiles. Our business philosophy is simple: sell only quality products, sell the customer only what they need, and provide the customer with unparalleled support. Our dedication to quality, customer service, and product availability has enabled us to set ourselves apart from other distributors and excel across various markets.

As an 9001-2015 ISO certified company and global supplier, we specialize in design consultation using non-metallic shapes such as o-rings and other various cylinder packings. We serve both the OEM and MRO markets. Our certification assures quality products that conform to dimensional, material, and customer specifications.

Our expanded one day shipping area includes all of Kentucky, parts of Tennessee, Ohio, Indiana, Illinois, and now Alabama. Our two locations will get you the products you need without paying for extra shipping. Our employee's cumulative experience and commitment to continuing education separates us from the pack with a comprehensive understanding of product profiles, market trends, demands, and logistical requirements.

- Our markets include, aerospace, military, manufacturing, mining, and MRO aftermarket repair
- We are a distributor for Parker Hannifin Seal Groups as well as many others
- NAICS:
 - 339991-Gasket, Packing, and Sealing Device Mfg.
 - 541330-Engineering Services
 - 326291-Rubber product manufacturing for mechanical use
- CAGE CODE 8V217