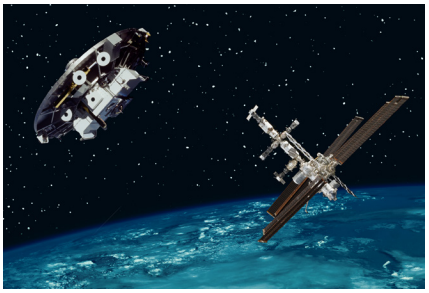
ENGINEERING GUIDE

Designing Silicone Gaskets for Spaceflight

Stockwell ELASTOMERICS



Thermal, Vacuum, Compression, and EMI Considerations

Gaskets used in spaceflight hardware can face demanding operating conditions while also being constrained by weight, packaging, and qualification requirements. Successful gasket design starts with evaluating the material and mechanical interface together—not treating the gasket as a final component added after the enclosure is designed.

1. Start With the Operating Environment

Temperature extremes and repeated thermal cycling can change the dimensions of mating components and place additional demands on gasket materials.

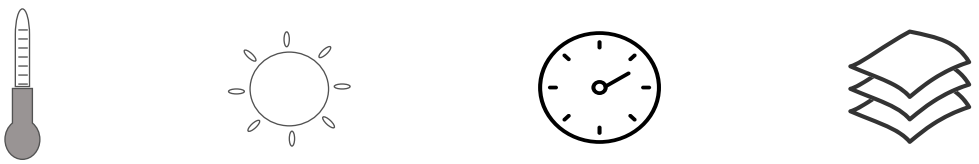
Silicone elastomers are commonly considered for aerospace sealing applications because of their broad operating temperature capability and compression properties.

Material selection should consider:

- Minimum and maximum operating temperatures
- Frequency and severity of thermal cycling
- Expected service duration
- Vacuum exposure
- UV and ozone exposure
- Fluid or chemical contact
- Required compression force

Where fuels, oils, or aggressive fluids are present, fluorosilicone may provide advantages over conventional silicone.

Environmental Considerations



Thermal Cycling | UV Exposure | Vacuum Exposure | Compression Set

800.523.0123 | 215.335.3005
www.stockwell.com | service@stockwell.com

2. Understanding Silicone Temperature Performance

Spaceflight applications demand sealing materials capable of maintaining performance across significant temperature variations. Selecting an elastomer with the appropriate thermal properties is essential for protecting sensitive components and maintaining sealing integrity.

Stockwell Elastomerics offers silicone materials with temperature capabilities ranging from -37°C to +260°C (-35°F to +500°F), depending on the specific formulation and material grade.

When evaluating silicone materials for aerospace applications, engineers should consider:

- Low-temperature flexibility: Maintaining sufficient elasticity and sealing force as temperatures decrease.
- High-temperature stability: Preserving material properties during elevated-temperature exposure.
- Thermal cycling: Evaluating the effects of repeated expansion and contraction on gasket geometry and compression.
- Compression set: Understanding how prolonged compression at elevated temperatures can affect sealing performance.
- Material compatibility: Ensuring the selected formulation meets application-specific environmental and performance requirements.

Not all silicone formulations perform equally across this temperature range. Engineers should review material-specific technical data and validate performance under representative operating conditions.

Published temperature capabilities do not independently establish suitability for vacuum or spaceflight use. Outgassing, application-specific qualification, and long-term material performance should also be evaluated.

3. Design for Compression—not Just Thickness

A gasket cannot provide reliable sealing simply because it fills the available space.

Compression should be considered during the initial design of the enclosure, including gasket thickness, tolerance stack-up, closure force, and groove geometry.

A common starting point for many elastomer gasket designs is approximately 20–30% compression, although the appropriate target depends on the specific material and application.

Designers should evaluate worst-case tolerance conditions to avoid both insufficient compression and excessive gasket loading.

4. Consider Compression Set

For long-duration applications, the gasket must maintain sufficient sealing force after remaining compressed for extended periods.

Low compression set can therefore be an important material-selection criterion, particularly where assemblies may experience extended service periods combined with thermal cycling.

Material datasheet values can help compare candidates, but testing the actual gasket geometry under representative application conditions provides greater confidence.

5. EMI Shielding May Be Part of the Seal

Compact avionics and electronic enclosures can require environmental sealing and EMI control at the same interface.

Conductive silicone elastomers combine elastomeric sealing with electrical conductivity, making them useful candidates for enclosure interfaces where both requirements must be addressed.

Selection should consider:

- Required shielding effectiveness
- Operating frequency
- Conductive filler system
- Closure force
- Environmental exposure
- Galvanic compatibility
- Gasket geometry
- Available sealing land

Evaluating EMI gasket performance early can help prevent enclosure redesigns later in development.

6. Prototype the Actual Interface

Material specifications are only part of gasket performance.

The interaction between gasket geometry, enclosure tolerances, compression, surface condition, and fastener placement ultimately determines how the seal behaves.

Rapid prototyping allows engineers to evaluate these factors using functional gasket materials before committing to production tooling or a finalized design.

From CAD to Functional Gasket

Stockwell Elastomerics supports aerospace development programs with precision waterjet cutting, die cutting, lamination, molding, and rapid gasket prototyping.

Applications engineering support can also help evaluate:

Material → Thickness → Geometry → Compression → Prototype → Validation → Production

Validate Your Gasket Design Earlier

Send Stockwell your gasket drawing, CAD file, or application requirements. Our team can review material options, compression targets, geometry, and manufacturability and help develop a functional prototype for evaluation.

AS9100 Certified | ITAR Registered

Request a Rapid Prototype:

800.523.0123 | 215.335.3005
www.stockwell.com | service@stockwell.com