Aerospace Fluorosilicones

Technical Bulletin

No. ORD 5745

The "Gold Standard" for Jet Fuel

Because of their good hydrocarbon compatibility and unmatched low temperature performance, fluorosilicone O-ring materials have become the standard seal materials for use in most jet fuel applications and many low temperature hydrocarbon hydraulic applications.

To meet the needs of multiple applications, Parker has three different hardnesses of fluorosilicone O-ring materials.

Extreme Low Temperature Performance

Fluorosilicones have long been used for their outstanding low temperature properties. With a functional temperature range of -100°F to +350°F (-73°C to +177°C), fluorosilicone rubber has the thermal stability to accommodate nearly all aerospace applications. This thermal stability comes from the silicone backbone that forms the base polymer chain.

Outstanding Fuel and Oil Resistance

Fluorosilicone rubber also has fluorinated side chains branching off of the silicone backbone that give it chemical compatibility that approaches that of fluorocarbon rubber; resistance to petroleum-based oils, greases, and fuels is excellent. Fluorosilicones have become the seal material of choice for handling jet fuel on commercial, military, and general aviation aircraft of all types. Testing in ASTM Fuel B (also called TT-S-735 Type III) shows good compatibility with aggressive hydrocarbon fuels.

In addition, fluorosilicone O-rings have found a niche in sealing fire-resistant synthetic hydrocarbon hydraulic fluids in static applications, expecially those used at low temperatures.

Good Rebound Resilience

Historically, fluorosilicones have not offered good short-term rebound resilience. When stretched to fit into a male O-ring gland, fluorosilicone materials tended to sag rather than snap back tight against the groove. These new fluorosilicone compounds exhibit dramatic improvements in this category. While there are no industry standard test procedures for this type of test, it can be easily observed. This improvement in rebound resilience should make automated assembly more feasible and decrease the incidence of torn O-rings during installation.

Other Properties

Fluorosilicones generally have poor mechanical properties. As a result, they wear quickly in dynamic applications and are easy to tear during installation. Fluorosilicones also have poor gas permeation resistance. In vacuum and pressurized gas applications, fluorosilicone O-rings will allow some gas to permeate through the seal over long periods of time.

LM159-70

-100°F to +350°F (-73°C to +177°C)
Standard fluorosilicone O-ring material

LM158-60

-100°F to +350°F (-73°C to +177°C)
Softer fluorosilicone O-ring material
- **Lower compressive loads than LM159-70**
- **Lower insertion forces than LM159-70**
- **Conforms better to rough surfaces than LM159-70**

LM160-80

-90°F to +350°F (-68°C to +177°C)
Harder fluorosilicone O-ring material
- **Higher pressure rating than LM159-70**

Typical Applications Include:

- Low temperature hydrocarbon-based hydraulic fluids
  MIL-PRF-5606
  MIL-PRF-83282
  MIL-PRF-87257
- Aviation fuels down to -100°F (-73°C)

Jet A	Jet A-1	Jet B
JP-4	JP-5	JP-6
JP-7	JP-8	JP8+100
JP-9	JP-10	

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Typical Test Data

AS568-214 O-ring unless otherwise noted
Date: January 23, 2004 / February 5, 2004

PROPERTY	LM158-60	LM159-70	LM160-80
Original Physical Properties ASTM D1414, D2240, D297			
Shore A hardness	60	69	80
Tensile strength, min., psi	884	976	949
Ultimate elongation, min., %	327	267	166
Specific Gravity	1.48	1.53	1.56
Low Temperature Retraction, D1329			
TR-10, °F	-76.2	-73.3	-76.7
Compression Set (70h @ 75°F) ASTM D395 Method B			
Under 0.110 inch thickness, % loss of original deflection	8.8	9.1	8.8
Over 0.110 inch thickness, % loss of original deflection	11.8	13.2	12.0
Compression Set (22h @ 347°F) ASTM D395 Method B			
Under 0.110 inch thickness, % loss of original deflection	12.1	21.2	8.8
Over 0.110 inch thickness, % loss of original deflection	23.3	15.7	14.1
Heat Age (70h @ 392°F) ASTM D573			
Hardness change, pts.	+4	+3	+2
Tensile strength change, max., %	-16	-13	-12
Ultimate elongation change, max., %	0	-13	-18
Weight loss, max., %	-0.57	-0.03	-0.4
Fluid Resistance AMS 3021 (70h @ 302°F) ASTM D471			
Hardness change, pts.	-10	-6	-7
Tensile strength change, max., %	-22	-27	-14
Ultimate elongation change, max., %	-5	-9	+8
Volume change, %	+11.5	+9.5	+8.8
Compression set, % D395 Method B, over 0.110 inch	16.4	13.9	11.8
Fluid Resistance Fuel B (22h @ 73°F) ASTM D471			
Hardness change, pts.	-10	-9	-9
Tensile strength change, max., %	-24	-28	-10
Ultimate elongation change, max., %	-10	-16	+3
Volume change, %	+23.3	+21.1	+19.5

WARNING:
FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THESE PRODUCTS CAN CAUSE EQUIPMENT FAILURE OR DAMAGE, PERSONAL INJURY OR DEATH.

For safe and trouble-free use of these products, it is important that you read and follow the Parker Seal Group Product Safety Guide. This Safety Guide can be referenced and downloaded free of charge at www.parkerseals.com. It is also printed in major Seal Group product catalogs, and can be ordered by telephone without charge as Parker Publication No. PSG 5004 by calling 1-800-C-PARKER.

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