

# Parco

## 9167-60 Fluorocarbon Seals

### Can Your Fluorocarbon Seals Handle -40°F?

Exposure to low temperatures and harsh chemicals can cause seals to crack or swell. Whether your seals are used in applications such as automotive fuel systems or aerospace hydraulic systems, your seals need to prevent leakage. Parco's chemists have created another innovative compound for use in those applications. That's why the world's leading automotive and aerospace companies rely on Parco for their seals.

#### 9167-60 Meets Your Needs

Parco's 60-durometer compound is tailored to meet the needs of various low-pressure applications including automotive fuel injectors and aircraft hydraulic pumps.

Parco's 9167-60 compound provides these features:

- Superior performance at low temperatures
- Excellent resistance to chemicals

After extensive laboratory testing, Parco's 9167-60 seals showed outstanding resistance to cracking at low temperatures and to swelling in chemicals. That means improved performance and safety for your equipment in cold and caustic environments.

*For advanced solutions to the challenging demands of the automotive and aerospace industries, Parco leads the way. Parco's chemists have formulated a new low-temperature fluorocarbon compound. That compound is Parco's best performing fluorocarbon at low temperatures, and offers superior resistance to harsh chemicals.*

#### Fluorocarbon Outperforms Most Elastomers

Fluorocarbon elastomers command a substantial share of the seal market. Those compounds primarily use DuPont Dow's Viton® and Dyneon's Fluorel® as the base polymer. Fluorocarbon withstands a broad range of chemicals and temperatures, second only to silicone.

Fluorocarbons are commonly rated for continuous service temperatures from -20 to +400°F, with intermittent exposures as high as 600°F. Parco offers compounds with continuous service ratings to 500°F. In spite of its higher cost, fluorocarbon has replaced nitrile in many applications. Fluorocarbon offers superior resistance to compression set, high temperatures, and a wide range of chemicals.

## Key Properties of 9167-60

The enhanced properties of Parco's 9167-60 seals make them ideal for low-pressure applications which require superior resistance to low temperatures, automotive fuels, hydraulic fluids, or harsh chemicals. Parco recommends 9167-60 seals for use in automotive fuel systems and aerospace hydraulic systems.

### Superior performance at low temperatures

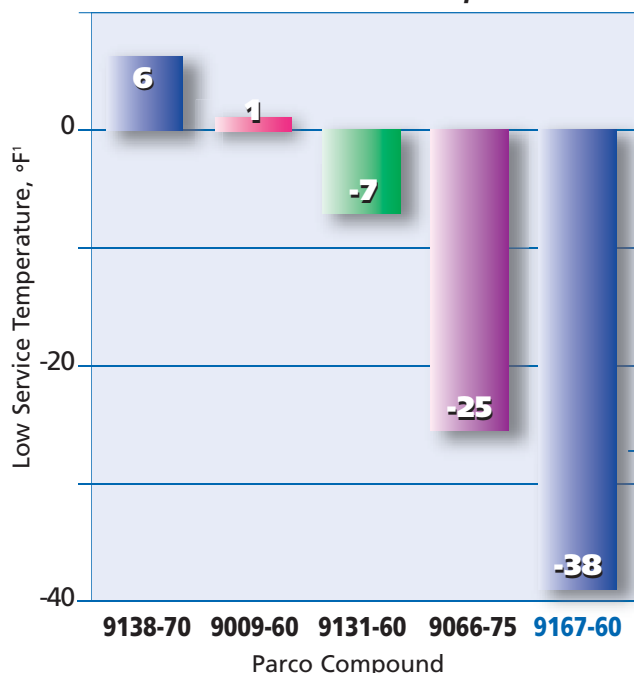
Seals used in automotive and aerospace applications are regularly exposed to extreme heat and cold. Seal performance is particularly affected by temperature variations in cold environments. Seals become hard and brittle at low temperatures, making them more susceptible to cracking.

Our 9167-60 seals can be used in applications with continuous service temperatures as low as -40°F. Our laboratory technicians performed a temperature retraction test (TR-10) on our 9167-60 material. The American Society for Testing and Materials (ASTM) recommends the TR-10 test to evaluate rubber for low-temperature service. After stretching strips of our 9167-60 compound 50 percent in freezing temperatures, we gradually raised the temperature. The strips retracted ten percent at the low temperature of -38°F. The temperature at which rubber retracts ten percent approximates the material's low service temperature. The excellent low-temperature properties of 9167-60 seals make them less susceptible to cracking in low-temperature applications (see Figure 1).

Until recently, compounds made from Viton's® GLT or GFLT polymers offered the best low-temperature performance among fluorocarbon compounds.

Fig. 1:

### Low Service Temperatures of Typical Parco Fluorocarbon Compounds



<sup>1</sup>Values taken from temperature retraction tests (TR-10).  
Source: Parco Test Reports.

*9167-60 seals have the best low-temperature properties of any Parco fluorocarbon compound. 9167-60 seals can be used in applications exposed to temperatures as low as -40°F.*

Viton® GLT has a TR-10 value of -33°F. Compounds using Viton® GFLT typically have a TR-10 value of -25°F. However, Parco's chemists have formulated a compound, with a new base polymer from Dyneon, that features better low-temperature flexibility than compounds made from existing Viton® GLT and GFLT. Parco's 9167-60 compound has a TR-10 value of -38°F, making it superior to most fluorocarbon compounds.

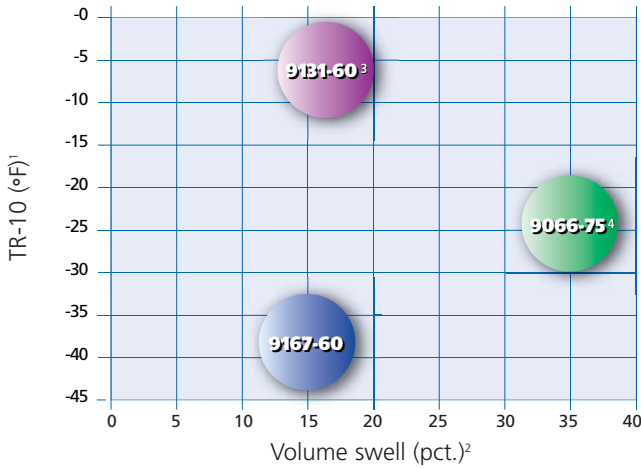
### Excellent resistance to harsh chemicals

Parco's 9167-60 compound offers superior performance in harsh chemical applications compared to compounds made from Viton® GFLT (see Figure 2).

Fluorocarbon is naturally resistant to a wide range of chemicals due to the elastomer's high

Fig. 2:

### Resistance of Parco Fluorocarbon Compounds to Low Temperature and a Blend of Methanol and Fuel C



<sup>1</sup>Values taken from temperature retraction tests (TR-10).

<sup>2</sup>Values calculated after fluid aging materials in 15 percent Methanol, 85 percent Fuel C (M15) for 168 hours at 73.4°F (23°C).

<sup>3</sup>The base polymer in Parco's 9131-60 compound is Viton® GFLT.

<sup>4</sup>The base polymer in Parco's 9066-75 compound is Viton® GLT.

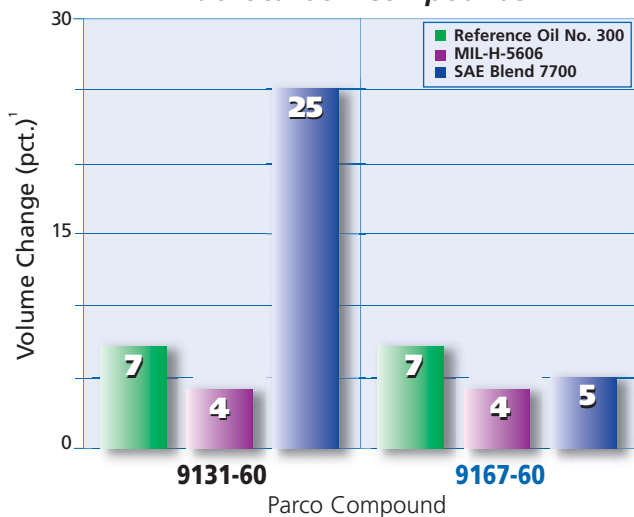
Source: Parco Test Reports 7637A and 7981.

*Parco's 9167-60 seals offer better resistance to low temperatures and harsh chemicals than seals made from Viton® GFLT and GLT. 9167-60 seals are made from a new Dyneon base polymer with superior resistance to low temperatures and a wide range of chemicals.*

ratio of fluorine to hydrogen, the natural strength of the carbon-fluorine bond, and the absence of unsaturation in the carbon bond.

Fig. 3:

### Volume Change of Parco Low-Temperature Fluorocarbon Compounds



<sup>1</sup>All volume change results calculated after 70 hours at 200°C (392°F).

<sup>2</sup>The base polymer in Parco's 9131-60 compound is Viton® GFLT.

Source: Parco Test Report 7637.

*Parco's 9167-60 seals offer excellent resistance to a wide range of chemicals. 9167-60 seals swelled less than ten percent after prolonged exposure to chemicals used frequently in automotive and aerospace applications.*

The base polymer for Parco's 9167-60 compound has a fluorine content of 67 percent. That high fluorine content gives our compound increased chemical resistance. Our 9167-60 seals had volume swell of less than 10 percent after prolonged exposure to standard reference fluids (see Figure 3).

## Rely on Parco

Parco is a leading manufacturer of high-performance seals. We specialize in developing proprietary elastomeric compounds and bonding techniques. Parco's seals are available in 340 compounds, more than 25 percent developed in the last five years.

Founded in 1941, Parco was the first manufacturer to specialize in O-rings. Our modern 154,000 square-foot facility is one of the largest plants in the world making molded rubber seals. Parco also manufactures custom-molded elastomeric products, including rubber-to-metal bonded parts. Our quality management system is certified to ISO/TS 16949:2002, AS7115, and AS9100B. Our R & D laboratory is certified to ISO/IEC 17025.

Parco products are available throughout the world from a network of knowledgeable distributors.

## Parco Delivers Faster

Parco can provide samples of its 9167-60 fluorocarbon compound within ten working days. If you need sample parts even faster, Parco can deliver them in as few as three days through its Rapid Prototype Program.

For more information on Parco's 9167-60 fluorocarbon compound or to obtain samples, please contact a Parco customer service representative or one of our distributors.

## Key Features

Parco's 9167-60 fluorocarbon compound is designed for low-pressure applications requiring broad chemical resistance at low temperatures. Key features include the following:

- **Superior performance at low temperatures:**  
Parco 9167-60 seals can be used in applications with continuous service temperatures as low as -40°F.
- **Excellent resistance to chemicals:**  
Parco 9167-60 seals had volume swell of less than 10 percent after prolonged exposure to standard reference fluids.
- **Wide range of service temperatures:**  
Parco 9167-60 seals are suitable for applications ranging from -40 to +400°F.

## Typical Values

Physical Property	Compound 9167-60	ASTM Test Method
<b>Original Properties</b>		
Hardness, Shore A	63	D2240
Tensile strength, MPa (psi)	11.5(1669)	D412
Ultimate elongation, pct.	174	D412
<b>Heat Aging</b>		
<b>70 hours at 250°C (482°F)</b>		D573
Hardness change, pts., Shore A	-1	
Tensile strength change, pct.	-10	
Ultimate elongation change, pct.	14	
<b>Compression Set, Plied</b>		D395
<b>pct. of original deflection</b>		Method B
22 hours at 200°C (392°F)	11	
70 hours at 200°C (392°F)	14	
<b>Fluid Aging, Reference Oil No. 300</b>		
<b>70 hours at 200°C (392°F)</b>		D471
Hardness change, pts., Shore A	-5	
Tensile strength change, pct.	-13	
Ultimate elongation change, pct.	0	
Volume change, pct.	7	
<b>Fluid Aging, MIL-H-5606</b>		
<b>70 hours at 135°C (275°F)</b>		D471
Hardness change, pts., Shore A	-2	
Tensile strength change, pct.	-17	
Ultimate elongation change, pct.	-5	
Volume change, pct.	4	
<b>Fluid Aging, SAE Blend 7700</b>		
<b>70 hours at 200°C (392°F)<sup>1</sup></b>		D471
Hardness change, pts., Shore A	-5	
Tensile strength change, pct.	-24	
Ultimate elongation change, pct.	-9	
Volume change, pct.	5	
<b>Fluid Aging, 20 pct. MTBE<sup>2</sup> / 80 pct. Fuel C</b>		
<b>168 hours at 23°C (73°F)</b>		D471
Volume change, pct.	8	
<b>Low Temperature Property</b>		
TR-10°C (°F)	-39(-38)	D1329

<sup>1</sup>SAE is the acronym for Society of Automotive Engineers. <sup>2</sup>MTBE is the acronym for Methyl Tertiary Butyl Ether.  
Source: Parco Test Report 7637A.

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