

# *A Guide To Fluoroelastomers*

*For when you need a highly reliable and long-term elastomer, Fluoroelastomer could be your ideal solution.*

*White  
Paper*

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## Executive Summary

J-Flex has created this comprehensive Guide to Fluoroelastomers to be used as a valuable resource for all those wanting to purchase a highly reliable and long-term elastomer.

This guide comprises of:

- Fluoroelastomers – The Definition
- What Makes Fluoroelastomers Work
- The Polymer Types
- Application/Industry
- Product Variations
- Life Expectancy
- Who Makes Fluoroelastomers

## The Definition

Fluoroelastomers also known as fluorocarbon compounds are used in a wide variety of high performance applications. Long term reliability, with minimum change to environmental are the main factors that make fluoroelastomers a vital polymer. These elastomers are specifically designed to be highly resistant to elevated temperatures (-15°C to +204°C Continuous and 300°C Intermittent) and aggressive chemical changes. Fluoroelastomers have a great compression, sunlight and ozone resistance as well as a low gas absorption rate.

The ASTM D2000 designation for fluoroelastomers is HK meaning one of the highest heat resistance and the lowest swell available of rubber type elastomers.



## What Makes Fluoroelastomer Work

There are three main factors that allow fluoroelastomers to gain their unique quality.

1. Extremely strong bonds between atoms – the carbon atoms which make up the backbone of this polymer are extremely resistant to change. This means that these polymers are unlikely to undergo any division of their macromolecular chains into smaller sections, which would then be more susceptible to deterioration.
2. High fluorine-to-hydrogen ratio – fluorine is the dominant atom, making it more stable and less likely to be affected by its environment. The higher the level of fluorine, the more stable the polymer.
3. Single carbon backbone – the backbone contains only single bonds between the carbon atoms. Double bonds are increasingly more likely to be affected by chemical attacks; single bonds are less likely to be harmed by oxygen, ozone, UV lights, etc...

## So What's the difference between FPM & FKM?

FPM is the international designation according to ISO – whereas – FKM is the ASTM abbreviation. Both of these designations stand for the same base material: fluoro rubber.



## The Polymer Types

When choosing your Fluoroelastomer it is important to pick the right Polymer type for its intended use. We have identified the five main polymer types below. It is important to consider the Fluorine content percentage as this is what provides the greater resistance to swell and degradation.

Polymer Type	Fluorine (%)	Consists of...	Further details...
A Type Di-Polymer	65% - 66%	Vinylidene fluoride and hexafluoropropylene.	The most common elastomer. Highly resistant to oils, aqueous fluids, steam and acids.
B Type Ter-Polymer	67% - 68%	Vinylidene fluoride, hexafluoropropylene and tetrafluoroethylene.	This has a slightly better fluids resistance than Type A.
F Type Ter-Polymer	69%	Vinylidene fluoride, hexafluoropropylene and tetrafluoroethylene.	This has the best fluid resistance but is not ideal for low temperature use.
GF Type Ter-Polymer	70%	Vinylidene fluoride, hexafluoropropylene, tetrafluoroethylene and a cure site monomer.	This type has extra resistance to fluids, steam and acid. However still not ideal for low temperature uses.
GFLT Type	67%	Vinylidene fluoride, perfluoromethylvinyl ether, tetrafluoroethylene and a cure site monomer.	This elastomer has the lowest swell rate and best performance for low temperature uses. LT in 'GFLT' stand for low temperature. (Typically -23°C)

## **Application/Industry**

Fluoroelastomers can be used in a wide range of different industries, but they are especially beneficial to sectors which need highly reliable and long term polymers. The following industries are specially known for using fluoroelastomers:

### **Automotive**

- Shaft Seals
- Valve Stem Seals
- Fuel Injector O-rings
- Fuel Hose
- Tank Seals
- Gaskets
- Lathe Cut Gaskets

### **Chemical and Petrochemical**

- O-Rings
- Mechanical Seals
- Flexi Liners for pumps
- Seals and Diaphragms
- Rolls
- Pipe Coupling
- Valve Liners

### **Industrial**

- Hydraulic O-Ring Seals
- Check Valve Balls
- Military Flare Blinders
- Electrical Connectors
- Fuel Joints
- Valve Liners
- Roll Covers

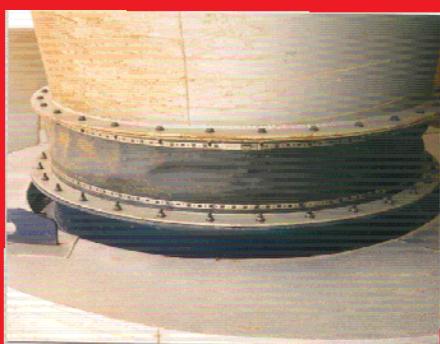
### **Aerospace**

- O-Ring Seals in Fuels
- Manifold Gaskets
- Firewall Seals
- Fuel Tanks
- Engine Siphon Hose
- Clips for Jet Engines
- Tire Valve Stem Seals

In addition to the above J-Flex has developed a White FDA Compliant FKM material suitable for food processing; beverage and pharmaceutical applications.

## **Product Variations**

Fluoroelastomers can be found in a wide range of different shapes and sizes, depending on its intended use. At J-Flex, we provide one of the world's largest stocks of fluoroelastomer sheet products and sponges. Adhesives, caulk sealants, custom mouldings, flue duct expansion joints, V-J rings, 'O' rings, gaskets and joints can all be made to order in a range of different colours, sizes and thickness.



## Life Expectancy

### Resistance to temperature extremes

**Heat** - Viton® withstands high temperature and simultaneously retains its good mechanical properties better than most other elastomers. Oil and chemical resistance also are relatively unaffected by elevated temperatures. Compounds of Viton® remain usefully elastic indefinitely when exposed to laboratory air oven ageing up to 204°C or to intermittent test exposures up to 260°C. High temperature service limits are generally considered to be:-

3,000 hrs at 232°C

1,000 hrs at 260°C

240 hrs at 288°C

48 hrs at 316°C

### Who Makes Fluoroelastomers

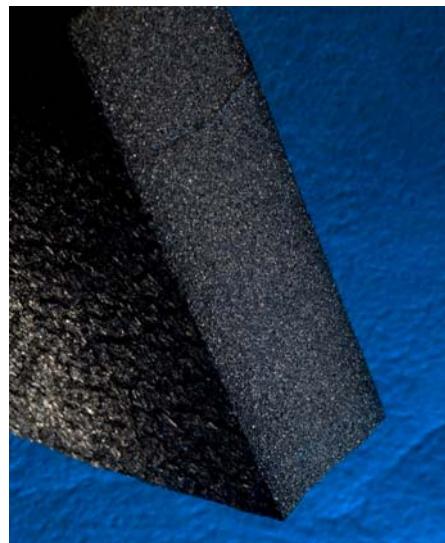
Fluoroelastomers are made and marketed by some of the world's leading and largest chemical corporations. For example:

- **Du-Pont – Viton®**
- **Dyneon Chemicals Dyneon®**
- **Solvay Solexis– Technoflon®**
- **Daikin – Dai-El®**
- **Chenqai - China**
- **3F - China**
- **Dongyue - China**
- **Lanxess - Levatherm®**



J-Flex is an official licensee of the DuPont Genuine Viton Scheme® but we do also offer other grades and have one of the widest ranges of elastomers available worldwide. We understand you may have specific requirements and we will work with you to find the correct elastomer for your intended purpose.

A new fluoroelastomer family was introduced by Asahi Glass Co., FEPM based on an alternative copolymer of TFE and propylene. It is marketed under the trade name AFLAS®.



**Disclaimer:** Because conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any material, evaluation of any compound under end-use conditions prior to specification is essential.

## About J-Flex

**Established in 1984, and with over 30 years in the industry, J-Flex offers expertise fluoroelastomer product manufacture and supply. Our mission is to help our customers by providing the right fluoroelastomer product, at the right time, in perfect condition.**

We pride ourselves in good, old-fashioned customer service. Our customers are looking for product availability, reliability and a quick and efficient response to their requests. We deliver every time.

We are already helping over 1,300 customers and we export to over 40 countries.

We are accredited to BS: EN: ISO 9001: 2008 and are Registered Licensees under the DuPont Genuine Viton® Licensing Scheme. We also ensure where appropriate our products are tested and approved by the relevant authorities, and will provide relevant certifications on request.

J-Flex is a member of the Gasket Cutter's Association (GCA), the European Seals & Gaskets Association (EUSGA) as well as a semi<sup>®</sup> Member.

If you are struggling to specify the right solution for your particular circumstances, please contact us and we'll do our very best to help you make the right decision.

Check out the download area of our website [www.j-flex.co.uk](http://www.j-flex.co.uk) for product information, data sheets and more.

## About The Author

John Kirk set up J-Flex in 1984 and is the Managing Director of the company.



As an industry veteran, with over 45 years' experience in the rubber industry, John relishes the opportunity to help customers with solutions to their industrial rubber engineering challenges.

Travelling worldwide on a regular basis, John is able to tap into his extensive network of contacts to drive the J-Flex business forward to the benefit of customers. With a strong customer focus, John is also keen to develop new products to meet customer requirements.

John is eager to ensure the rubber industry as a whole meets the quality standard customers expect which is one of the reasons for writing this White Paper.

John is currently President of European Seals and Gaskets Association (eusga).

## **J-FLEX RUBBER PRODUCTS**

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