

Viton® made with Advanced Polymer Architecture

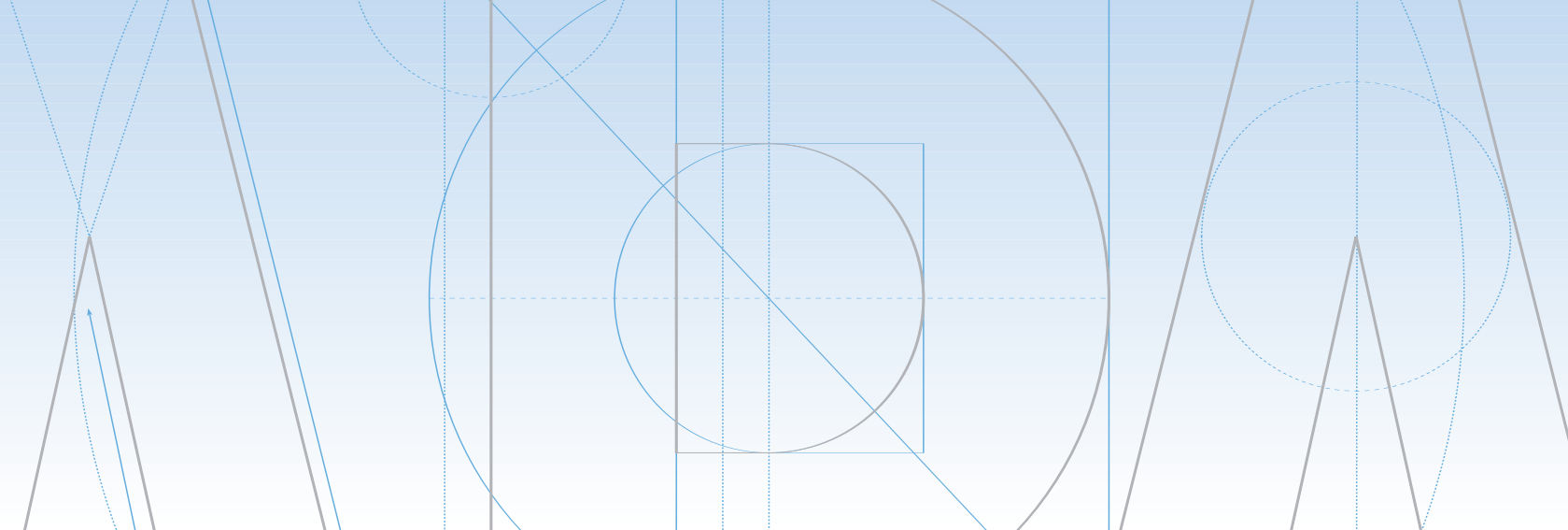
expands fluoroelastomer performance

in a variety of applications



Viton®

From DuPont Performance Elastomers



Advanced Polymer Architecture for improved compounding

optimizing processing performance

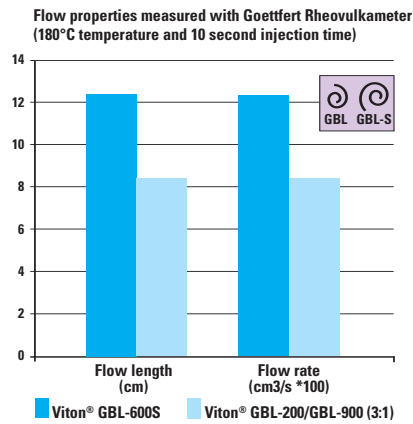
For 50 years, Viton® fluoroelastomers have been the polymers of choice for reliable sealing. Bisphenol curable copolymers satisfy conventional sealing needs, but as application requirements have become more demanding, specialty types of Viton® have been developed. In 2001, new technology developed by DuPont Performance Elastomers, called Advanced Polymer Architecture (APA), led to

a step-change in the processing and end-use performance of specialty types of Viton® to herald a new era for fluoroelastomers. The range of Viton® polymers made with APA is indicated in Table 1. Both low- and high-viscosity types have been developed to allow compound viscosities to be optimized for the chosen processing method (injection, compression, transfer, extrusion).

Table 1 – Viton® made with APA is available in several types to meet processing and end-use requirements

Commercial type of Viton®	Mooney @ 121°C	% Fluorine	TR-10°C	Special features and applications
Viton® made with APA – Standard Peroxide types				
GF-600S	65	70	-6	Broad resistance to acids, lubricants, hot aqueous media. GF-600S and GF-200S provide very low permeation. Applications: automotive (fuel, lubrication, cooling system) and industrial.
GF-200S	25	70	-6	
GBL-600S	65	68	-17	
GBL-200S	25	68	-17	
Viton® made with APA – Improved low-temperature types				
GLT-600S	65	64	-30	Very low temperature service combined with fuel resistance. Applications: automotive and aerospace.
GLT-200S	25	64	-30	
GBLT-600S	65	66	-27	
GBLT-200S	25	66	-27	
GFLT-600S	65	67	-23	
GFLT-200S	25	67	-23	
Viton® Extreme™ made with APA – Improved base-resistance TFE/P Type				
VTR-8802	60	60	+4	Extreme base resistance. Applications: offshore, automotive and industrial.
Viton® Extreme™ made with APA – Expanded fluid-resistance type				
ETP-600S	65	67	-8	Extraordinary resistance to a wide variety of extremely aggressive media. Applications: offshore, industrial and automotive.

Figure 1 – APA polymers offer higher productivity from improved flow despite faster curing



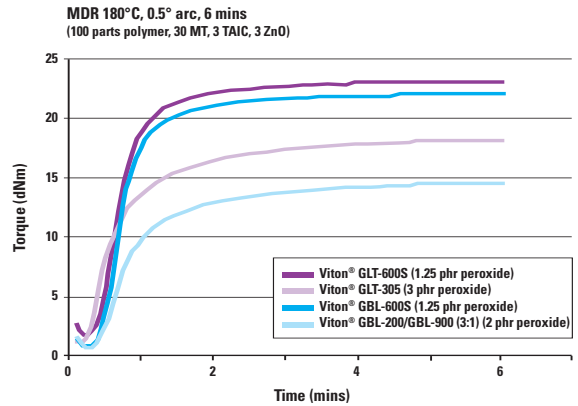
APA technology makes processing easy

The optimized polymer structure and strategically placed cure sites of Viton® made with APA technology allow DuPont Performance Elastomers to dramatically improve processing characteristics such as flow, cure and mold release without sacrificing end-use performance. Shorter cycle times, less waste and improved productivity are possible with APA polymers. APA polymers also provide fast output rates and low die-swell in extrusion processes, leading to high-quality extruded tubing, profiles or preform cord with excellent dimensional stability. Since good physical properties and low compression set can be achieved without post curing, new production opportunities such as overmolding onto plastic inserts or carriers can be realized.

Faster flow and rapid cure

Tests have shown that the flow of Viton® made with APA is improved by up to 30% compared to similar compounds based on earlier-generation polymers (Figure 1). Molders can adopt larger and more complex molds with smaller runner dimensions to boost production and reduce waste. Extruders can benefit

Figure 2 – APA polymers cure faster and to a higher state of cure with lower levels of curative



from higher output rates and the ability to extrude veneered hose that does not require post curing.

APA polymers cure quickly due to the proprietary cure-site monomer and its position along the polymer chain. The rate of cure can be tailored by adjusting the peroxide level or type to ensure optimal results in your process or application (Figure 2). APA polymers flow easily and then cure rapidly to form a high-quality structure with optimal physical properties and performance.

Exceptional performance in compression and injection molding

Compression molding tests have shown that sticking and fouling can be reduced to very low levels (Figure 3). Dramatic improvements are also demonstrated in injection molding where lower pressures and shorter injection times can also provide improved productivity (Figure 4).

Efficient mold release helps reduce cycle times, cleaning intervals and reject rates, providing significant productivity improvements.

Figure 3 – APA polymers de-mold easily in compression molding

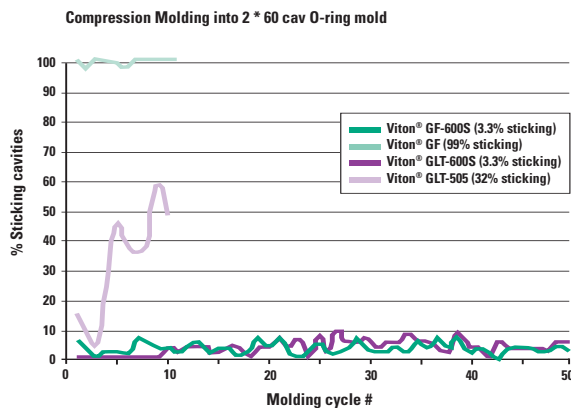
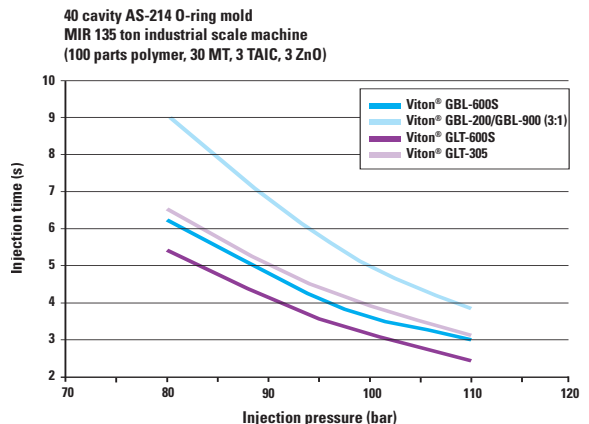


Figure 4 – APA polymers in injection molding fill and de-mold quickly and easily



Viton® made with APA for demanding requirements in automotive applications

Viton® made with APA in powertrain

Current trends in automotive powertrain applications are pushing elastomeric seal materials to their limit. Materials that were once state of the art are being asked to do more in an era of longer warranties, hotter engines and more aggressive lubricants that shorten the life of existing elastomers. In powertrain applications, oil resistance has always been the primary need, but today, aggressive lubricants, fuels and low-temperature requirements can significantly impact the choice of sealing materials.

The excellent base resistance of Viton® Extreme™ polymers makes them suitable for the most aggressive automotive and heavy-duty lubricants. For many engine oils and transmission fluids, Viton® GF-600S and GBL-600S will perform very well. Viton® GBL-600S is excellent for coolant sealing applications.

Viton® GFLT-600S provides an excellent solution to tough lubricant-sealing applications where additional low-temperature flexibility is required.

Viton® made with APA in automotive fuels

Fuel compositions are changing rapidly to meet tough emissions regulations. Many of the newer additives alter the swelling characteristics of elastomers in fuel and contribute to seal deterioration. APA polymers offer outstanding resistance to heat, swell, permeation and degradation when in contact with automotive fuels and additives. Polymers should be selected depending on the applications needs (Figure 6). For low-temperature sealing, Viton® GLT-600S is the suggested polymer. If low permeation is more important, then Viton® GF-600S is the suggested polymer.

Viton® GFLT-600S offers intermediate performance and is suitable for other fuel system applications.

Figure 5 – Powertrain applications require base, oil and coolant resistance. APA polymers can deliver extended life in these applications versus conventional fluoroelastomers (FKM)*

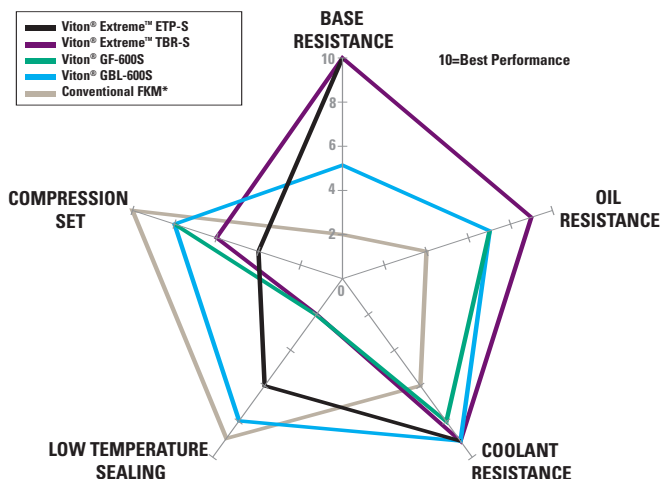
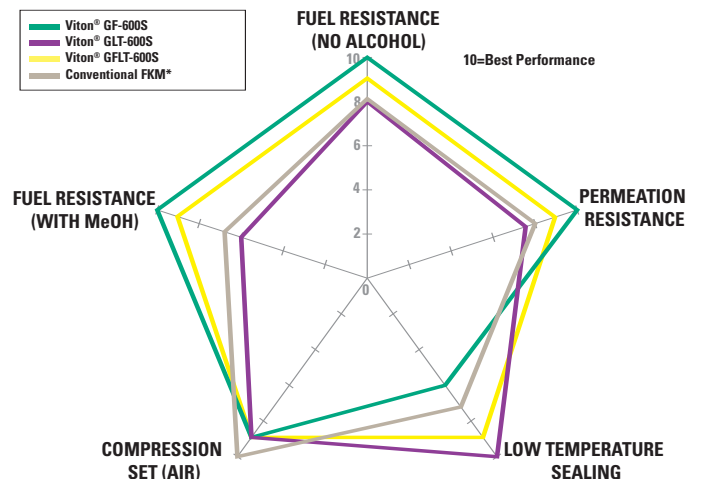


Figure 6 – Fuel and permeation resistance for APA polymers has improved versus conventional fluoroelastomers*



*Conventional FKM refers to bisphenol curable copolymers.

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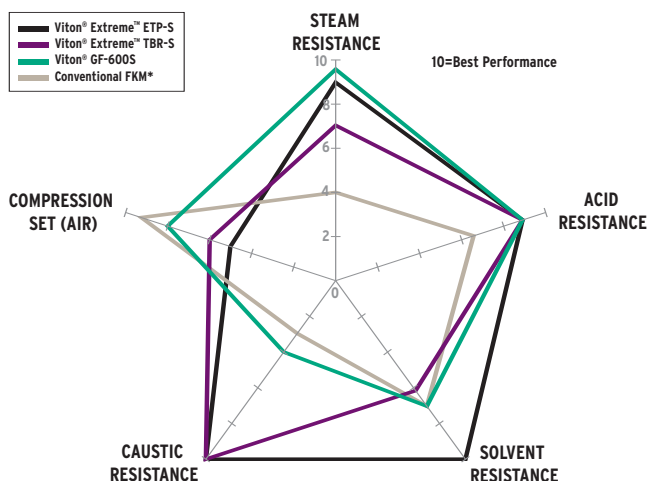
Viton® made with APA for long-term sealing performance in non-automotive applications

Viton® made with APA provides broad chemical resistance

Engineers and seal manufacturers specify Viton® for the most demanding applications. The combination of high-temperature performance, exceptional chemical resistance and dynamic characteristics has allowed critical seals to perform exceptionally well under aggressive conditions. But even the best products can have a weakness, and for fluoroelastomers it has been

long-term performance in strong bases. Specialty fluoroelastomers, such as Viton® Extreme™ ETP-S and TBR-S, can provide the resistance to bases that are frequently encountered in non-automotive environments, e.g., downhole drilling and intermediate chemical manufacturing. If base resistance is not required, other types of Viton® such as GF-600S can provide long-term sealing capabilities in aggressive environments (Figure 7).

Figure 7 – Industrial applications require broad resistance to aggressive chemicals. APA polymers deliver broader chemical resistance than conventional fluoroelastomers*



*Conventional FKM refers to bisphenol curable copolymers.

Viton® made with APA
sealing success
 in a multitude of applications

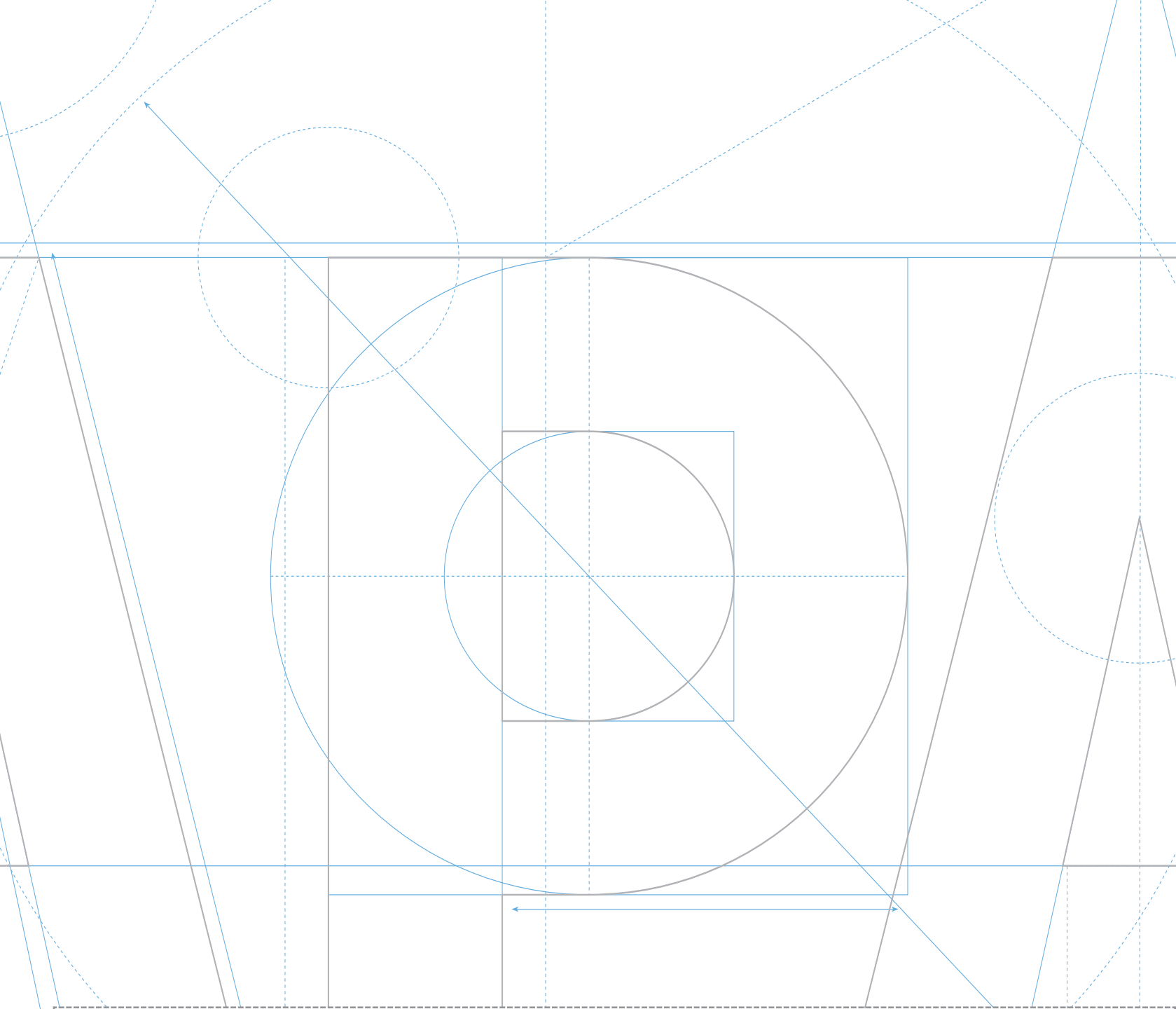
Viton® made with Advanced Polymer Architecture gives you advantages over other fluoroelastomers because its performance is backed by innovation, quality and experience. No other manufacturer offers as broad a selection of fluoroelastomer types to meet your specific application need. Viton® made with APA offers you superior performance in applications where you demand the best, whether it's in fuels,

aggressive chemicals or low temperature. To help you select the best type of Viton®, refer to our website for the latest application profiles. To ensure product integrity, make sure to ask for Genuine Viton® from our licensed manufacturers. Our network of licensees provide documentation that parts they supply are made from Viton®. Make sure to look for the Genuine Viton® mark.



To find out about the latest developments or application successes, contact your DuPont Performance Elastomers representative or refer to our website:

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- Application testing
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