

**DUPONT™ VAMAC® ETHYLENE ACRYLIC ELASTOMER  
THRIVE IN A HARSH WORLD**



# DuPont™ Vamac® Performs in Turbo Charger Hoses, Oil Cooler Hoses, Seals, and Gaskets



DuPont™ Vamac® ethylene acrylic elastomers can be made into cured compounds that have excellent resistance to high temperatures, and good resistance to automotive fluids such as transmission fluids, engine oils and acidic condensates.

## Low Temperature Performance

The low temperature performance of Vamac® surpasses that of most other heat- and oil-resistant polymers. Typical compounds meet OEM specifications for performance at -40 °C. Vamac® compounds can be designed to meet end use requirements as low as -50 °C.

## High-Temperature Durability

Parts made with Vamac® retain elasticity and remain functional after continuous air oven exposures. Conventional filled Vamac® compounds can meet heat requirements of six weeks at 165 °C, 18 months at 121 °C or five days at 204 °C. VMX5000 series pre-compounds provide superior high temperature performance (up to six weeks at 180 °C, and three weeks at 190 °C).

## Compressive Stress Relaxation

Vamac® compounds perform exceptionally well in seal and gasket applications and have good CSR performance in engine oils up to 5000 hours at 150 °C. VMX5000 series pre-compounds provide a step change for CSR (in hot air) sealing force retention of 15 to 20 °C higher temperature than conventional filled Vamac®.

## Resistance to Fluids

Products based on Vamac® have excellent resistance to hot oils and hydrocarbon- or glycol-based lubricants, transmission fluids, and power steering fluids. Low oil swell can be obtained with proper Vamac® grade selection and compounding.

Vamac® is not recommended for use in components immersed in gasoline or highly aromatic fluids, but can be used as gasket for air intake manifold and as cover material in fuel line applications to reduce costs.

Good resistance to Blow-By, Exhaust Gas Acid Condensates and Urea solutions used for SCR systems makes Vamac® the material of choice for many automotive applications. This property becomes more important as more exhaust gas is being recycled, exhaust gas treatment are applied to most combustions engines to reduce emissions.

## Excellent Vibration Damping

The high vibrational damping characteristic of Vamac® compounds remains nearly constant over broad ranges of temperature, frequency and amplitude.

## NHFR Compounds

Vamac® ethylene acrylic elastomers are not inherently resistant to burning. However, when properly compounded with non-halogenated flame retardants, a Vamac® compound will pass the demanding UL-94 V0 protocol. These NHFR compounds exhibit a combination of good oil resistance, good heat resistance, and good low temperature properties.

## Key Properties of Vamac®

- Temperature range: -40 °C to +175 °C (and up to +190 °C for VMX5000 series)
- Good resistance to automotive fluids
- Outstanding ozone/ weather resistance
- Very good performance in compressive set and compressive stress relaxation (CSR) rating
- Good flex fatigue resistance
- Vibration-damping consistency
- Non-halogen, and low-smoke emissions

Performance Property	Typical Range
100% Modulus <sup>1</sup> , MPa	2 to 10
Tensile Strength <sup>1</sup> , MPa	7 to >20
Elongation <sup>1</sup> , %	100 to 600
Hardness <sup>2</sup> , Durometer A	40 to 90
Tear Strength <sup>3</sup> , N/mm	15 to 45
Compression Set <sup>4</sup> , % (168h at 150 °C, 25% compressed)	15 to 30

<sup>1</sup> ASTM D412, <sup>2</sup> ASTM D2240, <sup>3</sup> ASTM D624 (Die C), <sup>4</sup> ASTM D395 (Method B)



# Select DuPont™ Vamac® for Engine Seals and Gaskets, Specialty Hoses, and Boots



## Grade Selection Criteria

### Basic Heat and Oil Swell Characteristics

Compounds based on the Vamac® G family (Vamac® G, GXF, Ultra IP and Ultra HT) and the Vamac® dipolymers (DP and Ultra DX) typically exhibit IRM903 oil swell of 40–60%. Appropriately compounded, Vamac® can withstand three weeks of continuous use at 175 °C, retaining 50% of initial elongation. Compounds based on the Vamac® G family are generally rated as EE or EF by ASTM D2000/ SAE J200.

### For Reduced Oil Swell

Compounds made of Vamac® GLS family (GLS, Ultra LS, Ultra HT-OR, VMX5394) exhibit about one half the IRM903 oil swell of its G counterpart. The improved oil swell of Vamac® GLS results in tradeoff of low temperature flexibility (7 °C Tg increase). Compounds made of Vamac® GLS family are rated as EG and EH by ASTM D2000.



### For Extrusion

Vamac® GXF was designed for the demanding requirements of turbocharger hose as it shows improved physical properties and dynamic fatigue resistance compared to Vamac® G. Compounds of Vamac® GXF demonstrate improved extrudability with lower head pressure, and less scorch, resulting in hose with smoother surface appearance.

Vamac® Ultra HT and Ultra HT-OR compounds have the best combination of processability, compression set, and dynamic properties for high temperature hoses. The Ultra HT-OR compounds have lower volume swell in fluids while the Ultra HT compounds have better low temperature properties.

Vamac® Ultra XF offers intermediate viscosity between Vamac® GXF and Ultra HT, allowing an excellent combination of good extrusion at moderate extruder head pressure of 70 Sh.A compounds and good green strength.

### For Molding

Compared to standard Vamac® G compounds, Vamac® Ultra IP and Ultra LS compounds can vastly improve productivity in the molding process through reduced mold fouling, scrap, improved hot tear resistance and cycle time. With higher viscosity, Vamac® Ultra IP provides superior compound dispersion with a one pass mix.



volatility plasticizer can be used to make compounds with a Tg of –50 °C, both before and after heat aging in air. These compounds can be used in automotive hoses and boots as well as dampers where functional performance is required throughout a thermal range as wide as –50 °C to 160 °C.

### Bright/ Colored Compounds

Vamac® Ultra & VMX5000 series allow fabrication of bright / colored molded parts with good mechanical properties and processing performance. DuPont can provide starting formulation/recipe.

### Curing Method

Most grades of Vamac® are curable with diamine, and require a post cure to obtain the best of its properties. Should a post cure step be impractical or undesirable, Vamac® DP or Vamac® Ultra DX peroxide-cured dipolymers can be used instead.

Vamac® invites opportunities to help you formulate compounds to meet specific processing needs.



# DuPont™ Vamac® Works for Torsional Dampers, Underhood Ducts, Low-Smoke Flooring, and O-Rings

## DuPont™ Vamac® Grades

Grade	ML (1+4) at 100 °C	Tg (by DSC) °C <sup>1</sup>	Key Feature
Vamac® G	16.5	-30	General purpose
Vamac® GXF	17.5	-30	Dynamic fatigue resistance
Vamac® GLS	18.5	-23	Low oil swell
Vamac® HVG	26	-30	High viscosity
Vamac® Ultra XF	23	-30	Intermediate viscosity
Vamac® Ultra IP	29	-30	Improved performance grade for molding & extrusion
Vamac® Ultra HT	29	-30	High temperature
Vamac® Ultra HT-OR	31	-24	High temperature / Oil resistance
Vamac® Ultra LS	33	-23	High viscosity / Low oil swell
Vamac® DP	22	-27	Peroxide curable dipolymer
Vamac® Ultra DX	28	-29	Improved processing peroxide curable dipolymer
VMX4017	11	-41	Low temperature

## DuPont™ Vamac® Pre-Compounds for High Heat Resistance

Grade	ML (1+4) at 100 °C	Tg (by DSC) °C <sup>1</sup>	Key Feature
VMX5015	67	-30	Compression molding pre-compound <sup>2</sup>
VMX5020	53	-30	Injection molding pre-compound <sup>2</sup>

<sup>1</sup> Tg of compounds with Vamac® may be extended typically -10 °C lower with addition of plasticizer.

<sup>2</sup> Not suitable for steam autoclave cure.

Visit us at [vamac.dupont.com](http://vamac.dupont.com)

Contact DuPont at the following regional locations:

**North America**  
+1-800-853-5515

**Latin America**  
+0800 17 17 15

**Europe, Middle East, Africa**  
+41 22 717 51 11

**Greater China**  
+86-400-8851-888

**Japan**  
+81-3-5521-8600

**ASEAN**  
+65 6586 3688

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