Celanese

CELANESE VAMAC® AEM ETHYLENE ACRYLIC ELASTOMER

THRIVE IN A HARSH WORLD

CELANESE VAMAC® AEM PERFORMS IN TURBO CHARGER HOSES, OIL COOLER HOSES, SEALS, AND GASKETS

Celanese Vamac® AEM 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.

KEY PROPERTIES OF VAMAC® AEM

- 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 perfo rmance in compressive set and compressive stress relaxation (CSR) rating
- Good flex fatigue resistance
- Vibration-damping consistency
- Non-halogen, and low-smoke emissions

LOW TEMPERATURE PERFORMANCE

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

RESISTANCE TO FLUIDS

End products based on Vamac® AEM 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® AEM grade selection and compounding.

Vamac® AEM is not recommended for use in components immersed in gasoline or highly aromatic fluids, but can be used as gasket for air intake manifolds and as cover materials 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® AEM the material of choice in many automotive applications. This property becomes more important as more exhaust gas is recycled and exhaust gas treatment applied to most combustions engines for reduced emission.

EXCELLENT VIBRATION DAMPING

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

NHFR COMPOUNDS

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

HIGH-TEMPERATURE DURABILITY

Parts made with Vamac® AEM retain elasticity and remain functional after continuous air oven exposures. Conventional filled Vamac® AEM 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® AEM compounds perform exceptionally well in seal and gasket applications and have good CSR performance in engine oils out 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® AEM.

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

[1] ASTM D412 [2] ASTM D2240 [3] ASTM D624 (Die C) [4] ASTM D395 (Method B)

SELECT CELANESE VAMAC® AEM FOR ENGINE SEALS AND GASKETS, SPECIALTY HOSES, AND BOOTS

GRADE SELECTION CRITERIA

BASIC HEAT AND OIL SWELL CHARACTERISTICS

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

FOR REDUCED OIL SWELL

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

FOR EXTRUSION

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

Vamac® AEM 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® AEM Ultra XF offers intermediate viscosity between Vamac® AEM 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

Vamac® AEM 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 compared with the standard Vamac® AEM G compounds. With higher viscosity, Vamac® AEM Ultra IP provides superior compound dispersion with a one pass mix.

FOR LOW TEMPERATURE PERFORMANCE

The combination of VMX4017 and a low 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® AEM Ultra & VMX5000 series allow fabrication of bright/ colored molded parts with good mechanical properties and processing performance. Celanese can provide starting formulation/ recipe.

CURING METHOD

Most grades of Vamac® AEM are curable with diamine, and require a post cure for the best properties. If a post cure step is impractical or undesirable, Vamac® AEM DP or Vamac® AEM Ultrra DX peroxide-cured dipolymers can be used.

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

CELANESE VAMAC® AEM WORKS FOR TORSIONAL DAMPERS, UNDERHOOD DUCTS, LOW-SMOKE FLOORING, AND O-RINGS

CELANESE VAMAC® AEM GRADES

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

CELANESE VAMAC® AEM PRE-COMPOUNDS FOR HIGH HEAT RESISTANCE

Grade	ML(1+4) at 100°C	Tg (by DSC)°C[1]	Key Feature
Vamac® AEM VMX5015	67	–30	Compression molding pre-compound[2]
Vamac® AEM VMX5020	53	–30	Injection molding pre-compound[2]

[1] Tg of compounds with Vamac® AEM may be extended typically –10°C lower with addition of plasticizer.
[2] Not suitable for steam autoclave cure.

celanese.com

Form No. 001-20203-SMC0819

Celanese