



Ethylene Propylene Diene Terpolymer for Sealings in Coolant

1 Scope

This specification covers the materials and performance of Ethylene Propylene Diene Monomer (EPDM) sealings in the cooling circuit. EPDM rubber is a terpolymer of Ethylene, Propylene and Diene monomers.

1.1 Material Description. Materials covered by this specification are divided into six (6) EPDM "Types":

Note: Continuous and Excursion temperature limits are as defined by the Vehicle Technical Specifications (VTS).

- **Type A:** EPDM for sealing radiator, sulfur cured; -35 °C to +125 °C continuous, +150 °C excursion.
- **Type B:** EPDM for sealing radiator, peroxide cured; -35 °C to +150 °C continuous, +175 °C excursion.
- **Type C:** EPDM for sealing in engine applications, peroxide cured, better compression set; -35 °C to +150 °C continuous, +175 °C excursion.
- **Type D:** EPDM O-rings in water circuit, sulfur cured; -35 °C to +125 °C continuous, +150 °C excursion.
- **Type E:** EPDM for gasket, peroxide cured, with a functional temperature range of -35 °C to +135 °C. The limits are defined by ASTM D1329 TR₁₀ and the continuous upper limit by SAE J2236.
- **Type F:** EPDM for gasket, peroxide cured, with a functional temperature range of -35 °C to +150 °C. The limits are defined by ASTM D1329 TR₁₀ and the continuous upper limit by SAE J2236.

1.2 Symbols. Not applicable.

1.3 Applicability. Not applicable.

1.4 Remarks. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D297	ASTM D1415	ISO 48	ISO 2921
ASTM D412	ASTM D1505	ISO 188	ISO 7619-1
ASTM D624	ASTM D2240	ISO 815	ISO 23529
ASTM D1329	ISO 34-1	ISO 1817	SAE J2236
ASTM D1414	ISO 37	ISO 2781	

2.2 GM Standards/Specifications.

GMW3059	GMW16955	GMW17113
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2.3 Additional References.

TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

Vehicle Technical Specifications (VTS).

3 Requirements

3.1 Resources.

3.1.1 Test Samples. Unless otherwise specified, the shape, size and number of test pieces shall be in accordance with the relevant Test Methods.

Unless otherwise specified, samples are finished parts or to be taken from finished parts. Where the dimensions of the finished parts do not allow preparing of test pieces, tests are to be performed on sheet material of the same production batch. Tests must be carried out to confirm same state of cure between sheet material and finished parts. If not otherwise stated, mechanical properties in delivery state and after heat or fluid immersion are to be tested at $23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$, and with the same test methods.

3.1.2 Conditioning. Conditioning shall be as specified in the relevant Test Methods.

3.1.3 Equipment. Conforming to the relevant Test Methods.

3.1.4 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.5 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to its physical definition.

3.1.6 Facilities. Conforming to the relevant Test Methods.

3.1.7 Deviations. Deviations from the requirements of this specification shall have been agreed upon. Such deviations shall be specified on component drawings, test certificates, reports, etc.

3.2 Material and Performance Requirements. Material and performance requirements are summarized in Table 1 and Table 2. Table 1 uses International Rubber Hardness Degrees (IRHD) as a unit of measure.

3.2.1 Design Validation Testing. Material properties (material approval) are summarized in Table 1. For full approval of a compound, compliance to the requirements of Table 1 is needed.

3.2.2 Production Validation Testing. If not defined otherwise, the following testing should be done for production audit testing: All tests to Table 2.

3.2.3 Product Validation Testing and Audit/Inspection Testing. If not defined otherwise, the following testing should be done for production and audit testing: Tests to Table 2, except age resistance.

Table 1: Material Properties

Property	Test Method	Unit	Value
Hardness			
Type A, B, C, E, F	ISO 48 Method M	IRHD	As specified on drawing
Type D	ISO 48 Method M (measured on cross section)	IRHD	As specified on drawing
Hardness			
All Types	ASTM D2240 or ISO 7619-1	Shore A	To be reported
Density			
All Types	ASTM D297, ASTM D1505 or ISO 2781	g/cm ³	Must conform to released compound
Elongation at Break			
Type A and B	ASTM D412, Die C or ISO 37, Type 4 dumbbell, 200 mm/minute $\pm$ 20 mm/minute	%	300 minimum
Type C	ASTM D412, Die C or ISO 37, Type 4 dumbbell, 200 mm/minute $\pm$ 20 mm/minute	%	150 minimum
Type D	ASTM D1414 or ISO 37, on complete O-ring 500 mm/minute $\pm$ 50 mm/minute	%	150 minimum
Type E	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute $\pm$ 20 mm/minute	%	240 minimum
Type F	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute $\pm$ 20 mm/minute	%	220 minimum

Property	Test Method	Unit	Value
Stress at 100% Elongation			
Type A, B, C,	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute $\pm$ 20 mm/minute	MPa	To be reported
Type E	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute $\pm$ 20 mm/minute	MPa	4.5 minimum
Type F	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute $\pm$ 20 mm/minute	MPa	2.5 minimum
Tensile Strength			
Type A, B, C, E and F	ASTM D412, Die C or ISO 37, Type 4 dumbbell, 200 mm/minute $\pm$ 20 mm/minute	MPa	10 minimum
Type D	ASTM D412, Die C or ISO 37, on complete O-ring 500 mm/minute $\pm$ 50 mm/minute	MPa	8 minimum
Tear Strength			
Type A, B and C	ASTM D624, Die C, specimens are un-nicked or ISO 34-1 Method A (trouser test piece)	N/mm	16 minimum 2.5 minimum
Type E	ASTM D624, Die C, specimens are un-nicked or ISO 34-1, Method A	kN/m N/mm	16 minimum 2.5 minimum
Type F	ASTM D624, Die C, specimens are un-nicked or ISO 34-1, Method A	kN/m N/mm	20 minimum 3 minimum
Age Resistance (Heat Aging)			
Type A and D	ISO 188 Method B, 168 h - 2 h at +125 °C $\pm$ 3 °C Change in Hardness Change in Elongation at Break Change in Tensile Strength Tear Strength	IRHD % % N/mm	+10 maximum -30 maximum -20 maximum 2 minimum
Type E	ISO 188 Method B, 168 h - 2 h at +135 °C $\pm$ 3 °C Change in Hardness Change in Elongation at Break Change in Tensile Strength Tear Strength	IRHD % % N/mm	+12 maximum -40 maximum -20 maximum 3 minimum
Type B, C and F	ISO 188 Method B, 168 h - 2 h at +150 °C $\pm$ 3 °C Change in Hardness Change in Elongation at Break Change in Tensile Strength Tear Strength	IRHD % % N/mm	+12 maximum -40 maximum -20 maximum 1.5 minimum
Long Term Age Resistance			
Type A and D	SAE J2236, 1008 h at +125 °C Change in Elongation at break Change in Tensile strength	% %	-50 maximum -50 maximum
Type E	SAE J2236, 1008 h at +135 °C Change in Elongation at break Change in Tensile strength	% %	-50 maximum -50 maximum
Type B, C and F	SAE J2236, 1008 h at +150 °C Change in Elongation at break Change in Tensile strength	% %	-50 maximum -50 maximum