



Rubber Engine Cover Fastener Grommets

1 Scope

1.1 Material Description. This specification covers the requirements of rubber compounds used for underhood fastener isolator grommets, classified to two (2) different temperature categories; Class A and Class B. Types are hardness ranges defined in Tables 2 and 4. Test requirements for approved compounds are intended to permit usage in the described temperature and engine fluid exposure environments.

- **Class A:** Silicone Rubber (>VMQ<); -40 °C to +175 °C continuous
- **Class B:** Polyacrylate (>ACM<) or Ethylene Acrylate (>AEM<); -35 °C to +150 °C continuous

1.2 Symbols. The material shall be identified according to ASTM D1418 or ISO 1629 as indicated in Table 1.

Table 1: Material Types Defined

Material	Symbol	Temperature Class (continuous)	Type
Silicone Rubber	>VMQ<	A (+175 °C)	1, 2, 3
Polyacrylate or Ethylene Acrylate	>ACM< >AEM<	B (+150 °C)	1 >ACM< 2 >AEM<

1.3 Applicability. Typical applications include cam, rocker, front and rear cover, M6 or M8 fastener grommets for vibration isolation.

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 D1505	ISO 48	ISO 2781
ASTM D412	ASTM D2240	ISO 188	ISO 2921
ASTM D471	ASTM D3182	ISO 815	ISO 4650
ASTM D624	ASTM D3677	ISO 815-1	ISO 7111
ASTM D1329	ASTM E1311	ISO 1101	ISO 7619-1
ASTM D1415	ISO 34-1	ISO 1629	SAE J2236
ASTM D1418	ISO 37	ISO 1817	

2.2 GM Standards/Specifications.

GMW3059	GMW16955
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2.3 Additional References. None.

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. Minimum three test samples are required for inspection testing. Report both individual and averaged values.

Specimens used to develop table properties for the respective compound are die-cut specimens of sheet stock prepared to ASTM D3182, molded to the same conditions as for actual products, with post cure if applicable. Precondition slabs at 50% Relative Humidity (RH) and 23 °C for at least 16 h before testing. As an option, specimens from non-post cure compounds may be used from production molds. Report cure time and temperature condition for all molded specimens. For final product testing, samples are finished parts or to be taken from finished parts.

If not otherwise stated, mechanical properties in delivery state and after heat or fluid immersion are to be tested at 23 °C ± 3 °C, and with the same test methods.

3.1.1.1 Minimum Part Dimensions. Tensile and elongation test pieces taken from elastomeric components shall be 4.4 mm wide, 6 mm to 20 mm long, and 1.5 mm thick. Laminated test pieces are not permitted. The minimum area for micro-hardness measurement must be 4.4 mm × 4.4 mm. The test tool indenter width is 0.4 mm. Only a single measurement can be made from one (1) area. Alternatively, the test pieces can be embedded in plastic resin. For more information, see Appendix A.

3.1.1.2 Specimens from sheets test area are 20 mm × 40 mm and a thickness of 2 mm ± 0.5 mm. The upper and lower surface flatness tolerance is 0.1 mm to ISO 1101 and parallelism tolerance 0.2 mm to a diameter of 150 mm (measured on a slab of sheet stock prepared to ASTM D3182, before cutting).

3.1.1.3 Micro-hardness (Cross Section). When part surface measurement is not practical or desired, the cross section of the part is measured when supported in captive resin. Part micro-hardness measurements are made per ASTM D1415, Type M or ISO 48, Method M. Measurements shall follow the Appendix A, Section A1 conditions.

3.1.1.4 Print Designations for Micro-hardness Method. The part print shall indicate which hardness method using the word surface in parenthesis or cross section in parenthesis after the numerical range. Slab measurements require no designation after the numerical range.

3.1.1.5 Compression Set Part Dimensions. The specimen shall be one continuous piece provided the upper and lower surfaces are flat and parallel to each other to the specified print release drawing. Specimen thickness shall be 6 mm minimum.

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

3.1.2.1 Environmental Conditions. The minimum time between vulcanization and testing of elastomers shall be 72 h. The test pieces shall be maintained at a temperature of 23 °C ± 3 °C for at least 8 h prior to test and shall be free from strain during this period.

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 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 requirements (for compound properties (black)) are summarized in Tables 2 and 4. Properties on the finished parts are defined in Tables 3 and 5. Tables for finished parts use International Rubber Hardness Degrees (IRHD) as a unit of measure.

3.2.1 Design Validation Testing. Materials are summarized in Tables 2 thru 5. For full approval of a compound, compliance to the requirements of respective Tables is needed.

3.2.2 Product Validation Testing and Audit/Inspection Testing. If not defined otherwise, the following testing should be done for production and audit testing: All tests defined in the respective Tables 3 and 5.

The following information is also required for full specification approval:

- Infrared Spectroscopy, ISO 4650 or ASTM D3677
- Thermogravimetric Analysis, ISO 7111 or ASTM E1311
- Density, ASTM D297 or ASTM D1505

3.2.2 Minimum Data Requirements. Tables 2 and 4 approvals are based on a three (3) production lot minimum per compound. The minimum number of specimens per lot is specified in each property test procedure. Table 3 and Table 5 for parts is based on a single production lot of parts a minimum of five (5) specimens per test. Compound approvals are based on Tables 2 and 4 data requirements.

Table 2: Compound Properties (Black) for Temperature Class A (>VMQ<)

Property	Test Procedure	Unit	Value
Hardness			
Class A, Type 1	ASTM D2240 or ISO 7619-1	Shore A	60 ± 5
Class A, Type 1	ISO 48, Method M	IRHD	To be reported
Class A, Type 2	ASTM D2240 or ISO 7619-1	Shore A	70 ± 5
Class A, Type 2	ISO 48, Method M	IRHD	To be reported
Class A, Type 3	ASTM D2240 or ISO 7619-1	Shore A	80 ± 5
Class A, Type 3	ISO 48, Method M	IRHD	To be reported
Density			
Class A, All Types	ASTM D297, ASTM D1505 or ISO 2781	g/cm ³	To be reported
Tensile Strength			
Class A, Type 1	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute	MPa	5.0 minimum
Class A, Type 2 and 3	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute	MPa	6.0 minimum
Elongation at Break			
Class A, Type 1 and 2	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute	%	200 minimum
Class A, Type 3	ASTM D412, Die C or ISO 37, Type 2 dumbbell, 200 mm/minute	%	150 minimum
Tear Strength			
Class A, Type 1 and 2	ISO 34-1, Method A ASTM D624, Dye C or ISO 34-1, Method B, Angle Die 500 mm/minute	N/mm	3 minimum
		kN/m	13.0 minimum
Class A, Type 3	ISO 34-1, Method A ASTM D624, Dye C or ISO 34-1, Method B, Angle Die 500 mm/minute	N/mm	2 minimum
		kN/m	10.0 minimum