SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS3334E

Issued 1955-03
Reaffirmed 2001-04
Revised 2009-05

Superseding AMS3334D

Silicone Rubber
Extreme Low-Temperature Resistant
35 - 45

RATIONALE

AMS3334E results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a silicone rubber in the form of sheet, strip, tubing, extrusions, and molded shapes.

1.2 Application

Primarily for rubber-like parts required to operate or seal from -112 to +248 °F (-80 to +120 °C), compounded especially for operation at extreme low temperatures. Silicone rubber is resistant to deterioration by weathering and by high-aniline-point petroleum-base oils and remains flexible over the temperature range noted. These products are not normally suitable for use in contact with low-aniline-point petroleum-base fluids, including fuels, due to excessive swelling.

1.3 Safety Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS

2.1 The purchase order date shall stipulate the published document that shall be in effect. The supplier may work to a subsequent revision unless a particular revision is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published revision shall apply

2.2 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2279 Tolerances, Rubber Products
AMS2810 Identification and Packaging, Elastomeric Products

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS3334E

2.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 297 Rubber Products Chemical Analysis
ASTM D 395 Rubber Property Compression Set
ASTM D 412 Rubber Properties in Tension
ASTM D 471 Rubber Property Effect of Liquids
ASTM D 518 Rubber Deterioration Surface Cracking
ASTM D 573 Rubber Deterioration in an Air Oven
ASTM D 624 Rubber Property Tear Resistance
ASTM D 797 Rubber Property Young's Modulus at Normal and Subnormal Temperatures
ASTM D 1149 Rubber Deterioration Surface Ozone Cracking in a Chamber (Flat Specimens)
ASTM D 2137 Rubber Property Brittleness Point of Flexible Polymers and Coated Fabrics
ASTM D 2240 Rubber Property Durometer Hardness

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be a compound, based on a silicone rubber, suitably cured to produce a product meeting the requirements of 3.2.

3.2 Properties

The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable:

TABLE 1 – TEST REQUIREMENTS

Paragraph	Test	Requirement	Test Method
3.2.1	Original Properties		
3.2.1.1	Hardness, Durometer "A" or equivalent	40 ± 5	ASTM D 2240
3.2.1.2	Tensile Strength, minimum	500 psi (3.45 MPa)	ASTM D 412, Die B or C
3.2.1.3	Elongation, minimum	250%	ASTM D 412, Die B or C
3.2.1.4	Tear Resistance, minimum	50 pounds force per inch (8.75 kN/m)	ASTM D 624, Die B
3.2.1.5	Specific Gravity	Preproduction Value ±0.03	ASTM D 297
3.2.2	Petroleum Lubricating Oil Resistance (Immediate Deteriorated Properties)		ASTM D 471 Medium: ASTM Oil No. 1 Temperature: 212 °F ± 2 (100 °C ± 1)
3.2.2.1	Hardness Change, Durometer "A" or equivalent	-10 to +5	Time: 70 hours ± 0.5
3.2.2.2	Tensile Strength Change, maximum	-30%	
3.2.2.3	Elongation Change, maximum	-15%	
3.2.2.4	Volume Change	0 to 15%	
3.2.2.5	Decomposition	None	
3.2.2.6	Surface Tackiness	None	
3.2.3	Dry Heat Resistance		ASTM D 573 Temperature: 212 °F ± 2 (100 °C ± 1)
3.2.3.1	Hardness Change, Durometer "A" or equivalent	0 to +5	Time: 22 hours ± 0.5

TABLE 1 – TEST REQUIREMENTS (CONTINUED)

Paragraph	Test	Requirement	Test Method
3.2.3.2	Tensile Strength Change, maximum	-10%	
3.2.3.3	Elongation Change, maximum	-15%	
3.2.3.4	Bend (flat)	No cracking or checking	
3.2.4	Compression Set		ASTM D 395, Method B
			Temperature: 212 °F ± 2 (100 °C ± 1)
3.2.4.1	Percent of Original Deflection, maximum	30	Time: 22 hours ± 0.5
3.2.5	Low-Temperature Resistance		
3.2.4.2	Brittleness	Pass	ASTM D 2137, Method A
			Temperature: -112 °F ± 5 (-80 °C ± 3)

3.2.5 Weathering

The product shall show no evidence of cracking when tested in accordance with ASTM D 1149, Method B, Procedure B2 for seven days at 105 °F ± 2 (40 °C ± 1). The ozone pressure shall be 50±5 MPa.

3.3 Dimensions and Tolerances

Dimensions and tolerances shall be as specified in the parts standard, drawing or purchase document. If not specified, shall conform to all applicable requirements of AMS2279 .

3.4 Toxicological Formulations

The material shall have no adverse effects on the health of personnel when used for its intended purpose in accordance with manufacturer's instructions and with appropriate handling procedures.

3.5 Quality

The product, as received by purchaser, shall be uniform in quality and condition, smooth, as free from foreign material as commercially practicable, and free from imperfections detrimental to usage of the product.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements .

4.2 Classification of Tests

4.2.1 Acceptance Tests

Tests for requirements shown in Table 2 are acceptance tests and shall be performed on each lot:

TABLE 2 –ACCEPTANCE TESTS

Requirement	Paragraph Reference
Hardness, as received	3.2.1.1
Tensile Strength, as received	3.2.1.2
Elongation, as received	3.2.1.3
Specific Gravity	3.2.1.5
Compression Set	3.2.4
Brittleness	3.2.5.1

4.2.1.1 Lot: A quantity of one size of product processed as one production entity from a batch

4.2.1.2 Batch: The quantity of compound run through a mill or mixer at one time.

4.2.1.3 Random Sampling

The method shall be as specified in the parts standard, drawing or purchase document. If not specified, product shall be taken at random from each lot to perform all the required acceptance tests. The number of test iterations for each requirement shall be specified in the applicable test procedure.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 For Acceptance Tests

Sufficient product shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 If test specimens cannot be prepared form the product, ASTM specimens prepared from the same batch and state of cure shall be used. When the product supplied is an extrusion of such shape that suitable test specimens cannot be cut from the product, a separate flat strip test sample from the same production lot shall be supplied upon request. This strip shall be prepared from tubing 1.000 inch ± 0.063 (25.40 mm ± 1.60) in OD by 0.075 inch ± 0.008 (1.90 mm ± 0.20) in wall thickness, mechanically slit and flattened into a strip while being extruded, and cured in the same manner as production material. When the product is a molded shape from which test specimens cannot be cut, a slab 6 x 6 inches (152 x 152 mm) by 0.075 inch ± 0.008 (1.90 mm ± 0.20) molded from the same batch of compound shall be supplied upon request.

4.3.1.2 When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6.1 shall state that such plan was used.

4.3.2 For Preproduction Tests

As agreed upon by purchaser and vendor.

4.4 Approval

4.4.1 Sample product shall be approved by purchaser before product for production use is supplied, unless such approval be waived by purchaser. Results of tests on production product shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the approved sample product. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample product. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval.