

AEROSPACE MATERIAL SPECIFICATION

SAE AMS3331

REV. B

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Superseding AMS3331A

Fluorosilicone (FVMQ) Rubber
Fuel and Oil Resistant
65 - 75

RATIONALE

AMS3331B is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a fluorosilicone (FVMQ) rubber in the form of sheet, strip, tubing, extrusions, and molded shapes.

1.2 Application

These products have been used typically for parts requiring resistance to jet fuel and lubricating oils, but usage is not limited to such applications. Generally, products are usable over a temperature range of -76 to +302 °F (-60 to +150 °C). Each application, however, has to be considered individually.

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

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

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2.1 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
AMS3021	Fluid, Reference, for Testing Di-Ester (Polyol) Resistant Materials

2.2 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	Standard Test Methods for Rubber Products Chemical Analysis
ASTM D 395	Standard Test Methods for Rubber Property Compression Set
ASTM D 412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D 471	Standard Test Methods for Rubber Property Effect of Liquids
ASTM D 573	Standard Test Methods for Rubber Deterioration in an Air Oven
ASTM D 624	Rubber Property Tear Resistance
ASTM D 1329	Rubber Property Retraction at Low Temperatures (TR Test)
ASTM D 1415	Standard Test Methods for Rubber Property - International Hardness
ASTM D 2240	Standard Test Methods for Rubber Property Durometer Hardness

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be a compound, based on a fluorosilicone (FVMQ) elastomer, suitably cured to produce a product meeting the requirements of 3.2.

3.1.1 Color

Shall be blue.

3.2 Properties

The product shall conform to requirements shown in Table 1; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable.

TABLE 1 - PROPERTIES

Paragraph	Property	Requirement	Test Method
3.2.1	Hardness, Durometer "A" or equivalent	70 ± 5	ASTM D 2240 or ASTM D 1415
3.2.2	Tensile Strength, minimum	1150 psi (7.93 MPa)	ASTM D 412, Die B or C
3.2.3	Elongation, minimum	150%	ASTM D 412, Die B or C
3.2.4	Tear Resistance, minimum	75 pounds force per inch (13.1 kN/m)	ASTM D 624, Die C
3.2.5	Specific Gravity	Preproduction Value ±0.03	ASTM D 297
3.2.6	Di-Ester Oil Resistance (Immediate Deteriorated Properties)		ASTM D 471 AMS3021 Temperature: 302 °F ± 5 (150 °C ± 3) Time: 70 hours ± 0.5
3.2.6.1	Hardness Change, Durometer "A" or equivalent	-15 to +15	
3.2.6.2	Tensile Strength Change, maximum	-40%	
3.2.6.3	Elongation Change, maximum	-25%	
3.2.6.4	Volume Change	+1 to +15%	
3.2.7	Aromatic Fuel Resistance (Immediate Deteriorated Properties)		ASTM D 471 ASTM Ref. Fuel B Temperature: 68 to 86 °F (20 to 30 °C) Time: 22 hours ± 0.5
3.2.7.1	Hardness Change, Durometer "A" or equivalent, maximum	-20	
3.2.7.2	Tensile Strength Change, maximum	-45%	
3.2.7.3	Elongation Change, maximum	-35%	
3.2.7.4	Volume Change	+1 to +25%	
3.2.8	Dry Heat Resistance		ASTM D 573 Temperature: 392 °F ± 5 (200 °C ± 3) Time: 70 hours ± 0.5
3.2.8.1	Hardness Change, Durometer "A" or equivalent	-5 to +10	
3.2.8.2	Tensile Strength Change, maximum	-20%	
3.2.8.3	Elongation Change, maximum	-25%	
3.2.9	Compression Set		ASTM D 395, Method B Temperature: 347 °F ± 5 (175 °C ± 3) Time: 22 hours ± 0.5
3.2.9.1	Percent of Original Deflection, maximum	25	
3.2.10	Low-Temperature Resistance		ASTM D 1329, Method A
3.2.10.1	Temperature Retraction, TR ₁₀ point, maximum	-71 °F (-57 °C)	

3.2.11 Corrosion

The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure agreed upon by purchaser and supplier. Discoloration of metal shall not be considered objectionable.

3.3 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.

3.4 Tolerances

Shall conform to all applicable requirements of AMS2279.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of the product shall supply all samples for required 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
Hardness	3.2.1
Tensile Strength	3.2.2
Elongation	3.2.3
Volume Change in Fuel	3.2.7.4
Compression Set	3.2.9
Quality	3.3

4.2.2 Preproduction Tests

All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of the product by the manufacturer, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 Manufacturer 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. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer 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.

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 specimens cannot be prepared from the product, ASTM test specimens prepared from the same batch and state of cure shall be used for required tests. 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 \pm 0.063 (25.40 mm \pm 1.60) in OD by 0.075 inch \pm 0.008 (1.90 mm \pm 0.20) in wall thickness, mechanically slit and flattened into a strip while being extruded, and cured in the same manner as production product. When the product is a molded shape from which test specimens cannot be cut, a slab 6 inches (152 mm) square by 0.075 inch \pm 0.008 (1.90 mm \pm 0.20) thick, molded from the same batch of compound, shall be supplied upon request.

4.3.1.2 A lot shall be all product from the same batch of compound produced in one continuous run and presented for manufacturer's inspection at one time.

4.3.1.3 A batch shall be the quantity of compound run through a mill or mixer at one time.

4.3.1.4 Final Inspection Sampling Plan

A statistical sampling plan acceptable to the purchaser may be used in lieu of sampling as in 4.3.1. Sample size for visual and dimensional requirements shall be as shown in Table 3, sample unit shall be one molded part and acceptance based on zero defects.

TABLE 3 - VISUAL AND DIMENSIONAL INSPECTION

Lot Size	Sample Size
2 to 8	Entire Lot
9 to 90	8
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1200	27
1201 to 3200	35
3201 to 10 000	38
10 001 to 35 000	46
35 001 to 150 000	56
150 001 and Over	65