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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3331A

Issued JUL 1984
Revised JUL 1994
Reaffirmed FEB 2001

Superseding AMS 3331

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

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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 -60 to +150 °C (-76 to +302 °F). 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 following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

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2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2279	Tolerances, Rubber Products
MAM 2279	Tolerances, Metric, Rubber Products
AMS 2810	Identification and Packaging, Elastomeric Products
AMS 3021	Fluid, Reference, for Testing Di-Ester (Polyol) Resistant Materials

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

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 573	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	Rubber Property - International Hardness
ASTM D 2240	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 and 3.2.11; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable.

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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 AMS 3021 150 °C ± 3 (302 °F ± 5)
3.2.6.1	Hardness Change, Durometer "A" or equivalent	-15 to +15	70 hours ± 0.5
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 20 to 30 °C (68 to 86 °F) 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 573 200 °C ± 3 (392 °F ± 5) 70 hours ± 0.5
3.2.8.1	Hardness Change, Durometer "A" or equivalent	-5 to +10	

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TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.8.2	Tensile Strength Change, maximum	-20%	
3.2.8.3	Elongation Change, maximum	-25%	
3.2.9	Compression Set:		ASTM 395, Method B 175 °C ± 3
3.2.9.1	Percent of Original Deflection, maximum	25	(347 °F ± 5) 22 hours ± 0.5
3.2.10	Low-Temperature Resistance:		ASTM D 1329, Method A
3.2.10.1	Temperature Retraction, TR_{10} point, maximum	-57 °C (-71 °F)	

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 AMS 2279 or MAM 2279.

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 performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

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.

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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
Tolerances	3.4

4.2.2 Preproduction Tests: Tests for 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 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

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 ± 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 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 ± 0.008 (1.90 mm ± 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.

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