

# AEROSPACE MATERIAL SPECIFICATION



AMS 3330A

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Superseding AMS 3330

## Fluorosilicone (FVMQ) Rubber Fuel and Oil Resistant 45 - 55

### 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 Material |

## 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.

TABLE 1 - Properties

|  | Paragraph | Property                                                            | Requirement                               | Test Method                                                                      |
|--|-----------|---------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------|
|  | 3.2.1     | Hardness, Durometer<br>"A" or equivalent                            | 50 ± 5                                    | ASTM D 2240 or<br>ASTM D 1415                                                    |
|  | 3.2.2     | Tensile Strength, minimum                                           | 900 psi<br>(6.21 MPa)                     | ASTM D 412, Die B or C                                                           |
|  | 3.2.3     | Elongation, minimum                                                 | 200%                                      | ASTM D 412, Die B or C                                                           |
|  | 3.2.4     | Tear Resistance, minimum                                            | 40 pounds force<br>per inch<br>(7.0 kN/m) | ASTM D 624, Die C                                                                |
|  | 3.2.5     | Specific Gravity                                                    | Preproduction<br>Value ±0.03              | ASTM D 297                                                                       |
|  | 3.2.6     | Di-Ester Oil Resistance:<br>(Immediate Deteriorated<br>Properties)  |                                           | ASTM D 471<br>AMS 3021<br>150 °C ± 3<br>(302 °F ± 5)<br>70 hours ± 0.5           |
|  | 3.2.6.1   | Hardness Change, Durometer<br>"A" or equivalent                     | -15 to +15                                |                                                                                  |
|  | 3.2.6.2   | Tensile Strength Change,<br>maximum                                 | -45%                                      |                                                                                  |
|  | 3.2.6.3   | Elongation Change, maximum                                          | -30%                                      |                                                                                  |
|  | 3.2.6.4   | Volume Change                                                       | +1 to +15%                                |                                                                                  |
|  | 3.2.7     | Aromatic Fuel Resistance:<br>(Immediate Deteriorated<br>Properties) |                                           | ASTM D 471<br>ASTM Ref. Fuel B<br>20 to 30 °C<br>(68 to 86 °F)<br>22 hours ± 0.5 |
|  | 3.2.7.1   | Hardness Change, Durometer<br>"A" or equivalent, maximum            | -15                                       |                                                                                  |
|  | 3.2.7.2   | Tensile Strength Change,<br>maximum                                 | -55%                                      |                                                                                  |
|  | 3.2.7.3   | Elongation Change, maximum                                          | -50%                                      |                                                                                  |
|  | 3.2.7.4   | Volume Change                                                       | +1 to +25%                                |                                                                                  |
|  | 3.2.8     | Dry Heat Resistance:                                                |                                           | ASTM D 573<br>200 °C ± 3<br>(392 °F ± 5)<br>70 hours ± 0.5                       |
|  | 3.2.8.1   | Hardness Change, Durometer<br>"A" or equivalent                     | -5 to +10                                 |                                                                                  |

TABLE 1 - Properties (Continued)

| Paragraph | Property                                                | Requirement        | Test Method                                      |
|-----------|---------------------------------------------------------|--------------------|--------------------------------------------------|
| 3.2.8.2   | Tensile Strength Change, maximum                        | -30%               |                                                  |
| 3.2.8.3   | Elongation Change, maximum                              | -25%               |                                                  |
| 3.2.9     | Compression Set:                                        |                    | ASTM 395, Method B<br>175 °C ± 3<br>(347 °F ± 5) |
|           | Percent of Original Deflection, maximum                 | 35                 | 22 hours ± 0.5                                   |
| 3.2.10    | Low-Temperature Resistance:                             |                    | ASTM D 1329, Method A                            |
| 3.2.10.1  | Temperature Retraction, TR <sub>10</sub> point, maximum | -57 °C<br>(-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.

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 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  $\pm$  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.