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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 3216A

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Superseding AMS 3216

FLUOROCARBON (FKM) RUBBER
Fuel and Oil Resistant
70 - 80

1. SCOPE:

1.1 Form: This specification covers a fluorocarbon (FKM) rubber in the form of sheet, strip, tubing, extrusions, and molded shapes.

1.2 Application: Primarily for rubber-like parts requiring continuous operation in aromatic fuels and synthetic lubricants from -40° to +260°C (-40° to +500°F).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2279 - Tolerances, Rubber Products
MAM 2279 - Tolerances, Metric, Rubber Products
AMS 2350 - Standards and Test Methods
AMS 2810 - Identification and Packaging, Elastomeric Products
AMS 3021 - Reference Fluid for Testing Di-Ester (Polyol) Resistant Materials

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D297 - Rubber Products - Chemical Analysis
ASTM D395 - Rubber Property - Compression Set
ASTM D412 - Rubber Properties in Tension
ASTM D471 - Rubber Property - Effect of Liquids

2.2 (Continued):

ASTM D573 - Rubber - Deterioriation in an Air Oven
ASTM D624 - Rubber Property - Tear Resistance
ASTM D1329 - Rubber Property - Retraction at Low Temperatures (TR Test)
ASTM D2240 - Rubber Property - Durometer Hardness

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on a fluorocarbon (FKM) elastomer, 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:

3.2.1 As Received:

3.2.1.1	Hardness, Durometer "A" or equiv.	75 ± 5	ASTM D2240
3.2.1.2	Tensile Strength, min	1400 psi (9.65 MPa)	ASTM D412, Die B or C
3.2.1.3	Elongation, min		ASTM D412, Die B or C
3.2.1.3.1	Molded Shapes	200%	
3.2.1.3.2	Forms other than Molded Shapes	150%	
3.2.1.4	Tear Resistance, min		ASTM D624, Die B or C
3.2.1.4.1	Molded Shapes	100 lb per in. (17.5 kN/m)	
3.2.1.4.2	Forms other than Molded Shapes	80 lb per in. (14.0 kN/m)	
3.2.1.5	Specific Gravity	Preproduction Value ±0.02	ASTM D297
3.2.2 Ø	Synthetic Lubricant Resistance: (Immediate Deteriorated Properties)		ASTM D471 Medium: AMS 3021 Test Fluid (See 8.1) Temperature: 175°C + 3 (347°F ± 5) Time: 70 hr ± 0.5
3.2.2.1	Hardness Change, Durometer "A" or equiv.	-15 to +5	
3.2.2.2 Ø	Tensile Strength Change, max	-30%	
3.2.2.3	Elongation Change, max	-20%	

3.2.2.4 Ø	Volume Change	0 to +20%	
3.2.3 Ø	Aromatic Fuel Resistance: (Immediate Deteriorated Properties)		ASTM D471 Medium: ASTM Ref. Fuel B Temperature: 20° - 30°C (68° - 86°F) Time: 70 hr ± 0.5
3.2.3.1	Hardness Change, Durometer "A" or equiv.	-5 to +5	
3.2.3.2	Tensile Strength Change, max	-15%	
3.2.3.3	Elongation Change, max	-15%	
3.2.3.4 Ø	Volume Change	0 to +5%	
3.2.4	Dry Heat Resistance:		ASTM D573 Temperature: 250°C + 3 (482°F ∓ 5) Time: 70 hr ∓ 0.5
3.2.4.1	Hardness Change, Durometer "A" or equiv.	0 to +10	
3.2.4.2	Tensile Strength Change, max	-20%	
3.2.4.3	Elongation Change, max	-20%	
3.2.4.4	Weight Loss, max	5.0%	
3.2.4.5	Bend (flat)	No cracking or checking	
3.2.5	Compression Set:		ASTM D395, Method B Temperature: 200°C + 3 (392°F ∓ 5) Time: 70 hr ∓ 0.5
3.2.5.1	Percent of Original Deflection, max	30	
3.2.6	Low-Temperature Resistance:		
3.2.6.1	Temperature Retraction, TR_{10} point, max	-15°C (+5°F)	ASTM D1329

3.2.7 Ø 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 vendor. Discoloration of metal shall not be considered objectionable.

3.3 Ø Quality: The product, as received by purchaser, shall be uniform in quality and condition, clean, smooth, as free from foreign materials as commercially practicable, and free from imperfections detrimental to usage of product.

3.4 Ø Tolerances: Shall conform to AMS 2279 or MAM 2279.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all Ø samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. 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 to determine conformance to the following requirements are classified as acceptance tests and shall be performed on each lot:

Requirement	Paragraph
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	3.2.5

4.2.2 Periodic Tests: Tests to determine conformance to the following Ø requirements are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser:

Requirement	Paragraph
Tear Resistance	3.2.1.4
Volume Change in Di-ester Oil	3.2.2.4
Volume Change in Aromatic Fuel	3.2.3.4

4.2.3 Preproduction Tests: Tests to determine conformance to all technical Ø requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

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

4.3 Sampling: 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. If specimens cannot be prepared from the product, ASTM test 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 shall be supplied upon request. This strip shall be prepared from tubing 1 in. ± 0.063 (25 mm ± 1.60) in OD by 0.075 in. ± 0.008 (1.90 mm ± 0.20) in wall thickness, mechanically split 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 in. (150 x 150 mm) by 0.080 in. ± 0.008 (2.00 mm ± 0.020) molded from the same batch of compound shall be supplied upon request.

4.3.1.1 A lot shall be all product from the same batch of compound processed in one continuous run and presented for vendor's inspection at one time. An inspection lot shall not exceed 500 lb (225 kg). A lot may be packaged in small quantities under the basic lot approval provided lot identification is maintained.

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

4.3.1.3 When a statistical sampling plan and acceptance quality level (AQL) have 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 4.5.1 shall state that such plan was used.

4.3.2 For Periodic Tests and Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample material shall be approved by purchaser before material for production use is supplied, unless such approval be waived by purchaser. Results of tests on production material 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 material which are essentially the same as those used on the approved sample material. 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 material, processing, or both and, when requested, sample material. Production material made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports:

4.5.1 Ø The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and, when performed, to the periodic test requirements, and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 3216A, vendor's compound number, form and size or part number, and quantity.

4.5.2 Ø The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3216A, contractor or other direct supplier of material, supplier's compound number, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification and shall include in the report either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.6 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification and Packaging: Shall be in accordance with AMS 2810.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Material not conforming to this specification or to modifications authorized by purchaser will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 Test Fluid: AMS 3021 test fluid may be ordered from:

Stauffer Chemical Company
Special Chemical Division
Westport, CT 06880

8.3 Dimensions and properties in inch/pound units and the Celsius temperatures are primary; dimensions and properties in SI units and the Fahrenheit temperatures are shown as the approximate equivalents of the primary units and are presented only for information.