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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3216C

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Superseding AMS 3216B

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:

These products have been used typically on components requiring resistance to jet fuel, synthetic lubricants, and petroleum-based hydraulic fluids, but usage is not limited to such applications.

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.

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 - Deterioriation in an Air Oven
ASTM D 624 Rubber Property - Tear Resistance
ASTM D 1329 Evaluating Rubber Property - Retraction at Low Temperature (TR Test)
ASTM D 2240 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.

3.1.1 Color: Shall be black. (R)

3.2 Properties:

The product shall conform to the 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 Methods
3.2.1	As Received:		
3.2.1.1	Hardness, Durometer "A" or equivalent	75 ± 5	ASTM D 2240
3.2.1.2	Tensile Strength, minimum	1400 psi (9.65 MPa)	ASTM D 412, Die B or C

TABLE 1 - Properties (Cont.)

Paragraph	Property	Requirement	Test Methods
3.2.1.3	Elongation, minimum		ASTM D 412, 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, minimum		ASTM D 624, Die B or C
3.2.1.4.1	Molded Shapes	100 pounds force per inch (17.5 kN/m)	
3.2.1.4.2	Forms other than Molded Shapes	80 pounds force per inch (14.0 kN/m)	
3.2.1.5	Specific Gravity	Preproduction Value ±0.02	ASTM D 297
3.2.2 (R)	Synthetic Lubricant Resistance: (Immediate Deteriorated Properties)		ASTM D 471 AMS 3021 175 °C ± 3 347 °F ± 5) 70 hours ± 0.5
3.2.2.1 (R)	Hardness Change, Durometer "A" or equivalent	-15 to 0	
3.2.2.2 (R)	Tensile Strength Change, maximum	-25%	
3.2.2.3 (R)	Elongation Change, maximum	-20%	
3.2.2.4 (R)	Volume Change	0 to +20%	
3.2.3	Aromatic Fuel Resistance: (Immediate Deteriorated Properties)		ASTM D 471 ASTM Reference Fuel B 20 - 30 °C (68 - 86 °F) 70 hours ± 0.5
3.2.3.1	Hardness Change, Durometer "A" or equivalent	-5 to +5	
3.2.3.2	Tensile Strength Change, maximum	-15%	
3.2.3.3	Elongation Change, maximum	-15%	

TABLE 1 - Properties (Cont.)

Paragraph	Property	Requirement	Test Methods
3.2.3.4	Volume Change	0 to +5%	
3.2.4	Dry Heat Resistance:		ASTM D 573 250 °C ± 3 (482 °F ± 5) 70 hours ± 0.5
3.2.4.1	Hardness Change, Durometer "A" or equivalent	0 to +10	
3.2.4.2	Tensile Strength Change, maximum	-20%	
3.2.4.3	Elongation Change, maximum	-20%	
3.2.4.4	Weight Loss, maximum	5.0%	
3.2.4.5	Bend (flat)	No cracking or checking	
3.2.5	Compression Set:		ASTM D 395, Method B 200 °C ± 3 (392 °F ± 5) 70 hours ± 0.5
3.2.5.1	Percent of Original Deflection, maximum	30	
3.2.6	Low-Temperature Resistance:		
3.2.6.1	Temperature Retraction, TR_{10} point, maximum	-15 °C (+5 °F)	ASTM D 1329

3.2.7 Corrosion: The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure acceptable to purchaser. 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 materials as commercially practicable, and free from imperfections detrimental to usage of 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 vendor of the product shall supply all samples for vendor's 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, 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
Tolerances	3.4

4.2.2 (R) Periodic Tests: Tests for requirements shown in Table 3 are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

TABLE 3 - Periodic Tests

Requirement	Paragraph
Tear Resistance	3.2.1.4
Volume Change in Aromatic Fuel	3.2.3.4

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

4.2.3.1 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. 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 ± 0.020) 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 processed in one continuous run and presented for vendor'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 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 4.5 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 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.