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AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 3356D

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Superseding AMS 3356C

SILICONE (VMQ) RUBBER
Lubricating Oil and Compression Set Resistant, Electrical Grade
55 - 65

1. SCOPE:

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

1.2 Application: Primarily for rubber-like parts required to operate or seal from -55° to +230°C (-65° to +450°F), compounded especially for aircraft piston engine oil resistance, low compression set, and controlled dielectric strength. Silicone elastomer is resistant to deterioration by weathering and by high-aniline-point petroleum-base oils and remains flexible over the temperature range noted. This material is not normally suitable for use in contact with gasoline or aromatic fuels and low-aniline-point petroleum-base fluids due to excessive swelling of the elastomer.

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

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

ASTM D149 - Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies
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
ASTM D573 - Rubber - Deterioration in an Air Oven
ASTM D624 - Rubber Property - Tear Resistance
ASTM D797 - Rubber Property - Young's Modulus at Normal and Subnormal Temperatures
ASTM D2137 - Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics
ASTM D2240 - Rubber Property - Durometer Hardness

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on a silicone (VMQ) rubber, 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 equivalent	60 ± 5	ASTM D2240
3.2.1.2	Tensile Strength, min	800 psi (5.50 MPa)	ASTM D412, Die B or C
3.2.1.3	Elongation, min	200%	ASTM D412, Die B or C
3.2.1.4	Tensile Stress at 50% Elongation, max	250 psi (1.70 MPa)	ASTM D412, Die B or C
3.2.1.5	Tear Strength, min	50 lb per in. (8.75 kN/m)	ASTM D624, Die B
3.2.1.6	Dielectric Strength, Short Time Test, min		ASTM D149
	Specimen Thickness: 0.070 - 0.080 in. (1.78 - 2.03 mm)	350 V per mil (13.800 V/mm)	

3.2.1.7	Specific Gravity	Preproduction Value ±0.03	ASTM D297
3.2.2	Petroleum Lubricating Oil Resistance: (Immediate Deteriorated Properties)		ASTM D471 Medium: ASTM Oil No. 1 Temperature: 175°C ± 3 (347°F ± 5) Time: 70 hr ± 0.5
3.2.2.1	Hardness Change, Durometer "A" or equivalent	-15 to +5	
3.2.2.2	Tensile Strength Change, max	-20%	
3.2.2.3	Elongation Change, max	-15%	
3.2.2.4	Volume Change, max	0 to +15%	
3.2.2.5	Decomposition	None	
3.2.2.6	Surface Tackiness	None	
3.2.3	Water Resistance: (Immediate Deteriorated Properties)		ASTM D471 Medium: Distilled Water Temperature: 20° - 30°C (68° - 86°F) Time: 46 hr ± 0.5
3.2.3.1 Ø	Volume Change, max	0 to +5%	
3.2.3.2	Dielectric Strength Change, max	-15%	
3.2.4	Dry Heat Resistance:		ASTM D573 Temperature: 225°C ± 3 (437°F ± 5) Time: 22 hr ± 0.5
3.2.4.1	Hardness Change, Durometer "A" or equivalent	0 to +10	
3.2.4.2	Tensile Strength Change, max	-15%	
3.2.4.3	Elongation Change, max	-25%	
3.2.4.4	Bend (flat)	No cracking or checking	
3.2.5	Compression Set:		ASTM D395, Method B Temperature: 175°C ± 3 (347°F ± 5) Time: 22 hr ± 0.5
3.2.5.1	Precent of Original Deflection, max	30	

3.2.6 Low-Temperature Resistance:

3.2.6.1 Brittleness	Pass	ASTM D2137, Method A Temperature: -65°C + 3 (-85°F ∓ 5)
3.2.6.2 Young's Modulus, max	10,000 psi (69 MPa)	ASTM D797 Temperature: -50°C + 3 (58°F ∓ 5) Time: 5 hr ∓ 0.2

3.2.7 Weathering: The product shall have weather resistance acceptable to the Ø purchaser, determined by a procedure agreed upon by purchaser and vendor.

3.2.8 Corrosion: The product shall not have a corrosive effect on other Ø materials when exposed to conditions normally encountered in service, determined by a procedure agreed upon by purchaser and vendor.

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

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

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 Reference
Hardness, as received	3.2.1.1
Tensile Strength, as received	3.2.1.2
Elongation, as received	3.2.1.3
Specific Gravity	3.2.1.7
Petroleum Lubricating Oil Resistance	3.2.2
Compression Set	3.2.5

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests Ø 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.

4.2.2.1 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 Ø 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. Ø 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 Ø one time.

4.3.1.3 When a statistical sampling plan and acceptance quality level (AQL) have Ø 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 Preproduction Tests: As agreed upon by purchaser and vendor. Ø

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.