SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS3249 REV. D

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Superseding AMS3249C

Ethylene Propylene (EPDM) Rubber Hydrazine-Base-Fluid Resistant 75 - 85

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

STABILIZED NOTICE

This document has been declared "Stabilized" by SAE AMS CE, Elastomers Committee, and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE:

1.1 Form:

This specification covers an ethylene propylene (EPDM) rubber in the form of sheet, strip, tubing, extrusions, and molded shapes other than O-rings.

1.2 Application:

These products have been used typically for seals and gaskets for use from -55 to +70 °C (-67 to +158 °F) in hydrazine-base 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. (See 8.2 and 8.3).

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 2825	Material Safety Data Sheets
AMS 5647	Steel Bars, Forgings, Tubing, and Rings, Corrosion Resistant, 19Cr - 9.5Ni (SAE 30304L) Solution Heat Treated

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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 1329	Rubber Property - Retraction at Low Temperature (TR Test)
ASTM D 1415	Rubber Property - International Hardness
ASTM D 2240	Rubber Property - Durometer Hardness

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-P-26536	Propellant, Hydrazine

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be a compound, based on an ethylene propylene (EPDM) elastomer, suitably cured to produce a product meeting the requirements of 3.2.

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 Method
3.2.1	Hardness, Durometer "A" or equivalent	80 ± 5	ASTM D 2240 or ASTM D 1415
3.2.2	Tensile Strength, minimum	1600 psi (11.0 MPa)	ASTM D 412, Die B or C
3.2.3	Elongation, minimum	100%	ASTM D 412, Die B or C
3.2.4	Specific Gravity	Preproduction Value ±0.02	ASTM D 297
3.2.5	Hydrazine Resistance (See 8.2 & 8.3): (Immediate Deteriorated Properties)		4.5.1
3.2.5.1	Hardness Change, Durometer "A" or equivalent	-5 to 0	
3.2.5.2	Tensile Strength Change, maximum	-10%	
3.2.5.3	Elongation Change, maximum	-10%	
3.2.5.4	Volume Change, maximum	+3%	
3.2.5.5	Compatibility, maximum	5 psi (34.5 kPa) Greater Than Control Container	4.5.1.1
3.2.5.6	Compression Set:		4.5.2
	Percent of Original Deflection, maximum	20	
3.2.6	Dry Heat Resistance:		ASTM D 573 150 °C ± 3
3.2.6.1	Hardness Change, Durometer "A" or equivalent	0 to +10	(302 °F ± 5) 70 hours ± 0.5
3.2.6.2	Tensile Strength Change, maximum	-25%	
3.2.6.3	Elongation Change, maximum	-10%	
3.2.7	Compression Set:		ASTM D 395, Method B 125 °C ± 3
	Percent of Original Deflection, maximum	30	(257 °F ± 5) 22 hours ± 0.25
3.2.8	Low-Temperature Resistance:		ASTM D 1329
	Temperature Retraction, TR_{10} point, maximum	-46 °C (-51 °F)	

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 the product.

3.4 Tolerances:

Shall be in accordance with 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
Specific Gravity	3.2.4
Volume Change in Hydrazine	3.2.5.4
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 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 processed 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.

4.3.1.4 When a statistical sampling plan has been agreed upon by purchaser and manufacturer, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 shall state that such plan was used.

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

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 Manufacturer 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. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer 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.

4.5 Test Methods:

4.5.1 Hydrazine Resistance (See 8.3): Testing shall be performed in accordance with ASTM D 471, with the following exceptions: The pyrex glass test tubes shall be capable of withstanding 500 psi (3.45 MPa) pressure and shall be mechanically sealed and fitted with a 0 to 50 psi (0 to 345 kPa) pressure gage. Air and moisture shall be excluded from the test tubes. The elastomer specimens shall be cleaned of surface contamination, using absolute isopropyl alcohol, prior to hydrazine immersion. For each test, 150 mL of MIL-P-26536 hydrazine propellant shall be used (See 8.2). The sealed test tubes shall be exposed for 96 hours ± 0.5 at 70 °C ± 3 (158 °F ± 5). At the end of the test exposure, tensile, elongation, and volume increase specimens shall be removed from the test tubes, dried in vacuum for 1 hour ± 0.1, followed by air drying for 24 hours ± 0.5 at room temperature.

4.5.1.1 Compatibility with Hydrazine: By observation of the pressure gage on the hydrazine resistance test tubes of 4.5.1, the compatibility of the rubber shall be measured. A control test tube of the same configuration as used in 4.5.1, containing 150 mL of MIL-P-26536 hydrazine propellant but without the rubber specimens, shall also be subjected to the test conditions specified in 4.5.1. The maximum pressure difference observed between the rubber test specimen tube and control test tube shall be the measure of compatibility.

4.5.2 Compression Set in Hydrazine: Testing shall be performed in accordance with ASTM D 395, Method B, with the following exceptions: The compression set plates and test container shall be fabricated from AMS 5647 steel. Test containers shall be mechanically sealed during the test duration. The elastomer specimens shall be cleaned of surface contamination, using absolute isopropyl alcohol, prior to hydrazine immersion. Completely immerse the compression set plates, with test specimens, in the test container containing MIL-P-26536 hydrazine propellant. The sealed container shall be exposed for 96 hours ± 0.5 at 70 °C ± 3 (158 °F ± 5). Following test exposure, the specimens shall be removed from the compression set plates, dried in vacuum for 1 hour ± 0.1, followed by air drying for 24 hours ± 0.5 at room temperature before measurement for calculation of compression set.

4.6 Reports:

The supplier of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3249C, manufacturer's compound number, form and size or part number, and quantity.

4.6.1 A material safety data sheet conforming to AMS 2825, or equivalent, shall be supplied to each purchaser prior to, or concurrent with, the report of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of a product for production use. Each request for modification of product formulation shall be accompanied by a revised data sheet for the proposed formulation.