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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 3249B

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Superseding AMS 3249A

ETHYLENE PROPYLENE (EPDM) RUBBER
Hydrazine-Base-Fluid Resistant
75 - 85

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: Primarily for seals and gaskets for use from -55° to +70°C (-65° to +160°F) in hydrazine-base fluids.

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 5647 - Steel Bars, Forgings, Tubing, and Rings, Corrosion Resistant, 19Cr - 9.5Ni (SAE 30304L) Solution Heat Treated

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
ASTM D573 - Rubber - Deterioration in an Air Oven
ASTM D1329 - Rubber Property - Retraction at Low Temperature (TR Test)
ASTM D2240 - Rubber Property - Durometer Hardness

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-P-26536 - Propellant, Hydrazine

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on an ethylene propylene (EPDM) Ø 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.	80 ± 5	ASTM D2240
3.2.1.2	Tensile Strength, min	1600 psi (11.0 MPa)	ASTM D412, Die B or C
3.2.1.3	Elongation, min	100%	ASTM D412, Die B or C
3.2.1.4	Specific Gravity	Preproduction Value ±0.02	ASTM D297

3.2.2 Hydrazine Resistance (See 8.2 & 8.3): (Immediate Deteriorated Properties) 4.5.1

3.2.2.1	Hardness Change, Durometer "A" or equiv.	-5 to 0
3.2.2.2	Tensile Strength Change, max	-10%
3.2.2.3	Elongation Change, max	-10%
3.2.2.4	Volume Change, max	+3%
3.2.2.5	Compatibility, max	5 psi (34.5 kPa) Greater Than Control Container 4.5.1.1

3.2.2.6 Compression Set: 4.5.2

Percent of Original Deflection, max	20

3.2.3 Dry Heat Resistance:		ASTM D573 Temperature: 150°C + 3 (300°F ∓ 5) Time: 70 hr ± 0.5
3.2.3.1 Hardness Change, Durometer "A" or equiv.	0 to +10	
3.2.3.2 Tensile Strength Change, max	-25%	
3.2.3.3 Elongation Change, max	-10%	
3.2.4 Compression Set:		ASTM D395, Method B Temperature: 125°C + 3 (255°F ∓ 5)
Percent of Original Deflection max	30	Time: 22 hr ± 0.25
3.2.5 Low-Temperature Resistance:		ASTM D1329
Temperature Retraction, TR_{10} point, max	-46°C (-50°F)	

3.3 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 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 vendor of the product shall supply all 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 4.6. 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, as received	3.2.1.4
Volume Change in Hydrazine	3.2.2.4

4.2.2 Preproduction Tests: Tests to determine conformance to all technical 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. Ø

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, the contracting officer, or the request for procurement. Ø

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 x 0.75 in. ± 0.075 (150 x 150 x 2.0 mm ± 0.20) molded from the same batch of compound shall be supplied upon request. Ø

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).

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 4.6.1 shall state that such plan was used. Ø

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.

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 Test Methods:

4.5.1 Hydrazine Resistance (See 8.3): Testing shall be performed in accordance with ASTM D471, with the following exceptions: The pyrex glass test tubes shall be capable of withstanding 500 psi (3.5 MPa) pressure and shall be mechanically sealed and fitted with a 0 - 50 psi (0 - 345 kPa) pressure gauge. 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 hr ± 0.5 at 70°C ± 3 (160°F ± 5). At the end of the test exposure, tensile, elongation, and volume increase specimens shall be removed from the test tubes and dried in vacuum for 1 hr ± 0.1, followed by air drying for 24 hr ± 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 will 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 D395, 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 hr ± 0.5 at 70°C ± 3 (160°F ± 5). Following test exposure, the specimens shall be removed from the compression set plates and dried in vacuum for 1 hr ± 0.1, followed by air drying for 24 hr ± 0.5 at room temperature before measurement for calculation of compression set.