



AEROSPACE MATERIAL

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

SPECIFICATION

AMS 3249A

Superseding AMS 3249

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ETHYLENE PROPYLENE RUBBER

Hydrazine-Base-Fluid Resistant

75 - 85

1. SCOPE:

1.1 Form: This specification covers an ethylene propylene type rubber in the form of sheet, strip, tubing, molded shapes, and extrusions.

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 (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

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 (304L)

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 Temperatures (TR Test)

ASTM D2240 - Rubber Property - Durometer Hardness

2.3 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

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

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3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on an ethylene propylene 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 $\pm$ 5	ASTM D2240
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3.2.1.2 Tensile Strength, min	1600 psi (11.0 MPa)	ASTM D412, Die B or C
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3.2.1.3 Elongation, min	100%	ASTM D412, Die B or C
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Ø 3.2.1.4 Specific Gravity	Qualification Value ± 0.02	ASTM D297
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3.2.2 <u>Hydrazine Resistance (See 8.2 & 8.3):</u> (Immediate Deteriorated Properties)		4.5.1
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3.2.2.1 Hardness Change, Durometer "A" or equiv.	-5 to 0	
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3.2.2.2 Tensile Strength Change, max	-10%	
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3.2.2.3 Elongation Change, max	-10%	
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3.2.2.4 Volume Change, max	+3%	
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3.2.2.5 Compatibility, max	5 psi (34.5 kPa) Greater Than Control Container	4.5.1.1
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3.2.2.6 <u>Compression Set:</u>		4.5.2
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Percent of Original Deflection, max	20	
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3.2.3 Dry Heat Resistance:

ASTM D573

Temperature: 150°C $\pm$ 3
(302°F $\pm$ 5)

Ø 3.2.3.1 Hardness Change, Durometer "A" or equiv.	0 to +10	Time: 70 hr $\pm$ 0.5
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Ø 3.2.3.2 Tensile Strength Change, max	-25%	
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Ø 3.2.3.3 Elongation Change, max	-10%	
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Ø 3.2.4 Compression Set:

ASTM D395, Method B

Temperature: 125°C $\pm$ 3
(257°F $\pm$ 5)

Percent of Original Deflection, max	30	Time: 22 hr $\pm$ 0.25
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3.2.5 Low-Temperature Resistance:

ASTM D1329

Temperature Retraction, -46° C
TR₁₀ point, max (-50° F)

3.3 Quality: The product shall be uniform in quality and condition, clean, smooth, as free from foreign material as commercially practicable, and free from imperfections detrimental to fabrication, appearance, or performance of parts.

3.4 Tolerances: Unless otherwise specified, the following tolerances shall apply:

3.4.1 Sheet and Strip:

TABLE I

Nominal Thickness Inches	Tolerance, Inch plus and minus
Up to 0.125, incl	0.016
Over 0.125 to 0.500, incl	0.031
Over 0.500	0.047

TABLE I (SI)

Nominal Thickness Millimetres	Tolerance, Millimetres plus and minus
Up to 3.18, incl	0.41
Over 3.18 to 12.70, incl	0.79
Over 12.70	0.19

3.4.2 Tubing:

3.4.2.1 Diameter:

TABLE II

Nominal OD or ID (not both), Inches	Tolerance plus and minus	Ovality, % (See 3.4.2.1.1)
Up to 0.500, incl	0.020 in.	10
Over 0.500 to 1.000, incl	0.030 in.	15
Over 1.000	4%	15

TABLE II (SI)

Nominal OD or ID (not both), Millimetres	Tolerance plus or minus	Ovality, % (See 3.4.2.1.1)
Up to 12.70, incl	0.51 mm	10
Over 12.70 to 25.40, incl	0.76 mm	15
Over 25.40	4%	15

- 3.4.2.1.1 Ovality applies to tubing ordered in straight lengths with wall thickness of 0.063 in. (1.60 mm) and over, and shall be computed from the difference between the minor and major axis diameter measurements, taken at the same transverse plane on the tube, expressed as a percentage of the nominal diameter.

3.4.2.2 Wall Thickness:

TABLE III

Nominal Wall Thickness Inches	Tolerance plus and minus
Up to 0.063, excl	0.005 in.
0.063 and over	10%

TABLE III (SI)

Nominal Wall Thickness Millimetres	Tolerance plus and minus
Up to 1.60, excl	0.13 mm
1.60 and over	10%

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the product shall supply all samples 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 perform such confirmatory testing as he deems 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 Qualification Tests: Tests to determine conformance to all technical requirements of this specification are classified as qualification tests and shall be performed on the first-article shipment of a product to a purchaser, when a change in material 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, qualification test material shall be submitted to the cognizant qualification agency as directed by the procuring activity, the contracting officer, or the request for procurement.

- 4.3 Sampling: Sufficient product shall be taken at random from each lot to perform all required tests. The number of tests for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three. 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. $\pm$ 0.063 (25 mm $\pm$ 1.60) in OD by 0.075 in. $\pm$ 0.008 (1.90 mm $\pm$ 0.20) in wall thickness, mechanically split and flattened into a strip while being extruded, and cured in the same manner as production material.
- 4.3.1 A lot shall be all product from the same batch of compound processed in a continuous run and submitted for vendor's inspection at one time. An inspection lot shall not exceed 500 lb (225 kg).
- 4.3.2 A batch shall be the quantity of compound run through a mill or mixer at one time.
- 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. 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 any change is necessary 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 and processing 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 $\pm$ 0.5 at 70°C $\pm$ 3 (158°F $\pm$ 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 $\pm$ 0.1, followed by air drying for 24 hr $\pm$ 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 $\pm$ 0.5 at 70°C $\pm$ 3 (158°F $\pm$ 5). Following test exposure, the specimens shall be removed from the compression set plates and dried in vacuum for 1 hr $\pm$ 0.1, followed by air drying for 24 hr $\pm$ 0.5 at room temperature before measurement for calculation of compression set.