

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 3220E

Superseding AMS 3220D

Issued 1-23-40
Revised 1-1-83

**SYNTHETIC RUBBER
General Purpose, Fluid Resistant
55 - 65**

1. SCOPE:

- 1.1 **Form:** This specification covers a synthetic rubber in the form of sheet, strip, tubing, extrusions, and molded shapes.
- 1.2 **Application:** Primarily for packing and sealing joints which come in contact with aircraft fuels, hot petroleum-base lubricating oils, and ethylene glycol. This material has fair resistance to all fluids listed. Where better resistance to a particular fluid is required, use the AMS for material compounded specifically for good resistance to that fluid.

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 SAE, 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

- 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 D412 - Rubber Properties in Tension
ASTM D471 - Rubber Property - Effect of Liquids
ASTM D573 - Rubber - Deterioration in an Air Oven
ASTM D2240 - Rubber Property - Durometer Hardness

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3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on a synthetic 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 60 ± 5 ASTM D2240
"A" or equiv.

3.2.1.2 Elongation, min 200% ASTM D412,
Die B or C

3.2.1.3 Specific Gravity Preproduction ASTM D297
Value ± 0.02

3.2.2 Petroleum Lubricating Oil Resistance: ASTM D471
(Immediate Deteriorated
Properties) Medium: ASTM Oil No. 1
Temperature: $150^{\circ}\text{C} \pm 3$
 $302^{\circ}\text{F} \pm 5$

3.2.2.1 Hardness, Durometer 50 to 70 Time: $5 \text{ hr} \pm 0.2$
"A" or equiv.

3.2.2.2 Elongation, min 150%

3.2.2.3 Decomposition None

3.2.2.4 Surface Tackiness None

3.2.3 Aliphatic Fuel Resistance: ASTM D471
(Immediate Deteriorated
Properties) Medium: ASTM Ref. Fuel A
Temperature: $20^{\circ} - 30^{\circ}\text{C}$
 $(68^{\circ} - 86^{\circ}\text{F})$

3.2.3.1 Elongation, min 200% Time: $5 \text{ hr} \pm 0.2$

3.2.3.2 Volume Change 0 to +30%

3.2.3.3 Decomposition None

3.2.3.4 Surface Tackiness None

3.2.4 Dry Heat Resistance: ASTM D573

3.2.4.1 Hardness, Durometer 70 Temperature: $100^{\circ}\text{C} \pm 1$
"A" or equiv., max $(212^{\circ}\text{F} \pm 2)$
Time: $15 \text{ hr} \pm 0.5$

3.2.4.2 Elongation, min 150%

3.2.4.3 Bend (flat) No cracking or checking

3.2.5 Weathering: When specified, the product shall have weather resistance acceptable to the purchaser, determined by a procedure agreed upon by purchaser and vendor.

3.2.6 Corrosion: The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service. Discoloration of metal shall not be considered objectionable.

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

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

3.4.1 Sheet and Strip:
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TABLE I

Nominal Thickness (T) Inches	Tolerance, Inch	
	Plus	Minus
Up to 0.400, incl	0.008	0.013
Over 0.400 to 0.630, incl	0.010	0.016
Over 0.630 to 1.000, incl	0.013	0.020
Over 1.000 to 1.600, incl	0.016	0.025
Over 1.600 to 2.500, incl	0.020	0.032
Over 2.500 to 4.000, incl	0.025	0.040
Over 4.000 to 6.300, excl	0.032	0.050
6.300 and over	0.005T	--

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TABLE I (SI)

Nominal Thickness (T) Millimetres	Tolerance, Millimetres Plus and Minus	
	Fixed	Closure (See 3.4.1.1)
Up to 10.00, incl	0.20	0.32
Over 10.00 to 16.00, incl	0.25	0.40
Over 16.00 to 25.00, incl	0.32	0.50
Over 25.00 to 40.00, incl	0.40	0.63
Over 40.00 to 63.00, incl	0.50	0.80
Over 63.00 to 100.00, incl	0.63	1.00
Over 100.00 to 160.00, excl	0.80	1.25
160.00 and over	0.005T	--

3.4.1.1 Closure dimensions are across mold parting line.

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3.4.2 Tubing Diameter and Wall Thickness:

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TABLE II

Nominal OD or ID (D) (not both) and Wall Thickness Inches	Tolerance, Inch Plus and Minus	Ovality, % (See 3.4.2.2)
Up to 0.100, incl (See 3.4.2.1)	0.013	10
Over 0.100 to 0.160, incl	0.016	15
Over 0.160 to 0.250, incl	0.020	15
Over 0.250 to 0.400, incl	0.025	15
Over 0.400 to 0.630, incl	0.032	15
Over 0.630 to 1.000, incl	0.040	15
Over 1.000	0.035XD	

TABLE II (SI)

Nominal OD or ID (D) (not both) and Wall Thickness Millimetres	Tolerance, Millimetres Plus and Minus	Ovality, % (See 3.4.2.2)
Up to 2.50, incl (See 3.4.2.1)	0.32	10
Over 2.50 to 4.00, incl	0.40	15
Over 4.00 to 6.30, incl	0.50	15
Over 6.30 to 10.00, incl	0.63	15
Over 10.00 to 16.00, incl	0.80	15
Over 16.00 to 25.00, incl	1.00	15
Over 25.00	0.035XD	

3.4.2.1 In general, cross-sectional dimensions less than 0.040 in. (1.00 mm) are impractical to extrude.

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3.4.2.2 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 of the tube, expressed as a percentage of the nominal diameter.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all \emptyset 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
Elongation, as received	3.2.1.2
Elongation Change in Oil	3.2.2.2
Volume Change in Fuel	3.2.3.2

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 a product to a purchaser, when a change in material 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 test 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.