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

AEROSPACE MATERIAL SPECIFICATION

AMS 3215J
Superseding AMS 3215H
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NITRILE RUBBER
Aromatic Fuel Resistant
65 - 75

1. SCOPE:

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

1.2 Application: Primarily for parts such as gaskets, diaphragms, bushings, grommets, and sleeves requiring resistance to aromatic and aliphatic fuels when continuously or alternately exposed to both.

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 Packing, 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 D395 - Rubber Property - Compression Set
ASTM D412 - Rubber Properties in Tension
ASTM D471 - Rubber Property - Effect of Liquids
ASTM D518 - Rubber Deterioration - Surface Cracking
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 D1149 - Rubber Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimens)
ASTM D2137 - Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics
ASTM D2240 - Rubber Property - Durometer Hardness
ASTM F64 - Corrosive and Adhesive Effects of Gasket Materials on Metal Surfaces

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

2.3.1 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on a nitrile 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 ø	Hardness, Durometer "A" or equiv.	70 ± 5	ASTM D2240
3.2.1.2	Tensile Strength, min	1500 psi (10.3 MPa)	ASTM D412, Die B or C
3.2.1.3	Elongation, min	250%	ASTM D412, Die B or C
3.2.1.4	Tensile Stress at 100% Elongation, max	1000 psi (6.90 MPa)	ASTM D412, Die B or C Stretch specimen twice to 125% elongation within 5 min. before testing.
3.2.1.5	Tear Resistance, min (lb per in. (kN/m))	80% of qualification value	ASTM D624, Die B
3.2.1.6	Specific Gravity	Qualification Value ±0.02	ASTM D297
3.2.2	Aliphatic Fuel Resistance: (After 24 hr drying at 70°C ± 1 (158°F ± 2))		ASTM D471 Medium: ASTM Ref. Fuel A Temperature: 20° - 30°C (68° - 86°F)
3.2.2.1	Volume Change, max	-5%	Time: 24 hr ± 0.5
3.2.3	Aromatic Fuel Resistance: (Immediate Deteriorated Properties)		ASTM D471 Medium: ASTM Ref. Fuel B Temperature: 20° - 30°C (68° - 86°F)
3.2.3.1	Hardness Change, Durometer "A" or equiv.	-20 to 0	Time: 168 hr ± 0.5
3.2.3.2	Tensile Strength Change, max		
3.2.3.2.1	For parts other than extrusions	-50%	
3.2.3.2.2	For extruded parts	-60%	
3.2.3.3	Elongation Change, max	-45%	
3.2.3.4	Volume Change in 24 hr	0 to +35%	
3.2.3.5	Volume Change in 168 hr	0 to +35%	
3.2.3.6	Volume Change on Drying (after 168 hr immersion) at 70°C ± 1 (158°F ± 2) for 24 hr, max	-10%	

3.2.4 Dry Heat Resistance:		ASTM D573	
		Temperature:	100°C ± 1 (212°F ± 2)
3.2.4.1 Hardness Change, Durometer "A" or equiv.	0 to +10	Time:	70 hr ± 0.5
3.2.4.2 Tensile Strength Change, max	-20%		
3.2.4.3 Elongation Change, max	-40%		
3.2.4.4 Bend (flat)	No cracking or checking		
3.2.5 Compression Set:		ASTM D395, Method B	
		Temperature:	100°C ± 1 (212°F ± 2)
3.2.5.1 Per cent of original deflection, max		Time:	70 hr ± 0.5
3.2.5.1.1 For parts other than extrusions	75		
3.2.5.1.2 For extruded parts	80		
3.2.6 Low-Temperature Resistance:		ASTM D2137, Method A	
		Temperature:	-18°C ± 1 (0°F ± 2)
Ø 3.2.6.1 Brittleness	Pass	Time:	10 min. ± 1
3.2.6.2 Young's Modulus, max (See 8.2)	30,000 (207 MPa)	ASTM D797	
		Temperature:	-25°C ± 1 (-13°F ± 2)
		Time:	5 hr ± 0.5

3.2.7 Weathering: The product, unless otherwise specified, shall show no evidence of cracking when Ø tested in accordance with ASTM D1149 for 7 days at 40°C ± 1 (104°F ± 2). Test specimens shall be prepared and mounted in accordance with ASTM D518, Method B.

3.2.8 Corrosion: The product, unless otherwise specified, shall not have a corrosive effect on other Ø materials, determined in accordance with ASTM F64. Discoloration of metal shall not be considered objectionable.

3.3 Quality: The product shall be uniform in quality and condition, clean, smooth, as free from foreign Ø 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	1.19

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 and 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 4.5. 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 of product:

Requirement	Paragraph
Hardness, as received	3.2.1.1
Tensile Strength, as received	3.2.1.2
Elongation, as received	3.2.1.3
Specific Gravity	3.2.1.6
Compression Set	3.2.5

4.2.2 Periodic Tests: Tests to determine conformance to the following requirements are classified as periodic tests and shall be performed on one lot from each batch in addition to the acceptance tests:

Requirement	Paragraph
Tensile Stress at 100% Elongation, as received	3.2.1.4
Tear Resistance	3.2.1.5
Volume Change in Aliphatic Fuel	3.2.2.1
Volume Change in Aromatic Fuel	3.2.2.4

4.2.3 Qualification Tests: Tests to determine conformance to all technical requirements of this specification are classified as qualification tests and may be the basis for approval of the compound (See 4.4.1).

4.2.3.1 For direct U.S. Military procurement, substantiating test 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 specimens for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three. If test specimens cannot be prepared from the product, ASTM specimens 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 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.

4.3.1 A lot shall be all product from the same batch of compound processed in one continuous run and submitted for vendor's inspection at one time.

4.3.2 A batch shall be the quantity of compound run through a mill or mixer at one time.