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FSC 5330

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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 7274H

Issued 1 MAR 1949
Revised 1 OCT 1991

Submitted for recognition as an American National Standard

Superseding AMS 7274G

RINGS, SEALING, BUTADIENE-ACRYLONITRILE (NBR) RUBBER
Oil Resistant
65 - 75

1. SCOPE:

1.1 Form:

This specification covers a butadiene-acrylonitrile (NBR) rubber in the form of molded rings.

1.2 Application:

These rings have been used typically for sealing at temperatures as low as -55 °C (-67 °F) where resistance to hot petroleum-base lubricating oil is required, but usage is not limited to such applications.

1.2.1 The cross-section of such rings is usually not over 0.275 inch (6.98 mm) in diameter or thickness.

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.

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 2817 Packaging and Identification, Preformed Packings
AS568 Aerospace Size Standard for O-Rings
AS871 Manufacturing and Inspection Standards for Preformed Packings (O-Rings)
AIR851 O-Ring Tension Testing Calculations

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 471 Rubber Property - Effect of Liquids
ASTM D 1414 Testing Rubber O-Rings

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be a compound, based on a butadiene-acrylonitrile (NBR) elastomer, suitably cured to produce sealing rings meeting the requirements of 3.2.

3.2 Properties:

Rings shall conform to the requirements shown In Table 1, tests shall be performed on the rings supplied and, except as otherwise specified herein, in accordance with ASTM D 1414, insofar as practicable. Testing for tensile strength is not required on rings which are too small to permit assembly on rollers and are, after cutting, too short to permit testing as a single strand. Eliminating testing for tensile strength does not eliminate testing for elongation; elongation test can be made by stretching a ring over a mandrel of a size which will stretch the ring sufficiently to produce the required elongation when figured on the ID of the ring. Calculations of tensile strength and elongation may be made in accordance with AIR851.

TABLE 1 - Test Requirements

Paragraph	Property	Requirement	Test Conditions
3.2.1	As Received		
3.2.1.1	Hardness, Durometer "A" or equivalent	70 ± 5	
3.2.1.2	Tensile Strength, minimum	1500 psi (10.3 MPa)	
3.2.1.3	Elongation, minimum	150%	

TABLE 1 - Test Requirements (Cont.)

Paragraph	Property	Requirement	Test Conditions
3.2.1.4	Corrosion	Nil	
3.2.1.5	Specific Gravity	Preproduction Value ±0.02	
3.2.2	Lubricating Oil Resistance: (Immediate Deteriorated Properties)		Medium: ASTM Oil No. 1 (ASTM D 471) Temperature: 150 °C ± 3 (302 °F ± 5) Time: 96 hours ± 0.5
3.2.2.1	Hardness Change, Durometer "A" or equivalent	-5 to +10	
3.2.2.2	Tensile Strength Change, maximum	-60%	
3.2.2.2.1	If impracticable to determine tensile strength of rings 0.50 inch (12.7 mm) and under in nominal ID after oil immersion, the rings shall withstand, without cracking, closing flat.		
3.2.2.3	Elongation Change, maximum	-50%	
3.2.2.4	Volume Change	0 to +10	
3.2.2.5	Decomposition	None	
3.2.2.6	Surface Tackiness	None	
3.2.3	Processing Oil Resistance: (Immediate Deteriorated Properties)		Medium: ASTM Oil No. 3 (ASTM D 471) Temperature: 150 °C + 3 (302 °F ± 5) Time: 70 hours ± 0.5
3.2.3.1	Hardness Change, Durometer "A" or equivalent	-20 to 0	
3.2.3.2	Volume Change	+25 to +45%	
3.2.3.3	Decomposition	None	
3.2.3.4	Surface Tackiness	None	

TABLE 1 - Test Requirements (Continued)

Paragraph	Property	Requirement	Test Conditions
3.2.4	Dry Heat Resistance:		Temperature: 100 °C ± 1 (212 °F ± 2)
3.2.4.1	Hardness Change, Durometer "A" or equivalent	0 to +10	Time: 70 hours ± 0.5
3.2.4.2	Tensile Strength Change, maximum	-25%	
3.2.4.3	Elongation Change, maximum	-40%	
3.2.4.4	Bend (Flat)	No cracking or checking	
3.2.5	Compression Set:		Temperature: 125 °C ± 2 (257 °F ± 4)
3.2.5.1	Percent of Original Deflection, maximum		Time: 70 hours ± 0.5
	Ring Cross Section Diameter		
	0.066 to 0.110 inch (1.68 to 2.79 mm), incl	85	
	Over 0.110 inch (2.79 mm)	75	
3.2.6	Low-Temperature Brittleness: (After Aging in Lubricating Oil)		

3.2.6.1 The specimen for rings 2 inches (51 mm) and under in nominal ID shall be a complete ring; the specimen for rings over 2 inches (51 mm)in nominal ID shall be a piece 3 inches (76 mm) long cut from a ring. The specimen shall be immersed in lubricating oil in accordance with 3.2.2 and, after cooling in air to room temperature, shall be placed in a refrigerator at -40 °C ± 1 (-40 °F ± 2) and held at that temperature for 5 hours ± 0.1. At the end of the refrigeration time, the specimen, while in the refrigerator or within 10 seconds after removal from the refrigerator, shall withstand, without cracking, bending as follows: The complete ring shall be ovalized until the minor axis is equal to 50% of the original ID, and the 3-inch (76-mm) specimen shall be bent around to form a circle.

3.3 Quality:

Rings, as received by purchaser, shall be uniform in quality and condition, smooth, as free from foreign material as commercially practicable, and free from internal imperfections detrimental to usage of the rings. Surface imperfections shall be no greater than permitted by AS871 for minor defects.

3.4 Sizes and Tolerances:

Shall be as specified on the drawing. Standard sizes are as shown in AS568. Inspection for conformance to dimensional requirements sha11 be made in accordance with AS871.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

(R)

The vendor of rings shall supply all samples for vendor's 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 rings conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests:

(R)

Tests for requirements listed in Table 2 are acceptance tests and shall be performed on each lot:

TABLE 2 - Acceptance Tests

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	3.2.1.5
Volume Change in lubricating oil	3.2.2.4
Decomposition in lubricating oil	3.2.2.5
Surface Tackiness in lubricating oil	3.2.2.6
Compression Set	3.2.5
Quality	3.3
Sizes and Tolerances	3.4

4.2.2 **Periodic Tests:** Tests for requirements listed in Table 3 are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser:

TABLE 3 - Periodic Tests

Requirement	Paragraph Reference
Corrosion, as received	3.2.1.4
Hardness Change in lubricating oil	3.2.2.1
Tensile Strength Change in lubricating oil	3.2.2.2
Elongation Change in lubricating oil	3.2.2.3
Hardness Change in processing oil	3.2.3.1
Volume Change in processing oil	3.2.3.2
Decomposition in processing oil	3.2.3.3
Surface Tackiness in processing oil	3.2.3.4
Hardness Change after dry heat exposure	3.2.4.1
Tensile Strength Change after dry heat exposure	3.2.4.2
Elongation Change after dry heat exposure	3.2.4.3
Bend after dry heat exposure	3.2.4.4
Low-Temperature Brittleness	3.2.6.1

4.2.3 **Preproduction Tests:** Tests for all technical requirements are preproduction tests and shall be performed prior to or on the first-article shipment of rings to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.3.1 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, contracting officer, or request for procurement.

4.3 Sampling and Testing:
(R)
Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient rings 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 A lot shall be all rings of the same nominal size from the same batch of
(R) compound processed in one continuous run and presented for vendor's inspection at one time but shall not exceed 1000 rings or 200 pounds (91 kg), whichever is the greater mass. A lot may be packaged in smaller quantities and delivered under the basic lot approval provided lot identification is maintained.