

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 7257B

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Submitted for recognition as an American National Standard

RINGS, SEALING, PERFLUOROCARBON (FFKM) RUBBER High Temperature Fluid Resistant 70 - 80

1. SCOPE:

1.1 Form:

This specification covers a high temperature fluid resistant perfluorocarbon (FFKM) rubber in the form of molded O-rings.

1.2 Application:

These sealing rings have been used typically in applications in contact with air or a variety of fuels, lubricants, and hydraulic fluids from -15 to +290 °C (5 to 555 °F), but usage is not limited to such applications. Each application, however, has to be considered individually. Instances are known when these rings have been used below -15 °C (5 °F) and above 290 °C (555 °F). The cross section of such rings is usually not over 0.275 inch (6.98 mm) in diameter or thickness. Standard sizes are as shown in AS568.

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.

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2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2817 Packaging and Identification, Preformed Packings
 AMS 3021 Reference Fluid for Testing Di-Ester (Polyol) Resistant Materials
 AIR851 O-Ring Tension Testing Calculations
 AS568 Aerospace Size Standard for O-Rings
 AS871 Manufacturing and Inspection Standards for Preformed Packings
 (O-Rings)
 AS1241 Fire Resistant Hydraulic Fluid for Aircraft

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
 ASTM D 2240 Rubber Property - Durometer Hardness

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be a compound, based on a perfluorocarbon (FFKM) elastomer, suitably cured to produce a product meeting the requirements of 3.2.

3.2 Properties:

Rings shall conform to the requirements shown in Table 1; tests shall be performed on slabs and rings as in 4.3.1.1 and in accordance with ASTM D 1414 insofar as practicable except that hardness shall be determined in accordance with ASTM D 2240. Calculations of tensile strength and elongation may be made in accordance with AIR851.

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Methods
3.2.1	As Received:		
3.2.1.1	Hardness, Durometer "A" or equivalent	70 - 80	ASTM D 2240
3.2.1.2	Tensile Strength, minimum	1.5 ksi (10.3 MPa)	
3.2.1.3	Elongation, minimum	120%	
3.2.2	Synthetic Lubricant Resistance		AMS 3021 175 °C ± 3
3.2.2.1	Hardness Change, Durometer "A" or equivalent	-5 to +5	(347 °F ± 5) 70 hours ± 0.5

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Methods
3.2.2.2	Tensile Strength Change, maximum	-10%	
3.2.2.3	Elongation Change, maximum	-15%	
3.2.2.4	Volume Change	0 to +5%	
3.2.3	Hydraulic Fluid Resistance:		AS1241, Type IV, Class 1 or Class 2
3.2.3.1	Hardness Change, Durometer "A" or equivalent	-15 to 0	125 °C $\pm$ 3 (255 °F $\pm$ 5) 70 hours $\pm$ 0.5
3.2.3.2	Tensile Strength Change, maximum	-40%	
3.2.3.3	Elongation Change, maximum	-15%	
3.2.3.4	Volume Change	0 to +15%	
3.2.4	Aromatic Fuel Resistance:		ASTM Ref. Fuel B (ASTM D 471)
3.2.4.1	Hardness Change, Durometer "A" or equivalent	-5 to +5	20 - 30 °C (68 - 86 °F) 70 hours $\pm$ 0.5
3.2.4.2	Tensile Strength Change, maximum	-20%	
3.2.4.3	Elongation Change, maximum	-15%	
3.2.4.4	Volume Change	0 to + 5%	
3.2.5	Dry Heat Resistance:		290 °C $\pm$ 3 (554 °F $\pm$ 5)
3.2.5.1	Hardness Change, Durometer "A" or equivalent	-5 to +5	70 hours $\pm$ 0.5
3.2.5.2	Tensile Strength Change, maximum	-20%	
3.2.5.3	Elongation Change, maximum	-5%	
3.2.5.4	Weight Loss, maximum	5%	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Methods
3.2.6	Compression Set: Percent of Original Deflection, maximum	40%	230 °C ± 3 (446 °F ± 5) 70 hours ± 0.5
3.2.7	Low-Temperature Resistance: Temperature Retraction TR10 Point, maximum	+5 °C (+41 °F)	

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. Inspection for conformance to dimensional requirements shall be made in accordance with AS871. Standard sized are as shown in AS568.

3.5 Part Numbers:

Shall consist of the following:

1. This specification number (AMS 7257)
2. A dash followed by the appropriate dash number from AS568.

Example 1
AMS 7257-014

Example 2
AMS 7257-121

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 Tests for the requirements shown in Table 2 are acceptance tests and shall be performed on each lot of rings.

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
Compression Set	3.2.6

- 4.2.2 Periodic Tests: Tests for the requirements shown 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
Tensile Strength Change in Synthetic Lubricant	3.2.2.2
Elongation Change in Synthetic Lubricant	3.2.2.3
Volume Change in Synthetic Lubricant	3.2.2.4
Volume Change in Hydraulic Fluid	3.2.3.4
Hardness Change After Dry Heat Exposure	3.2.5.1
Temperature Retraction, TR ₁₀ Point	3.2.7

- 4.2.3 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial 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.

4.3 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 Samples for acceptance tests shall be AS568-214 rings and slabs not less than 0.065 inch (1.65 mm) thick.

- 4.3.1.2 (R) A lot shall be all rings of the same size produced from the same batch of compound in one continuous series of operations 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.
- 4.3.1.3 A batch shall be the quantity of compound run through a mill or mixer at one time.
- 4.3.1.4 When a statistical sampling plan has 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 4.5 shall state that such plan was used.
- 4.3.2 For Periodic Tests: As in 4.3.1.
- 4.3.3 For Preproduction Tests: As agreed upon by purchaser and vendor.
- 4.4 Approval:
- 4.4.1 Sample rings shall be approved by purchaser before rings for production use are supplied, unless such approval be waived by purchaser. Results of tests on production rings shall be essentially equivalent to those on the approved samples.
- 4.4.2 Vendor shall establish, for each size of ring, parameters for the process control factors which will produce rings meeting the technical requirements of this specification. These shall constitute the approved manufacturing procedures and shall be used for manufacturing production rings. If necessary to make any change in parameters for the process control factors, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample rings, slabs, or both. Production rings made by the revised procedure shall not be shipped prior to receipt of reapproval.
- 4.4.2.1 Control factors for producing rings include, but are not limited to, the following:
- Compound ingredients and proportions thereof within established limits
 - Sequence of mixing compound ingredients
 - Type of mixing equipment
 - Method and equipment for preparing preforms
 - Basic molding procedure (compression, transfer, injection)
 - Curing time, temperature, and pressure; variations of $\pm 10\%$ are permissible
 - Finishing methods
 - Methods of inspection.
- 4.4.2.1.1 Any of the above process control factors for which parameters are considered proprietary by the vendor may be assigned a code designation. Each variation in such parameters shall be assigned a modified code designation.