SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 7278F

Issued 15 JAN 1960
Revised 1 JUL 1991

Submitted for recognition as an American National Standard

Superseding AMS 7278E

RINGS, SEALING, FLUOROCARBON RUBBER
High-Temperature-Fluid-Resistant
70 - 80

This specification has been declared as "SUPERSEDED" by the Aerospace Materials Division, SAE, as of 17 October 1990. The requirements of this specification are embodied in the latest issue of AMS 7276, RINGS, SEALING, FLUOROCARBON RUBBER, High-Temperature-Fluid-Resistant, Very Low Compression Set, FKM Type, 70 - 80. The requirements of the latest issue of AMS 7276 shall be fulfilled whenever reference is made to this specification.

This specification is under the jurisdiction of AMS Committee "CE".

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400 COMMONWEALTH DRIVE. WARRENDALE. PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 7278E

Issued 1-15-60
Revised 1-1-82

RINGS, SEALING, FLUOROCARBON RUBBER
High-Temperature-Fluid-Resistant
70 - 80

This specification was declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of 10-2-75. It was recommended, therefore, that this specification not be specified for new designs. The following specifications should be considered for applications where the AMS 7278 material would have been suitable:

AMS 7280 Rings, Sealing, Fluorocarbon Rubber, High-Temperature-Fluid-Resistant, Low Compression Set, FKM Type, 70 - 80

AMS 7276 Rings, Sealing, Fluorocarbon Rubber, High-Temperature-Fluid-Resistant, Very-Low Compression Set, FKM Type, 70 - 80

This cover sheet should be attached to the "E" revision of the subject specification.

This specification is under the jurisdiction of AMS Committee "C".

Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 7278E
Superseding AMS 7278D

Issued 1-15-60
Revised 6-1-74

RINGS, SEALING, FLUOROCARBON RUBBER
High-Temperature-Fluid-Resistant
70 - 80

1. SCOPE:

1.1 Form: This specification covers a high-temperature-fluid-resistant fluorocarbon rubber in the form of molded rings.

1.2 Application: Sealing rings primarily for use in contact with air or a variety of fuels, lubricants, and hydraulic fluids at temperatures from -15° C (+5° F) to +260° C (+500° F). The cross section of such rings is usually not over 0.275 in. (6.98 mm) in diameter or thickness. Standard sizes are as shown in AS 568.

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), Aerospace Standards (AS), and Aerospace Information Reports (AIR) 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., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2817 - Packaging and Identification, Preformed Packings

2.1.2 Aerospace Standards:

AS 568 - Aerospace Size Standard for O-Rings
AS 871 - Manufacturing and Inspection Standards for Preformed Packings (O-Rings)

2.1.3 Aerospace Information Report:

AIR 851 - O-Ring Tension Testing Calculations

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

ASTM D1414 - Testing Rubber O-Rings

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on a fluorocarbon elastomer, suitably cured to produce a product meeting all requirements of this specification.

3.2 Properties: The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with ASTM D1414, insofar as practicable. Testing for tensile strength and tensile stress 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 and tensile stress 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, elongation, and tensile stress may be made in accordance with AIR 851.

3.2.1 As Received:

3.2.1.1	Hardness, Durometer "A" or equiv.	75 ± 5
3.2.1.2	Tensile Strength, min	1200 psi (8.27 MPa)
3.2.1.3	Elongation, min	125%
3.2.1.4	Tensile Stress at 100% Elongation, min	350 psi (2.41 MPa)
3.2.1.5	Corrosion	Nil
3.2.1.6	Specific Gravity, variation from approved sample, max	±0.02

3.2.2 Aromatic Fuel Resistance: (Immediate Deteriorated Properties)

Medium: ASTM Ref. Fuel B
Temperature: 20° - 30°C (70° - 86°F)
Time: 70 hr

3.2.2.1	Hardness Change, Durometer "A" or equiv.	-5 to +5
3.2.2.2	Tensile Strength Change, max	-15%
3.2.2.3	Elongation Change, max	-15%
3.2.2.4	Volume Change	0 to +10%

3.2.3 Synthetic Lubricant Resistance: (Immediate Deteriorated Properties)

Medium: ASTM Service Fluid No. 101
Temperature: 200°C ± 3 (392°F ± 5.4)
Time: 70 hr

3.2.3.1	Hardness Change, Durometer "A" or equiv.	-15 to +5
3.2.3.2	Tensile Strength Change, max (based on area before immersion)	-40%
3.2.3.3	Elongation Change, max	-20%
3.2.3.4	Volume Change	0 to +20%

3.2.4 Dry Heat Resistance:

Temperature: 250°C ± 3 (482°F ± 5.4)
Time: 70 hr

3.2.4.1	Hardness Change, Durometer "A" or equiv.	0 to +15
3.2.4.2	Tensile Strength Change, max	-30%

3.2.4.3	Elongation Change, max	-40%
3.2.4.4	Weight Loss, max	8.0%
3.2.4.5	Bend (flat)	No cracking or checking

3.2.5 Compression Set:

Temperature: 200° C ± 3 (392° F ± 5.4)
Time: 70 hr

Percent of Original Deflection, max	
Ring Cross Section Diameter	
0.066 to 0.110 in. (1.68 to 2.79 mm), incl	55
Over 0.110 in. (2.79 mm)	50

3.2.6 Low Temperature Resistance:

Temperature Retraction, TR_{10} point, max	-15° C (+5° 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 internal imperfections detrimental to performance of parts. Surface imperfections shall, unless otherwise specified, be no greater than permitted by AS 871 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 AS 871, unless otherwise agreed upon by purchaser and vendor.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of rings 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 assure that the rings conform 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 or routine control tests and shall be performed on each lot of rings. A lot of rings is defined as all rings of the same size from the same batch of compound processed in one continuous run and submitted for the vendor's inspection at one time. A batch shall be the quantity of compound run through a mill or mixer at one time.

Test	Paragraph Reference
Hardness, as received	3.2.1.1
Tensile Strength, as received	3.2.1.2
Elongation, as received	3.2.1.3
Tensile Stress, as received	3.2.1.4
Specific Gravity, as received	3.2.1.6
Volume Change in fuel	3.2.2.4
Compression Set	3.2.5

4.2.2 Periodic Control Tests: Tests to determine conformance to the acceptance tests of 4.2.1 plus the following tests are classified as periodic control tests and shall be performed on rings produced from a production batch of compound at intervals not greater than 6 months.

Test	Paragraph Reference
Corrosion, as received	3.2.1.5
Tensile Strength Change in oil	3.2.3.2
Elongation Change in oil	3.2.3.3
Volume Change in oil	3.2.3.4
Hardness Change after dry heat exposure	3.2.4.1
Bend after dry heat exposure	3.2.4.5
Temperature Retraction, TR_{10} point	3.2.6

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).

4.3 Sampling: A sufficient number of rings shall be taken from each lot or batch to perform each required test on three specimens.

4.4 Approval:

4.4.1 Sample rings shall be approved by purchaser before rings for production use are supplied. 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 the control factors of processing which will produce rings meeting all requirements of this specification. These shall constitute the approved procedures and shall be used for manufacturing production rings. If necessary to make any change in control factors of processing which could affect quality or properties of the rings, vendor shall submit for reapproval a statement of the revised procedures and, when requested, sample rings. No production rings incorporating the revised procedures shall 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 or 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 and pressure (variations of ±10% are permissible)
Basic and minimum curing temperatures
Finishing methods
Methods of routine inspection

4.4.2.1.1 Any of the above control factors of processing considered proprietary by the vendor may be assigned a code designation. Each variation in such factors shall be assigned a modified code designation.

4.5 Reports:

4.5.1 The vendor of rings shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the acceptance test requirements and a statement that the rings conform to all other technical requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, vendor's compound number batch number, part number, and quantity.