AEROSPACE MATERIAL SPECIFICATION

AMS7259™	REV. F
Issued 1983-01 Revised 2024-09 Superseding AMS7259E	

(R) Rubber: Fluorocarbon (FKM)
High Temperature/Fluid Resistant
Low Compression Set/ 85 to 95 Hardness
For Seals In Fuel Systems and Specific Engine Oil Systems

RATIONALE

Update to latest AMS 7xxx template.

1. SCOPE

1.1 Form

This specification covers a fluorocarbon (FKM) rubber in the form of O-rings, O-ring cord, compression seals, and molded-in-place gaskets for aeronautical and aerospace applications.

1.2 Application

These products have been used typically as sealing rings, compression seals, O-ring cord, and molded-in-place gaskets in contact with air and a wide variety of fuels, lubricants, and specific hydraulic fluids, but usage is not limited to such applications. Each application should be considered individually. This class of fluoroelastomers is not recommended for use in high-temperature stabilized (HTS) engine oils. Each HTS oil should be evaluated separately. This fluorocarbon rubber has a typical service temperature range of -20 to 400 °F (-29 to 204 °C) in air. It is the responsibility of the user to determine that this specification is appropriate for the environments (temperature range, fluids exposure, etc.) in which it is sought to be used.

1.3 Order of Precedence

Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained. This specification is in addition to and in no way limiting, superseding, or abrogating any contractual obligation as required by the applicable procurement document. In the event of conflict in requirements, the order of precedence shall be:

a. Procurement document or contractual agreement and all statutory and regulatory requirements (excluding this document)

b. Applicable purchaser's drawing or SAE ASXXXX Parts Standard

c. Specification referenced on the drawing

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS7259F/

d. This document

e. All specifications referenced in this document

1.4 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 that 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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2817 Packaging and Identification of Molded Elastomeric Seals and Sealing Components

AMS3023 Fluid, Reference for Testing Polyol Ester (and Diester) Resistant Material

AIR851 O-Ring Tension Testing Calculations

AS568 Aerospace Size Standard for O-Rings

AS871 Manufacturing and Inspection Standards for Preformed Packings (O-Rings)

AS3581 Packing, Preformed - O-Ring Seal, AMS7259

AS5316 Storage of Elastomer Seals and Seal Assemblies Which Include an Elastomer Element Prior to Hardware Assembly

AS5752 Aerospace - Visual Inspection Standard for Elastomeric Sealing Elements Other than O-Rings

AS6414 Manufacturing Processing Requirements for Molded Elastomer Components Used in Aerospace Applications

AS6837 Required O-ring Sizes for Quality Conformance Testing

AS9100 Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D297 Rubber Products - Chemical Analysis

ASTM D395 Rubber Property - Compression Set

ASTM D471 Rubber Property - Effect of Liquids

ASTM D573 Rubber - Deterioration in an Air Oven

ASTM D1329 Rubber Property - Retraction at Lower Temperatures (TR Test)

ASTM D1414 Rubber O-Rings

ASTM D1418 Standard Practice for Rubber and Rubber Latices - Nomenclature

ASTM D2240 Rubber Property - Durometer Hardness

2.3 ANSI Accredited Publications

Copies of these documents are available online at https://webstore.ansi.org/.

ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.4 ISO Publications

Copies of these documents are available online at https://webstore.ansi.org/.

ISO 3601-1 Fluid Power Systems - O-rings - Part 1: Inside diameter, cross sections, tolerances and size identification code

2.5 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.p-r-i.org.

PD2000 Procedures for an Industry Qualified Product Management Process

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be prepared from ingredients as shall be necessary to achieve the requirements detailed in this standard and shall be a compound, based on a fluorocarbon elastomer as designated by ASTM D1418 FKM Type 3, suitably cured to produce product meeting the requirements of 3.2. Material used shall be based on 100% virgin fluorocarbon elastomer. No reprocessed or non-fluorocarbon polymer as designated by ASTM D1418 FKM Type 3 is acceptable.

3.1.1 Color

Shall be black or brown. No other color shall be acceptable.

3.2 Properties

The material shall conform to Table 1. Calculations of tensile strength and elongation may be made in accordance with AIR851. Material shall be tested on AS568-214 O-rings to determine the qualification properties.

Table 1 - Qualification properties

Paragraph	Property	Test Sample	Requirement	Test Method
3.2.1	As received			
3.2.1.1	Hardness, durometer Type “A”	AS568-214 O-rings	90 ± 5	ASTM D1414 (ASTM D2240)
3.2.1.1.a	Hardness, durometer Type “A”	Hardness solid button or plied samples	90 ± 5	ASTM D2240
3.2.1.2	Tensile strength, min	AS568-214 O-rings	1400 psi (9.65 MPa)	ASTM D1414
3.2.1.3	Elongation, min	AS568-214 O-rings	100%	ASTM D1414
3.2.1.4	Specific gravity/relative density	AS568-214 O-rings	Qualification value ± 0.02	ASTM D1414 (ASTM D297) (hydrostatic method)
3.2.2	Acceptance test (short term) Compression set Percent of original deflection, max	AS568-214 O-rings	25%	ASTM D1414 (ASTM D395, Method B) 22 hours ± 0.5 hour at 392 °F ± 5 °F (200 °C ± 3 °C)
3.2.3	Long-term compression set Percent of original deflection, max	AS568-214 O-rings	60%	ASTM D1414 (ASTM D395, Method B) 336 hours ± 0.5 hour at 392 °F ± 5 °F (200 °C ± 3 °C)
3.2.4	Low-temperature resistance Glass transition (Tg), inflection, max	AS568-214 O-rings	5 °F (-15 °C)	ASTM D7426
3.2.5	Low-temperature resistance Temperature retraction, 10% (TR_{10}), point, max	AS568-214 O-rings	5 °F (-15 °C)	ASTM D1414 (ASTM D1329)
3.2.6	**Dry Heat Resistance**			
3.2.6.1	Hardness, durometer Type “A” change	AS568-214 O-rings	-5 to +10	ASTM D1414 (ASTM D573) 70 hours ± 0.5 hour at 518 °F ± 5 °F (270 °C ± 3 °C)
3.2.6.2	Tensile strength change, max	AS568-214 O-rings	-45%	
3.2.6.3	Elongation change, max	AS568-214 O-rings	-20%	
3.2.6.4	Weight loss, max	AS568-214 O-rings	10%	See 4.4.1
3.2.7	**Aromatic Fuel Resistance, ASTM Ref. Fuel B**			
3.2.7.1	Hardness, durometer Type “A” change	AS568-214 O-rings	-5 to +5	ASTM D1414 (ASTM D471) 70 hours ± 0.5 hour at 73 °F ± 5 °F (23 °C ± 3 °C) Fluid: ASTM Ref. Fuel B
3.2.7.2	Tensile strength change, max	AS568-214 O-rings	-20%	
3.2.7.3	Elongation change, max	AS568-214 O-rings	-20%	
3.2.7.4	Volume change	AS568-214 O-rings	0 to 5%	
3.2.8	**Synthetic Lubricant Resistance, AMS3023**			
3.2.8.1	Hardness, durometer Type “A” change	AS568-214 O-rings	-15 to 0	ASTM D1414 (ASTM D471)(1) 70 hours ± 0.5 hour at 392 °F ± 5 °F (200 °C ± 3 °C) Fluid: AMS3085
3.2.8.2	Tensile strength change, max	AS568-214 O-rings	-35%	
3.2.8.3	Elongation change, max	AS568-214 O-rings	-20%	
3.2.8.4	Volume change	AS568-214 O-rings	+1 to +25%	
3.2.8.5	Compression set Percent of original deflection, max	AS568-214 O-rings	20%	ASTM D1414 (ASTM D395, Method B)(1) 70 hours ± 0.5 hour at 392 °F ± 5 °F (200 °C ± 3 °C) Fluid: AMS3085

(1) Do not dip specimen in acetone; blot dry residual oil from specimen. Fluid: MIL-PRF-83282.

3.3 Properties After Humidity Aging of Brown Seals Only

For brown seals only, in addition to the requirements of Table 1, the properties shown in Table 2 shall also be determined on brown seals that have been aged for 28 days ± 2 hours at 77 °F ± 4 °F (25 °C ± 2 °C) and 95% ± 3% relative humidity.

Table 2 - Humidity aged properties

Paragraph	Property	Test Sample	Requirements	Test Method
3.3.1.1	Tensile strength, min	AS568-214 O-rings	1400 psi (9.65 MPa)	ASTM D1414
3.3.1.2	Elongation, % min	AS568-214 O-rings	100	ASTM D1414
3.3.1.3	Tensile strength change, % max(2)	AS568-214 O-rings	-15	ASTM D1414
3.3.1.4	Elongation change, % max(2)	AS568-214 O-rings	-15	ASTM D1414
3.3.1.5	Short-term compression set Percent of original deflection, max	AS568-214 O-rings	25	ASTM D1414 (ASTM D395, Method B) Temp: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 22.0 hours ± 0.5 hour
3.3.2	**Dry Heat Resistance After Humidity Age, ASTM D573**			
3.3.2.1	Tensile strength change, % max	AS568-214 O-rings	-45	ASTM D1414 (ASTM D573) Temp: 518 °F ± 5 °F (270 °C ± 3 °C) Time: 70.0 hours ± 0.5 hour
3.3.2.2	Tensile elongation change, % max	AS568-214 O-rings	-25	
3.3.3	**Synthetic Lubricant Resistance, AMS3023(1)**			
3.3.3.1	Tensile strength change, % max(3)	AS568-214 O-rings	-35	ASTM D1414 (ASTM D471) Temp: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 70.0 hours ± 0.5 hour AMS3023 Polyol Ester (and Diester) Fluid ASTM D1414 (ASTM D395, Method B)
3.3.3.2	Tensile elongation change, % max(3)	AS568-214 O-rings	-20	
3.3.3.3	Compression set Percent of original deflection, max	AS568-214 O-rings	15	

(1) Do not dip specimen in acetone; blot dry residual oil from specimen.
(2) Shall be based on the original tensile strength and elongation found when tested to the requirements of Table 1.
(3) Shall be based on the tensile strength and elongation found after aging 28 days ± 2 hours at 77 °F 5 °F (25 °C ± 2 °C) and 95% ± 3% relative humidity.

3.4 Quality

All product, as received by the purchaser, shall be as specified in the AS3581 parts standard, drawing, or purchase document (see 1.3). If not specified, O-ring surface quality shall conform to AS871 requirements. For all other compression seal geometries, the parts other than O-rings shall meet AS5752 Type 2 requirements.

3.5 Dimensions and Tolerances

All dimensions and tolerances shall be as specified in the AS3581 parts standard, drawing, or purchase document (see 1.3). If not specified, O-ring standard sizes and tolerances shall be per AS568. The procedures outlined in Annex B of ISO 3601-1 shall be followed for dimensional inspection.

3.6 Toxicological Formulations

The material shall have no adverse effects on the health of personnel when used for its intended purpose in accordance with manufacturer's instructions and with appropriate handling procedures.

3.7 Qualification

Products sold to this specification shall be listed on the PRI qualified products list (QPL). The online QPL is available at www.eAuditNet.com. The qualified products list shall be in accordance with PD2000 (see 8.2). If no products are listed on the PRI qualified products list, then product qualification shall be as agreed between the purchaser and manufacturer until a QPL is established.

3.7.1 The QPL is a listing of manufacturers of product using a specific compound and not a listing of manufacturers of base polymers used in this specification.

3.7.2 Qualification shall be reapproved every 3 years in accordance with PD2000 and the instructions from the Performance Review Institute. Testing shall be in accordance with this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of product shall supply all samples and shall be responsible for the performance of all required tests. The purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that product conforms to the AMS7259 requirements.

4.1.1 Manufacturer of product to this specification shall be on the current PRI Qualified Manufacturer's List (QML) www.eAuditNet.com.

4.2 Classification of Tests

4.2.1 Batch Testing

4.2.1.1 Batch testing as defined in AS6414.

4.2.1.2 Batch testing on the same batch and state of cure is acceptable as long as the AS568-214 O-rings are cured and tested within 90 days of the manufacture of the subject lot.

4.2.1.3 Batch and the blending of compound as defined in AS6414. All incoming batches and or blended batches shall be tested per Table 3.

Table 3 - Batch test

Paragraph	Property	Test Sample	Requirements	Test Method
4.2.1.2	As received			
4.2.1.2.1	Hardness, durometer Type "A"	AS568-214 O-rings	90 ± 5	ASTM D1414 (ASTM D2240)
4.2.1.2.2	Tensile strength, min	AS568-214 O-rings	1400 psi (9.65 MPa)	ASTM D1414
4.2.1.2.3	Elongation, min	AS83485-214 O-rings	100%	ASTM D1414
4.2.1.2.4	Specific gravity/relative density	AS568-214 O-rings	Preproduction value ± 0.02	ASTM D1414 (D297) Hydrostatic Method
4.2.1.3	Acceptance test (short term) Compression set Percent of original deflection, max	AS568-214 O-rings	25%	ASTM D1414 (D395, Method B) Temp: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 22 hours ± 0.5 hour

4.2.2 Acceptance Tests for O-Rings

4.2.2.1 Lot as defined in AS6414.

4.2.2.2 Acceptance Lot Tests for O-Rings

Requirements shown in Table 4 are acceptance lot tests and shall be performed on each lot on the O-rings being supplied.

The term “Part” in Table 4 shall be interpreted to mean the O-ring shipped. It shall be permitted to use multiple such O-rings, which shall be made from the same lot and batch to perform the applicable test.

O-ring sizes for lot acceptance testing shall be in accordance with AS6837 unless otherwise agreed to between the customer and supplier.

Table 4 - Acceptance lot test for O-rings

Paragraph	Property	Test Sample	Requirements	Test Method
4.2.2.2.1	As received			
4.2.2.2.1.1	Hardness, durometer Type “A”	Part	90 ± 5	ASTM D1414 (ASTM D2240)
4.2.2.2.1.2	Tensile strength, min	Part	1400 psi (9.65 MPa)	ASTM D1414
4.2.2.2.1.3	Elongation, min	Part	100%	ASTM D1414
4.2.2.2.1.4	Specific gravity/relative density	Part	Preproduction value ± 0.02	ASTM D1414 (ASTM D297) hydrostatic method
4.2.2.3	Short term - compression set Percent of original deflection, max O-ring cross-sectional thickness: If 0.064 to 0.110 inch If over 0.110 inch	 Part Part	 35 25	ASTM D1414 (ASTM D395, Method B) Temperature: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 22 hours ± 0.5 hour

NOTE: O-rings from the same lot that have not passed visual inspection but are otherwise expected to meet the physical properties of this specification may be used for specific gravity and compression set testing.

4.2.3 Acceptance Tests for All Other Seal Geometries Other Than O-Rings and Plate Seals

For all seal geometries other than O-rings and plate seals, a suitable test plan shall be agreed upon between the purchaser and supplier. If no specific test plan is established, requirements in 4.2.1, including Table 3 tests, shall be performed.

NOTE: Parts from the same lot that have not passed visual inspection but are otherwise expected to meet the physical properties of this specification may be used for specific gravity and volume swell testing.

4.2.4 Acceptance Tests for Plate Seals

A plate seal is defined as an elastomer bonded to any substrate material whose primary function is to perform as a seal.

For all seal geometries other than O-rings, a suitable test plan shall be agreed upon between the purchaser and supplier. If no specific test plan is established, requirements in 4.2.1, including Table 3 tests, shall be performed.

NOTE: Parts from the same lot that have not passed visual inspection but are otherwise expected to meet the physical properties of this specification may be used for specific gravity and volume swell testing.

4.2.5 Random Sampling

The method shall be as specified in the parts standard, drawing, or purchase document. If not specified, product shall be taken at random from each lot to perform all the required acceptance tests. The number of test iterations for each requirement shall be specified in the applicable test procedure.

4.2.6 Qualification Tests

All technical requirements shall be in accordance with applicable material specification and performed prior to the initial shipment of the product to a purchaser. Any change in process or ingredients that would require requalification are listed in the AS6414 document unless otherwise specified by the purchase order, print, or design data. For initial qualification all specimens shall be from the same production batch and lot using test samples as specified in Table 1.

4.2.6.1 Qualification Test Report:

The supplier of the product shall make a qualification test report available upon request. This report shall include, at a minimum: AMS number, manufacturer's identification and product designation, batch and lot number, date of manufacture, and the results of all qualification tests.

4.3 Inspection

4.3.1 Dimensional and Visual Inspection

4.3.1.1 Prior to inspection, mold flash shall be removed from the parts in such a manner that they conform to the requirements specified herein. For end of process inspection, each individual part (100%) shall be visually inspected at 1X magnification for mold flash, backrind, parting line projection, non-fills, flow lines, and other significant defects in accordance with AS871 or AS5752 requirements. The entire part surface shall be inspected.

4.3.1.2 For final inspection, the sample size shall be in accordance with ANSI/ASQ Z1.4 single sampling plan inspection Level II with an AQL 1.0 except that the acceptance number shall be zero.

The sample unit shall be one part. Inspection shall be according to AS871 or AS5752 requirements as applicable under 2X magnification. In case of disagreement, the visual inspection at 2X magnification shall govern. The entire part surface shall be manually inspected. The procedures outlined in Annex B of ISO 3601-1 shall be followed for dimensional inspection. If the purchaser requires a different sampling plan or visual inspection criteria, the manufacturer shall be informed prior to the time of order

4.4 Test Methods

Shall be as follows:

4.4.1 Weight Loss Tests

The weight loss test shall be conducted on samples air aged at 527 °F ± 5 °F (275 °C ± 3 °C). Test specimens shall be conditioned for 24 hours ± 0.5 hour in a desiccator before and after air aging. The specimens shall be weighed immediately after the desiccation period before and after aging. The percentage weight loss shall be calculated as shown in Equation 1.

$$\text{Weight Loss} = \frac{W_1 - W_2}{W_1} \times 100 \qquad \text{(Eq. 1)}$$

where:

W_1 = weight of sample before air aging

W_2 = weight of sample after air aging