



AEROSPACE MATERIAL SPECIFICATION

AMS7287™**REV. A**Issued 2012-08
Revised 2022-09

Superseding AMS7287

(R) Fluorocarbon Elastomer (FKM)
High Temperature/HTS Oil Resistant/Fuel Resistant
Low Compression Set/70 to 80 Hardness,
Low Temperature Tg -22 °F (-30 °C),
for Seals in Oil/Fuel/Specific Hydraulic Systems

RATIONALE

Update to latest AMS7xxx template.

1. SCOPE

1.1 Form

This specification covers a high temperature, compression set, and fluid resistant fluorocarbon (FKM) elastomer in the form of molded O-rings, molded compression seals, molded O-ring cord, and molded-in-place gaskets for aeronautical and aerospace applications. For sheet, strip, tubing, extrusions, and molded shapes, use the AMS3384 specification.

1.2 Application

These products are expected to be suitable for use in contact with air and a wide variety of fuels, lubricants, specific hydraulic fluids, and a variety of gas turbine engine lubricants, including higher thermo-oxidative stability (HTS) lubricants, including those conforming to MIL-PRF-23699 Class HTS, MIL-PRF-7808 Grade 4, MIL-PRF-83282, and AS5780 Class HPC; however, usage is not limited to such applications. This material type has a typical service temperature range of -40 to +400 °F (-40 to +204 °C). These products are not suitable for use in phosphate ester based hydraulic fluids. Each application should be considered individually. 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:

1. Procurement document or contractual agreement and all statutory and regulatory requirements (excluding this document).
2. Applicable purchaser's drawing or SAE ASXXXX parts standard.
3. Specification referenced on the drawing.

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4. This document.
5. 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 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 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
AMS3085	Fluid, Reference for Testing AS5780 HPC Class (Polyol) Resistant Material (Also Known as Eastman Reference Oil 300)
AIR851	O-Ring Tension Testing Calculations
ARP5316	Storage of Elastomer Seals and Seal Assemblies Which Include an Elastomer Element Prior to Hardware Assembly
AS568	Aerospace Size Standard for O-Rings
AS5752	Aerospace - Visual Inspection Standard for Elastomeric Sealing Elements Other Than O-rings
AS5780	Specification for Aero and Aero-Derived Gas Turbine Engine Lubricants
AS6414	Manufacturing Processing Requirements for Molded Elastomer Components Used in Aerospace Applications
AS6837	Required O-Ring Sizes for Quality Conformance Testing
AS83485	O-Ring Molded from AMS7287 Material

2.2 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-PRF-7808	Performance Specification Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-PRF-83282	Performance Specification: Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537

2.3 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	Standard Test Methods for Rubber Products—Chemical Analysis
ASTM D395	Standard Test Methods for Rubber Property—Compression Set
ASTM D471	Standard Test Method for Rubber Property—Effect of Liquids
ASTM D573	Standard Test Method for Rubber—Deterioration in an Air Oven
ASTM D1329	Standard Test Method for Evaluating Rubber Property—Retraction at Lower Temperatures (TR Test)
ASTM D1414	Standard Test Methods for Rubber O-Rings
ASTM D1418	Standard Practice for Rubber and Rubber Latices - Nomenclature
ASTM D2240	Standard Test Method for Rubber Property—Durometer Hardness
ASTM D7426	Standard Test Method for Assignment of the DSC Procedure for Determining Tg of a Polymer or an Elastomeric Compound

2.4 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

ISO 3601-1	Fluid Power Systems - O-Rings - Part 1: Dimensions and Tolerances
ISO 3601-3	Fluid Power Systems - O-Rings - Part 3: Quality Acceptance Criteria

2.5 PRI Publications

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

PD2000	Procedures for an Industry Qualified Product Management Process
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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.

3.2 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 AS83485-214 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"	AS83485-214 O-rings	75 ± 5	ASTM D1414 (ASTM D2240)
3.2.1.1.a	Hardness, Durometer, Type "A"	Hardness solid button or plied samples	75 ± 5	ASTM D2240
3.2.1.2	Tensile Strength, Min	AS83485-214 O-rings	1600 psi (11.03 MPa)	ASTM D1414
3.2.1.3	Elongation, Min	AS83485-214 O-rings	120%	ASTM D1414
3.2.1.4	Specific Gravity/Relative Density	AS83485-214 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	AS83485-214 O-rings	20%	ASTM D1414 (ASTM D395, Method B) Temp: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 22 hours ± 0.5 hour
3.2.3	Long-Term Compression Set, Percent of Original Deflection, Max	AS83485-214 O-rings	50%	ASTM D1414 (ASTM D395, Method B) Temp: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 336 hours ± 0.5 hour
3.2.4	Low Temperature Resistance, Glass Transition (Tg), Inflection, Max	AS83485-214 O-rings	-20 °F (-29 °C)	ASTM D7426
3.2.5	Low-Temperature Resistance, Temperature Retraction, 10% (TR10), Point, Max	AS83485-214 O-rings	-20 °F (-29 °C)	ASTM D1414 (ASTM D1329)
3.2.6	Dry Heat Resistance			
3.2.6.1	Hardness, Durometer, Type "A" Change	AS83485-214 O-rings	-5 to +5	ASTM D1414 (ASTM D573) Temp: 527 °F ± 5 °F (275 °C ± 3 °C) Time: 70 hours ± 0.5 hour
3.2.6.2	Tensile Strength Change, Max	AS83485-214 O-rings	-35%	
3.2.6.3	Elongation Change, Max	AS83485-214 O-rings	-10%	See 4.4.1
3.2.6.4	Weight Loss, Max	AS83485-214 O-rings	12%	
3.2.7	Aromatic Fuel Resistance, ASTM Ref Fuel B			
3.2.7.1	Hardness, Durometer, Type "A" Change	AS83485-214 O-rings	-5 to +5	ASTM D1414 (ASTM D471) Temp: 73 °F ± 5 °F (23 °C ± 3 °C) Time: 70 hours ± 0.5 hour Fluid: ASTM Ref. Fuel B
3.2.7.2	Tensile Strength Change, Max	AS83485-214 O-rings	-30%	
3.2.7.3	Elongation Change, Max	AS83485-214 O-rings	-20%	
3.2.7.4	Volume Change	AS83485-214 O-rings	1 to 10%	
3.2.8	Synthetic Lubricant Resistance, AMS3085			
3.2.8.1	Hardness, Durometer, Type "A" Change	AS83485-214 O-rings	-10 to 0	ASTM D1414 (ASTM D471) ⁽¹⁾ Temp: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 70 hours ± 0.5 hour Fluid: AMS3085
3.2.8.2	Tensile Strength Change, Max	AS83485-214 O-rings	-35%	
3.2.8.3	Elongation Change, Max	AS83485-214 O-rings	-20%	ASTM D1414 (ASTM D395, Method B) ⁽¹⁾ Temp: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 70 hours ± 0.5 hour Fluid: AMS3085
3.2.8.4	Volume Change	AS83485-214 O-rings	+1 to +20%	
3.2.8.5	Compression Set, Percent of Original Deflection, Max	AS83485-214 O-rings	15%	
3.2.9	Fluid Resistance MIL-PRF-83282 Hydraulic Fluid ASTM D471			
3.2.9.1	Hardness, Durometer, Type "A" Change	AS83485-214 O-rings	-10 to +5	ASTM D1414 (ASTM D471) Temp: 275 °F ± 4 °F (135 °C ± 2 °C) Time: 70 hours ± 0.5 hour Fluid: MIL-PRF-83282
3.2.9.2	Tensile Strength Change, Max	AS83485-214 O-rings	-35	
3.2.9.3	Elongation Change, Max	AS83485-214 O-rings	-30	ASTM D1414 (ASTM D395, Method B) Temp: 275 °F ± 4 °F (135 °C ± 2 °C) Time: 70 hours ± 0.5 hour Fluid: MIL-PRF-83282
3.2.9.4	Volume Change	AS83485-214 O-rings	0 to +10%	
3.2.9.5	Compression Set, Percent of Original Deflection, Max	AS83485-214 O-rings	20%	

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

3.3 Quality

All product, as received by purchaser, shall be as specified in the AS83485 parts standard, drawing, or purchase document (see 1.3). If not specified, O-ring surface quality shall conform to ISO 3601-3 Grade S requirements. For all other compression seal geometries, the parts other than O-rings shall meet AS5752 Type 2 requirements.

3.4 Dimensions and Tolerances

All dimensions and tolerances shall be as specified in the AS83485 parts standard, drawing, or purchase document (see 1.3). If not specified, O-rings standard sizes and tolerances shall be per AS568. The procedures outlined in Annex B of ISO 3601-1 shall be followed for dimensional inspection.

3.5 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.

3.6 Qualification

Products sold to this specification shall be listed on the PRI qualified products list (QPL), Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, phone +1 724-772-1616, fax +1 724-772-1699. 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.

3.6.1 The qualified product list (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.

3.6.2 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 the product shall supply all samples for testing and shall be responsible for performing all required tests. Purchaser reserves the right to sample and perform any testing deemed necessary to ensure that the product conforms to the AMS7287 requirements.

4.1.1 Manufacturer of product to this specification shall be on the current PRI Qualified Manufacturer's List (QML), available online at 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 are acceptable as long as the AS83485-214 O-rings are cured and tested within 90 days of the manufacture of the subject lot.

Batch and the blending of compound as defined in AS6414. All incoming batches and or blended batches shall be tested per Table 2.

Table 2 - Batch test

Paragraph	Property	Test Sample	Requirements	Test Method
4.2.1.3	As Received			
4.2.1.3.1	Hardness, Durometer Type "A"	AS83485-214 O-rings	75 ± 5	ASTM D1414 (ASTM D2240)
4.2.1.3.2	Tensile Strength, Min	AS83485-214 O-rings	1600 psi (11.03 MPa)	ASTM D1414
4.2.1.3.3	Elongation, Min	AS83485-214 O-rings	120%	ASTM D1414
4.2.1.3.4	Specific Gravity/Relative Density	AS83485-214 O-rings	Preproduction value ± 0.02	ASTM D1414 (D297) Hydrostatic Method
4.2.1.4	Acceptance Test (Short Term), Compression Set, Percent of Original Deflection, Max	AS83485-214 O-rings	20%	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

Lot as defined in AS6414.

4.2.2.1 Acceptance Lot Tests for O-Rings

Requirements shown in Table 3 are acceptance lot tests and shall be performed on each lot on the O-rings being supplied.

The term "part" in Table 3 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 3 - Acceptance lot test for O-rings

Paragraph	Property	Test Sample	Requirements	Test Method
4.2.2.3	As Received			
4.2.2.3.1	Hardness, Durometer Type "A"	Part	75 ± 5	ASTM D1414 (ASTM D2240)
4.2.2.3.2	Tensile Strength, min	Part	1600 psi (11.03 MPa)	ASTM D1414
4.2.2.3.3	Elongation, min	Part	120 %	ASTM D1414
4.2.2.3.4	Specific Gravity/Relative Density	Part	Preproduction Value ± 0.02	ASTM D1414 (D297) Hydrostatic Method
4.2.2.4	Short Term, Compression Set, Percent of Original Deflection, Max, O-Ring Cross Sectional Thickness			ASTM D1414 (D395, Method B) Temp: 392 °F ± 5 °F (200 °C ± 3 °C) Time: 22 hours ± 0.5 hour
	If 0.064 to 0.110 inch	Part	25	
	If over 0.110 inch	Part	20	

NOTE: O-rings from the same lot which 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 2 tests) shall be performed.

NOTE: Parts from the same lot which 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 2 tests) shall be performed.

NOTE: Parts from the same lot which 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 ISO 3601-3, Grade S 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 ISO 3601-3, Grade S 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 $527^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($275^{\circ}\text{C} \pm 3^{\circ}\text{C}$). 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.