AEROSPACE MATERIAL SPECIFICATION

AMS7254	REV. B

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Superseding AMS7254A

Perfluoroether Elastomer

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

STABILIZED NOTICE

This document has been declared “Stabilized” by the AMS CE Elastomers Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE

1.1 Form

This specification covers a perfluoroether elastomer in the form of molded rings.

1.2 Application

These rings have been used typically as static sealing rings and molded in place gaskets at temperatures between -65 and +400 °F (-54 and +203 °C). The cross-section of such rings is usually not over 0.275 inch (6.98 mm) in diameter or thickness. The material has resistance to a variety of fuels, engine oils, hydraulic oil, and hydraulic fluid, but usage is not limited to such applications. Each application should be considered individually.

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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent supplied 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 724-776-4970 (outside USA), www.sae.org.

AMS 2817	Packaging and Identification, Preformed Packings
AMS 3023	Fluid, Reference for Testing Polyol Ester (and Diester) Resistant Material
AS568	Aerospace Size Standard for O-Rings
AS871	Manufacturing and Inspection Standard for Preformed Packings (O-Rings)
AS1241	Fire Resistant Phosphate Ester Hydraulic Fluid for Aircraft
AIR851	O-Ring Tension Testing Calculations

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 D 297	Rubber Products - Chemical Analysis
ASTM D 395	Rubber Property - Compression Set
ASTM D 471	Rubber Property - Effects of Liquids
ASTM D 573	Rubber - Deterioration in an Air Oven
ASTM D 1329	Rubber Property – Retraction at Lower Temperatures (TR Test)
ASTM D 1414	Rubber O-Rings
ASTM D 1415	Rubber Property – International Hardness, Micro Method

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

FED-STD-595	Colors Used in Government Procurement
MIL-PRF-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base

2.4 PRI Publications

Available from Performance Research Institute, 161 Thornhill Road, Warrendale, PA 15086-7257, Tel: 724-772-1616, www.pri-network.org

PD 2000	Procedures for an Industry Qualified Product Management Process

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be a compound, based on a perfluoroether elastomer, suitably cured to produce sealing rings meeting the requirements of 3.2. Material used shall be based on 100% virgin perfluoroether elastomer. No reprocessed or non-perfluoroether polymer is acceptable.

3.1.1 Color

Shall be green, approximating FED-STD-595 Table V, color 14193.

3.2 Properties

Rings shall conform to the requirements shown in Table 1; tests shall be performed on AS568 - 214 O-rings, in accordance with ASTM D 1414 and ASTM D 395, insofar as practicable, with the following exceptions. 1) TR-10 shall be performed on test slabs measuring 2.0 mm ± 0.2 in thickness. 2) All compression set fixtures shall be cooled to 72 °F ± 5 and let equilibrate for 30 minutes before releasing the compressive load. 3) Calculations of tensile strength and elongation may be made in accordance with AIR851.

TABLE 1 – PROPERTIES

Property		Requirement	Test Method
3.2.1	Hardness, International Rubber	70 ± 5	ASTM D 1415, Micro Method
3.2.2	Initial Tensile Strength, min	600 psi	ASTM D 1414
3.2.3	Initial Elongation, min	100%	ASTM D 1414
3.2.4	Temperature Retraction, 10% (TR-10), max	-55 °F (-48 °C)	ASTM D 1329
3.2.5	Specific Gravity	Qualification Value ±0.02	ASTM D 297 Hydrostatic Method
3.2.6	Aromatic Fuel Resistance (Immediate Deteriorated Properties)		ASTM D 471 ASTM Ref. Fuel B 73 °F ± 5 (23 °C ± 2) 70 hours ± 0.5
3.2.6.1	Volume Change	0 to +15%	
3.2.6.2	Hardness Change, International Rubber	0 to -15	
3.2.6.3	Tensile Strength Change, max	- 30%	
3.2.6.4	Elongation Change, max	- 20%	
3.2.7	Synthetic Lubricant Resistance		ASTM D 471 AMS 3023 400 °F ± 5 (203 °C ± 2) 70 hours ± 0.5
3.2.7.1	Volume Change	0 to +5%	
3.2.7.2	Hardness Change, International Rubber	0 to -10	
3.2.7.3	Tensile Strength Change, max	-20%	
3.2.7.4	Elongation Change, max	-20%	
3.2.7.5	Compression Set, max	35%	ASTM D 395 Method B(1)
3.2.8	Long-term Compression Set, max	70%	ASTM D 395, Method B(1) AMS 3023 400 °F ± 5 (203 °C ± 2) 500 hours ± 0.5
3.2.9	Dry Heat Resistance		ASTM D 573 400 °F ± 5 (203 °C ± 2) 70 hours ± 0.5
3.2.9.1	Hardness Change, International Rubber	-5 to +5	
3.2.9.2	Tensile Strength Change, max	- 25%	
3.2.9.3	Elongation Change, max	-25%	
3.2.9.4	Compression Set, max	45%	ASTM D 395 Method B(1)
3.2.10	Hydraulic Oil Resistance		ASTM D 471 MIL-PRF-83282 275 °F ± 5 (135°C ± 2) 70 hours ± 0.5
3.2.10.1	Volume Change	0 to +5%	
3.2.10.2	Hardness Change, International Rubber	0 to -10	

Property		Requirement	Test Method
3.2.10.3	Tensile Strength Change, max	-20%	
3.2.10.4	Elongation Change, max	-20%	
3.2.10.5	Compression Set, max	20%	ASTM D 395 Method B(1)
3.2.11	Long-term Compression Set, max	40%	ASTM D 395, Method B(1) MIL-PRF-83282 275 °F ± 5 (135 °C ± 2) 1000 hours ± 0.5
3.2.12	Hydraulic Fluid Resistance		ASTM D 471 AS1241, Type V 300 °F ± 5 (149 °C ± 2) 70 hours ± 0.5
3.2.12.1	Volume Change	0 to +12%	
3.2.12.2	Hardness Change, International Rubber	0 to -15	
3.2.12.3	Tensile Strength Change, max	-20%	
3.2.12.4	Elongation Change, max	-20%	
3.2.12.5	Compression Set, max	20%	ASTM D 395, Method B(1)
3.2.13	Long-term Compression Set, max	45%	ASTM D 395, Method B(1) AS1241, Type V(2) 300 °F±5 (149 °C ±2) 500 hours ±1)

(1) All compression set fixtures shall be cooled to 72°F ± 5 and let equilibrate for 30 minutes before releasing the compressive load.
(2) Fluid to be replaced with new fluid every 7 days ±2 hours.

3.2.14 Corrosion

The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure agreed upon by purchaser and supplier.

3.3 Quality

Seals, 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 seals. Surface imperfections shall be no greater than permitted by AS871 for minor defects. The entire surface of an O-ring is considered a critical sealing surface. Critical sealing surfaces for specialty seals are defined by product drawings and shall be plainly referenced on the drawings.

3.4 Sizes and Tolerances

Shall be as specified on the drawing. Standard sizes are as shown in AS568. If not specified on the drawing, inspection for conformance to dimensional requirements shall be made in accordance with AS871.

3.5 Qualification

Products sold to this specification shall be listed, or approved for listing, on the PRI qualified products list, (QPL). The qualified products list shall be in accordance with PD 2000 (see 8.2).

3.5.1 Qualification shall be re-approved every five years in accordance with PD 2000 and the instructions from the Performance Review Institute.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

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

4.1.1 Manufacturer

Shall be on the current PRI Qualified Manufacturer's List (QML).

4.2 Classification of Tests

4.2.1 Acceptance Tests

Each lot of product shall conform to Table 2.

TABLE 2 - ACCEPTANCE TESTS

Requirement	Paragraph
Hardness	3.2.1
Tensile Strength	3.2.2
Elongation	3.2.3
Specific Gravity	3.2.5
Compression Set	3.2.9.4
Quality	3.3
Sizes and Tolerances	3.4

4.2.1.1 Lot

A quantity of one size of product processed and packaged as one production entity from a batch.

4.2.1.2 Random Sampling

The method shall be specified in a purchase order/contract, otherwise 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.

4.2.1.3 Sample

Shall be end product whenever possible. Suitable test size for o-rings shall be determined by Table 3. When impossible to test the end product, size -214 o-rings molded using the same manufacturing parameters shall be tested.

TABLE 3 - SUITABLE TEST SIZE

1/8 inch Spool	
CS 0.070	-011 to -014

1/4 inch Spool	
CS 0.070	-015 to -021
0.103	-113 to -119
0.139	-211 to -213

1/2 inch Spool	
CS 0.070	-022 to -050
0.103	-120 to -163
0.139	-214 to -258