AEROSPACE MATERIAL SPECIFICATION

AMS7255	REV. D

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Superseding AMS7255C

Rings, Sealing, Tetrafluoroethylene/Propylene Rubber (FEPM) Hydraulic Fluid and Synthetic Oil Resistant 70 to 80

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 subject 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 tetrafluoroethylene/propylene rubber (FEPM) in the form of molded rings.

1.2 Application:

These rings have been used typically as static sealing rings for continuous use from -5 to +232 °C (+23 to +450 °F) in dry air, hydraulic fluids, synthetic lubricants, and high pH chemical decontamination fluids, but usage is not limited to such applications.

1.3 Safety - Hazardous Material:

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.

2.1 SAE Publications:

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

AMS 2817	Identification and Packaging, Preformed Packings
AMS 3023	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)
AS1241	Fire Resistant Phosphate Ester Hydraulic Fluid for Aircraft

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 471	Rubber Property-Effect of Liquids
ASTM D 1329	Rubber Property-Retraction at Low Temperature (TR Test)
ASTM D 1414	Rubber O-Rings
ASTM D 2137	Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be a compound, based on a tetrafluoroethylene/propylene rubber, suitably cured to produce a product meeting the requirement of 3.2.

3.2 Properties:

Rings shall conform to the requirements shown in Table 1; tests shall be performed on the rings supplied except as otherwise specified herein, and in accordance with ASTM D 1414, insofar as practicable. Testing for tensile strength 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 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 and elongation may be made in accordance with AIR851.

(R) TABLE 1 - Properties

	Property	Requirement	Test Method
3.2.1	Hardness, Durometer "A" or equivalent	75 ± 5	
3.2.2	Tensile Strength, min	1600 psi (11.0 MPa)	
3.2.3	Elongation, min	150%	
3.2.4	Specific Gravity	Preproduction Value ± 0.02	
3.2.5	Corrosion	Nil	ASTM D 471 AMS 3023 200 °C ± 3 (392 °F ± 5) 70 hours ± 0.5
3.2.6	Synthetic Oil Resistance:		
3.2.6.1 (R)	Hardness Change, Durometer "A" or equivalent, max	-25	
3.2.6.2	Tensile Strength Change, max	-30%	
3.2.6.3	Elongation Change, max	-20%	
3.2.6.4	Volume Change	0 to +30%	
3.2.7	Oil Resistance:		ASTM D 471 ASTM Reference Oil IRM 903
3.2.7.1	Hardness Change, Durometer "A" or equivalent	0 to -12	150 °C ±3 (302 °F ± 5) 70 hours ± 0.5)
3.2.7.2	Tensile Strength Change, max	-25%	
3.2.7.3	Elongation Change, max	-20%	

(R) TABLE 1 - Properties (Continued)

	Property	Requirement	Test Method
3.2.7.4	Volume Change	0 to + 20%	
3.2.8	Hydraulic Fluid Resistance:		ASTM D 471 AS1241, Type IV, Class 1 100 °C ± 5 (212 °F ± 9) 70 hours ± 0.5
3.2.8.1	Hardness Change, Durometer “A” or equivalent, max	-20	
3.2.8.2	Tensile Strength Change, max	-40%	
3.2.8.3	Elongation Change, max	-20%	
3.2.8.4	Volume Change	0 to +30%	
3.2.9	Dry Heat Resistance:		ASTM D 573 250 °C ± 3 (482 °F ± 0.5) 70 hours ± 0.5
3.2.9.1	Hardness Change, Durometer “A” or equivalent	0 to +10	
3.2.9.2	Tensile Strength Change, max	-25%	
3.2.9.3	Elongation Change, max	-25%	
3.2.9.4	Weight Loss, max	±5%	
3.2.10	Alkaline Fluid Resistance:		ASTM D 471 50% Sodium Hydroxide 100 °C ± 3 (212 °F ± 5) 22 hours ± 0.5
3.2.10.1	Hardness Change Durometer “A” or equivalent	±5	
3.2.10.2	Tensile Strength Change, max	-20%	
3.2.10.3	Elongation Change, max	-15%	
3.2.10.4	Volume Change	0 to +5%	

(R) TABLE 1 - Properties (Continued)

	Property	Requirement	Test Method
3.2.11	Compression Set: Percent of Original Deflection, max	35%	ASTM D 395, Method B 175 °C ± 3 (347 °F ± 0.5) 22 hours ± 0.5
3.2.12	Long-Term Compression Set Percent of Original Deflection, max	50%	ASTM D 395, Method B 175 °C ± 3 (347 °F ± 5) 168 hours ± 1.0
3.2.13	High-Temperature Compression Set: Percent of Original Deflection, max	35%	ASTM D 395, Method B 200 °C ± 3 (392 °F ± 5) 22 hours ± 0.5
3.2.14	Low-Temperature Resistance:		
3.2.14.1	Temperature Retraction TR_{10} point, max	+4 °C (+39 °F)	ASTM D 1329
3.2.14.2	Brittle Point, max	-35 °C (-31 °F)	ASTM D 2137, Method A

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

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of rings shall supply all samples and shall be responsible for 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 Acceptance Tests: Requirements shown in Table 2 are acceptance tests and shall be performed on each lot.

TABLE 2 - Acceptance Test Requirements

Requirements	Paragraph Reference
Hardness	3.2.1
Tensile Strength	3.2.2
Elongation	3.2.3
Specific Gravity	3.2.4
Compression Set	3.2.11

4.2.2 Periodic Tests: Requirements shown in Table 3 are periodic tests and shall be performed at least every six months unless another frequency of testing is specified by purchaser.

TABLE 3 - Periodic Test Requirements

Requirement	Paragraph Reference
Tensile Strength Change in synthetic oil	3.2.6.2
Elongation Change in synthetic oil	3.2.6.3
Volume Change in synthetic oil	3.2.6.4
Hardness Change after dry heat exposure	3.2.9.1
Temperature Retraction TR_{10} point	3.2.14.1

4.2.3 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of rings by the manufacturer, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing:

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 A lot shall be all rings of the same size, from the same batch of compound, processed in one continuous run, and presented for manufacturer's inspection at one time.

4.3.1.2 A batch shall be the quantity of compound run through a mill or mixer at one time.

4.3.1.3 A statistical sampling plan, acceptable to purchaser, may be used in lieu of sampling as in 4.3.1.

4.3.2 For Periodic and Preproduction Tests: Acceptable to purchaser.

4.4 Approval:

4.4.1 Sample rings shall be authorized or as specified 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 Manufacturer 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 procedure and shall be used for manufacturing production rings. If necessary to make any change in parameters for the process control factors, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample rings. Production rings incorporating 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 ±10% are permissible
Finishing methods
Methods of inspection