

INCH-POUND

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SUPERSEDING
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MILITARY SPECIFICATION

RUBBER FLUOROCARBON ELASTOMER, HIGH TEMPERATURE, FLUID, AND COMPRESSION SET RESISTANT

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers high temperature, compression set, and fluid resistant fluorocarbon elastomer sheets, strips, molded parts, an extruded shapes for aeronautical and aerospace applications.

1.2. Classification. Th synthetic rubber shall be furnished in the specified types and classes (see 6.2).

1.2.1 Types. The synthetic rubber types shall consist of the following:

- a. Type I: O-rings and compression seals
- b. Type II: Molded parts (other than sealing devices), sheets, strips, and extruded shapes

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: ASD/ENES, Wright-Patterson AFB, OH 45433-6503 by using the the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5330

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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1.2.2 Classes. The synthetic rubber classes shall be designated as follows:

- a. Class 1: 75 \pm 5 hardness
- b. Class 2: 90 \pm 5 hardness

2. APPLICABLE DOCUMENTS**2.1 Government documents**

2.1.1 Specifications and standards. The following specifications and standards for part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, in the solicitation (see 6.2)

SPECIFICATIONS**FEDERAL**

TT-S-735	Standard Test Fluids; Hydrocarbon
UU-P-268	Paper, Kraft, Wrapping
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-636	Box, Shipping, Fiberboard
PPP-T-45	Tape; Gummed, Paper, Reinforced and Plain, for Sealing and Securing

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MIL-P-4861	Packing, Preformed, Rubber, Packaging of
MIL-R-83248/1	Rubber, fluorocarbon Elastomer, High Temperature, Fluid, and Compression Set, Resistant O-Rings, Class 1, 75 Hardness
MIL-R-83248/2	Rubber, Fluorocarbon Elastomer, High Temperature, Fluid, and Compression Set, Resistant, O-Rings, Class 2, 90 Hardness

STANDARDS**MILITARY**

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-147	Palletized Unit Loads
MIL-STD-289	Visual Inspection Guide for Rubber Sheet Material

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MIL-STD-298	Visual Inspection Guide for Rubber Extruded Goods
MIL-STD-407	Visual Inspection Guide for Rubber Molded Items
MIL-STD-413	Visual Inspection Guide for Elastomeric O-Rings
MIL-STD-2073-1	DoD Material Procedures for Development and Application of Packaging Requirements

(Unless otherwise indicated copies of federal and military specifications and standards are available from the Standardization Documents Order Desk, Building 4D, Robbins Avenue, Philadelphia, PA 19111-5094)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

AS 568 Aerospace Size Standard for O-Rings

(Application for copies should be addressed to Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15059)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 297	Rubber Products, Chemical Analysis of. (DoD adopted)
ASTM D 395	Rubber Property - Compression Set, Tests for (DoD adopted)
ASTM D 412	Rubber Properties in Tension, Tests for. (DoD adopted)
ASTM D 471	Rubber Property - Effect of Liquids, Tests for (DoD adopted)
ASTM D 573	Rubber - Deterioration in an Air Oven - Tests for (DoD adopted)
ASTM D 1329	Evaluating Rubber Property - Retraction at Low Temperatures (TR TEST), Test for (DoD adopted)
ASTM D 1414	Rubber O-Rings, Testing (DoD adopted)
ASTM D 2240	Rubber Property - Durometer Hardness, Tests for (DoD adopted)
ASTM D 3951	Standard Practice for Commercial Packaging

(Applications for copies should be addressed to American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1137)

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INTERNATIONAL CRITICAL TABLES OF NUMERICAL DATA, PHYSICS, CHEMISTRY AND TECHNOLOGY

Laboratory Methods for Maintaining Constant Humidity

(Applications for copies should be addressed to McGraw-Hill Book Co. Inc., 1221 Avenue of the Americas, New York, New York, 10020)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specified exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2) before production is commenced, a sample of the specified rubber shall be submitted or made available to the contracting officer or his authorized representative for approval in accordance with 4.4, 4.4.1, 4.4.2, 4.4.3.1, 4.4.4 and 4.4.5. The approval of the first article sample authorizes the commencement of production, but does not relieve the supplier of responsibility for compliance with all applicable provisions of this specification. The first article sample shall be manufactured in the same facilities to be used for the manufacture of the production items.

3.2 Materials. The cured compound of fluorocarbon elastomer shall be entirely suitable for the intended purpose, and shall be of the same composition as the material used for the first article sample.

3.3 Physical properties. The physical properties of the fluorocarbon elastomer rubber shall conform to the requirements specified in table I, II, III, and IV as applicable.

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TABLE I. Physical properties, type I

	Class 1 (75 hardness)	Class 2 (90 hardness)
Original		
Tensile strength, psi, min	1400	1400
Elongation, %, min.	125	100
Hardness, points	75 ±5	90 ±5
Specific, gravity	As determined	As determined
Temperature retraction, 10% (TR-10) ^o F, max.	+5	+5
Compression set, % of original deflection, max. after 70 hours @ 75 ^o F ±5 ^o F		
under 0.100 inch	20	25
over 0.100 inch	15	20
Air age 70 hours @ 528 ^o F±5 ^o F		
Tensile strength decrease, %, max.	35	45
Elongation decrease, %, max.	15	20
Hardness change, points	+10, -5	+10, -5
Weight loss, %, max.	10	10
Air age 166 hours @ 347 ^o F±5 ^o F		
compression set, % of original deflection, max.		
under 0.100 inch	35	45
over 0.100 inch	20	30
Air age 22 hours @ 392 ^o F±5 ^o F		
compression set, % of original deflection, max.		
under 0.080 inch, inclusive	35	45
0.080 to 0.120 inch, inclusive	20	35
over 0.120 inch	15	25
Oil age 70 hours @ 392 ^o F±5 ^o F in ARM-100		
Tensile strength decrease, %, max.	45	45
Elongation decrease, %, max.	25	25
Hardness change, points	+5, -15	+5, -15
Volume change, %	+1 to +25	+1 to +25
Compression set, % of original deflection, max.		
under 0.100 inch	30	35
over 0.100 inch	10	15
Fuel age 70 hours @75 ^o F±5 ^o F in TT-S-735, type III		
Tensile strength decrease, %, max.	20	20
Elongation decrease, %, max.	20	20
Hardness change, points	+5	+5
Volume change, %	+0.5 to +10	+0.5 to +10

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TABLE II. Physical properties after humidity aging, type I

The following properties shall be determined on O-rings that have been aged for 28 days at 77°F ±2°F and 95 ±3 percent relative humidity.		
	Class 1 (75 hardness)	Class 2 (90 hardness)
Properties		
Tensile strength, psi, min	1400	1400
Elongation, %, min.	125	100
Tensile strength decrease, %, max. <u>1/</u>	10	10
Elongation decrease, %, max. <u>1/</u>	10	10
Air age 70 hours @ 528°F ±5°F		
Tensile strength decrease, %, max. <u>2/</u>	35	45
Elongation decrease, %, max. <u>2/</u>	25	25
Air age 166 hours @ 347°F ±5°F		
Compression set, % of original deflection, max.	20	30
Air age 22 hours @ 392°F ±5°F		
Compression set, % of original deflection, max.	15	25
Oil age 70 hours @ 392°F ±5°F in ARM-100		
Tensile strength decrease, %, max. <u>2/</u>	45	45
Elongation decrease, %, max. <u>2/</u>	25	25
Compression set, % of original deflection, max.	10	15

1/ Shall be based on the original tensile strength and elongation found when tested to the requirements of table I.

2/ Shall be based on the tensile strength and elongation found after aging 28 days at 77°F ±2°F and 95 ±3 percent relative humidity.

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TABLE III. Physical properties, type II

	Class 1 (75 hardness)	Class 2 (90 hardness)
Original		
Tensile strength, psi, min	1600	1600
Elongation, %, min.	125	100
Hardness, points	75 ±5	90 ±5
Specific gravity	As determined	As determined
Temperature retraction, 10% (TR-10) °F, max.	+5	+5
Compression set, % of original deflection, max. after 70 hours @ 75°F ±5°F	10	20
Air age 70 hours @ 528°F±5°F		
Tensile strength decrease, %, max.	35	45
Elongation decrease, %, max.	15	20
Hardness change, points	+10, -5	+10, -5
Weight loss, %, max.	10	10
Air age 166 hours @ 347°F±5°F compression set, % of original deflection, max.	15	25
Air age 22 hours @ 392°F±5°F compression set, % of original deflection, max.	15	20
Oil age 70hours @ 392°F±5°F in ARM-100		
Tensile strength decrease, %, max.	45	45
Elongation decrease, %, max.	25	25
Hardness change, points	+5, -15	+5, -15
Volume change, %	+1 to +25	+1 to +25
Compression set, % of original deflection, max.	15	20
Fuel age 70 hours @75°F±5°F in TT-S-735, type III		
Tensile strength decrease, %, max.	20	20
Elongation decrease, %, max.	20	20
Hardness change, points	+5	+5
Volume change, %	+0.5 to +10	+0.5 to +10

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TABLE IV. Physical properties after humidity aging, type II

The following properties shall be determined on specimens that have been cut from 6 inches by 6 inches by 0.075 inch platen sheets and have been aged for 28 days at 77°F ±2°F and 95 ±3 percent relative humidity.		
	Class 1 (75 hardness)	Class 2 (90 hardness)
Properties		
Tensile strength, psi, min	1600	1600
Elongation, %, min.	125	100
Tensile strength decrease, %, max. <u>1/</u>	10	10
Elongation decrease, %, max. <u>1/</u>	10	10
 Air age 70 hours @ 528°F ±5°F		
Tensile strength decrease, %, max. <u>2/</u>	35	45
Elongation decrease, %, max. <u>2/</u>	25	25
 Air age 166 hours @ 347°F ±5°F		
Compression set, % of original deflection, max.	15	25
 Air age 22 hours @ 392°F ±5°F		
Compression set, % of original deflection, max.	15	25
 Oil age 70 hours @ 392°F ±5°F in ARM-100		
Tensile strength decrease, %, max. <u>2/</u>	45	45
Elongation decrease, %, max. <u>2/</u>	25	25
Compression set, % of original deflection, max.	10	15

1/ Shall be based on the original tensile strength and elongation found when tested to the requirements of table III.

2/ Shall be based on the tensile strength and elongation found after aging 28 days at 77°F ±2°F and 95 ±3 percent relative humidity.

MIL-R-83248B**3.4 Dimensions and tolerances**

3.4.1 Sheets and strips. Unless otherwise specified (see 6.2) the width of the sheet material shall be 36 ± 1 inch, and the tolerances on thickness shall be as shown in table V. The width of strip material, or of shapes cut from sheet, shall be as specified by the procuring activity, within a tolerance of ± 5 percent. The thickness of strip material, other than shapes cut from sheet, shall be as specified by the procuring activity within a tolerance of ± 5 percent, and the length shall be as specified by the procuring activity, within a tolerance of ± 1 percent.

TABLE V. Thickness tolerances for sheet.

<u>Nominal thickness (inch)</u>	<u>Tolerance (inch)</u>
0.060 and less	± 0.010
Over 0.060 to 0.120, inclusive	± 0.016
Over 0.120 to 0.500, inclusive	± 0.031
Over 0.500 to 1.000, inclusive	± 0.047
Over 1.000	± 0.063

3.4.2 Type I dimensions. Dimensions and tolerances of the O-ring shall be in accordance with MIL-R-83248/1 and MIL-R-83248/2, as applicable.

3.4.3 Type II dimensions. Unless otherwise specified (see 6.2) dimensions and tolerances of molded parts (excluding O-rings) and extruded shapes (including tubing) shall be as specified in the contract or order.

3.5 Color. The color of the material furnished to this specification shall be either black or brown. No other color shall be acceptable.

3.6 Identification of material

3.6.1 Sheets and strips. Unless otherwise specified (see 6.2) sheet material (including strips cut from sheets) shall be marked to show the specification number, type, class, and the manufacturer, the manufacturer's designation (compound and lot number), and the cure date by quarter and year; for example 2Q82, thus:

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MIL-R-83248, Type II, Class 2
Compound No.
Lot No.
Cure date
XYZ Co.

The identification shall be applied by suitable means using marking fluid that is not deleterious to the fluorocarbon elastomer. The color shall be white. The marking shall not be obliterated by normal handling. The identification shall recur constantly, from one end of the sheet to the other, in rows spaced approximately 5 inches apart; shall be clear, legible, and not less than three-eighth inch high.

3.6.2 Molded parts and extruded shapes (including tubing). Where the size of the product permits, the identification shall be marked as indicated in 3.6.1. When identification marking of the product is impracticable, the unit package shall show the compound and lot number and manufacturer in addition to those markings specified in 5.3. Temporary marking of O-rings for the manufacturer's identification shall be permitted at the time of manufacture but shall in no way affect the properties or function of the O-rings.

3.7 Workmanship. The product shall be uniform in quality and condition, clean, and free from foreign materials and from defects detrimental to fabrication, appearance, or performance of parts.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use their own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all the applicable requirements of section 3 and 5. They shall meet all inspections set forth in the inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspections as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

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4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.4)
- b. Quality conformance inspection (4.5).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in section 4.

4.3.1 Control fluid. The oil aging in this specification shall be conducted using ARM-100, or approved equal, as the control fluid. The weight percent composition of ARM-100, or approved equal is:

- 95.9% trimethylolpropane triheptanoate (Stauffer 704)
- 1.0% phenyl-alpha-naphthylamine (PANA)
- 1.0% dioctyldiphenylamine (Vanlube 81)
- 2.0% tricresyl phosphate
- 0.1% 2,6-Di-tert-butyl-alpha-dimethylamino-para-cresol (Ethyl 703)

4.3.2 Atmospheric conditions. All fluid cooling, conditioning, and physical property determinations of rubber shall be conducted in an atmosphere of 50 \pm 15 percent relative humidity and at a temperature of 75°F \pm 5°F.

4.4 First article inspection First article tests are to be conducted every three years as a minimum. Each compound formulation shall be subject to first article and conformance testing at the frequency specified in this specification.

4.4.1 Waiver of first article tests. The first article tests need not be repeated for new orders or different parts, provided the materials and processes have not been changed and certified statement to this effect is furnished to the procuring activity. The waiving of the first article tests will be strictly at the discretion of the procuring activity. Test results to previous revisions on this specification are not acceptable. First article tests over three years old shall not be acceptable.

4.4.2 First article samples. Test samples for type I materials shall be O-rings conforming to MIL-R-83248/1 or MIL-R-83248/2, size -214. Hardness shall be determined on specimens of sufficient dimensions to comply with ASTM D2240. Samples for type II material shall be obtained from 6 inches by 6 inches by 0.075 platen sheets.

4.4.3 First article tests. The first article shall meet all the requirements in 3.3 when tested in accordance with 4.6.

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4.4.3.1 Variations. The permissible variations in physical properties during actual production shall be:

- a. Tensile strength, percent ± 20
- b. Elongation, percent ± 20
- c. Hardness, points ± 5
- d. Specific gravity ± 0.02

The variations shall be based on the mean of twenty-five different tests on MIL-R-83248/1 size -214, O-rings, for type I materials and on 6 inches by 6 inches by 0.075 inch platen sheets, for type II materials. A different lot is required for each test. In addition, all physical properties tested shall meet the requirements specified in tables I, II, III, and IV.

4.4.4 Submittal of first article samples. When specified (see 6.2) and as soon as practicable after the award of contract or order, first article samples (see 4.4.2) shall be separately packaged and forwarded to the laboratory designated by the contracting officer. Samples shall be plainly identified by securely attached durable tags, marked with the following information:

- a. Samples for first article inspection
- b. MIL-R-83248B
- c. Document title, i.e., Rubber, Fluorocarbon, etc.
- d. Manufacturer's compound number
- e. Name of manufacturer

4.4.5 First article report. After the supplier completes the first article inspection he shall prepare a first article test report for each type and class. The report shall show completion of inspection and the results of the inspections performed by the contractor to demonstrate that the first article unit(s) conform to the applicable contract technical requirements. The report shall delineate the particular inspection procedure(s), by description or appropriate reference, the specific results obtained, the witnesses, and any other pertinent observations. As applicable, the first article inspection report shall identify any deviations or limitations in the first article unit(s) involved, the recommended actions relating to each deviation or limitation and summary conclusions. Any exceptions, deviations or limitations noted during the tests will be submitted as an enclosure and will reference the appropriate page, paragraph, or column. A copy of the first article test report shall be furnished the Wright Research Development Center, Attn: MLSE, Wright-Patterson Base, OH 45433-6503. An updated test report shall be prepared whenever a change is made in the materials, processes, or this specification.

MIL-R-83248B**4.5 Quality conformance inspection.**

4.5.1 Quality conformance inspection testing. Quality conformance tests shall be required for all production lots of material.

4.5.1.1 Lot. A lot shall consist of all material of the same identity cured in the same production run, from the same batch, and submitted at the same time for inspection.

4.5.1.2 Batch. A batch shall be the quantity of material compounded on a mill or mixer at one time.

4.5.1.3 Sampling. Except where otherwise indicated herein, sampling for quality conformance inspection shall be in accordance with MIL-STD-105.

4.5.1.4 Inspection of material and components. The supplier is responsible for insuring that materials and components used where manufactured, tested, and inspected in accordance with referenced subsidiary specifications and standards to the extent specified, or if none, in accordance with this specification (see 4.1). In the event of conflict, this specification shall govern. Inspection records shall be kept complete and available to the procuring activity at all times.

4.5.2 Sampling plan A. Whenever possible, the end item, or specimens cut from the end item, shall be used as the sample. If these items are unsuitable for use as test samples, tests shall be performed on samples of identical composition and state of cure as that of the end item. The type I O-ring sizes that are suitable for test are shown in table VI. For all other sizes, the tests on type I materials shall be conducted on size -214 O-rings. If the type II items are unsuitable for test, the samples shall be cut from 6 inches by 6 inches by 0.075 inch platen sheets. If at all possible, compression set and specific gravity tests shall be conducted on the end item. The samples shall be subjected to the following tests that are conducted on each lot of material:

Original (Table VIII)

Tensile strength
Elongation
Hardness
Specific gravity

Air aged 22 hours @ 392F ±5F (4.6.5.1)

Compression set

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4.5.2.1 Rejection criteria. A lot shall be rejected upon the failure of the samples to meet the test requirements specified herein. A lot that has been rejected may be reworked to correct the deficiencies and resubmitted for acceptance.

TABLE VI Suitable size test table

<u>1/8" Spool</u>		
CS	.070	-011 to -014
<u>1/4" Spool</u>		
CS	.070	-015 to -021
	.103	-113 to -119
	.139	-211 to -213
<u>1/2" Spool</u>		
CS	.070	-022 to -050
	.103	-120 to -163
	.139	-214 to -258
	.210	-319 to -361
	.275	-425 to -437

4.5.3 Sampling plans B, C, and D. Examination of the end item shall be in accordance with the classification of defects, inspection levels, and acceptable quality levels (AQLs) set forth herein. The lot size, for the purpose of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of O-rings, molded parts, or yards of sheets, strips, or extruded shapes, as applicable for inspection as specified in 4.5.3.1, 4.5.3.2, and 4.5.3.3. If the end item is less than 1 yard, the sample unit shall be the end item.

MIL-R-83248B**4.5.3.1 Sampling plan B – examination for defects in appearance and workmanship**

4.5.3.1.1 Molded parts including O-rings. The sample unit shall be one molded part and the inspection shall be in accordance with MIL-STD-413 for O-rings and MIL-STD-407 for other molded products. The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL related to percent defective shall be 1.5.

4.5.3.1.2 Sheets, strips, and extruded shapes. The sample unit shall be 1 linear yard, except if the end item is less than 1 linear yard, the sample unit shall be the end item. The inspection shall be in accordance with MIL-STD-289 and MIL-STD-298, as applicable. Defects in marking such as “incomplete, not legibly identified”, or not as specified in 5.1, shall be considered minor. The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL related to percent defective shall be 2.5.

4.5.3.2 Sampling plan C – examination for dimensional defects

4.5.3.2.1 Molded parts including O-rings. The sample unit shall be one molded part. The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL related to percent defective shall be 1.5.

4.5.3.2.2 Sheets, strips, and extruded shapes. The sample unit shall be 1 linear yard, except if the end item is less than 1 linear yard, the sample unit shall be the end item. The dimensions shall be within the tolerances specified in 3.4.1. Dimensions for extruded shapes shall be as specified in the contract or order. The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL related to percent defective shall be 1.5.

4.5.3.3 Sampling plan D – inspection for defects in packaging for delivery. An examination in accordance with table VII shall be made to determine that the packaging, packing, and markings comply with section 5 and are in accordance with the applicable methods specified in table VII. The sample unit for this inspection shall be one shipping container fully packed, selected just prior to the closing operation. Shipping containers fully prepared for delivery shall be inspected for closure defects.

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TABLE VII. Packaging inspection.

<u>Inspect</u>	<u>Defect</u>
Packing (O-rings, molded parts, and extruded shapes)	Not the level specified. Not packaged as specified or required. Packaging material, closures not as specified. Unit items not individually wrapped when specified.
(Sheets)	Not interleaved; separator sheets do not fully cover the full area of contact between the sheets.
(Strips)	Stacked over 10 inches high. Not in rolls; not wound on suitable cores. Rolls not wrapped or sealed as specified. Total length per roll varies by more than the indicated tolerances (5.1.1.3.2).
Packing	Not level specified; not in accordance with contract requirements. Container not as specified, closures not accomplished by specified or required methods or materials. Any nonconforming component, component missing, damaged or otherwise defective, affecting serviceability. Inadequate application of components such as; incomplete flaps loose or inadequate strapping bulged or distorted containers.
Count	Less than specified or indicated quantity, linear footage, or units, as applicable.
Weight	Gross weight exceeds specified requirements.
Markings	Interior or exterior markings, as applicable omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements. Date of cure, storage instructions missing.

The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL related to percent defective shall be 2.5.

MIL-R-83248B**4.6 Inspection test methods**

4.6.1 Physical properties tests. Conformance with the rubber product properties shall be determined in accordance with the applicable test methods specified in table VIII.

TABLE VIII. Physical properties tests.

<u>Characteristics</u>	<u>ASTM Method</u>
Hardness	D 2240 (type A)
Tensile strength and elongation	
Type I	D 1414
Type II	D 412, (Use die C for oil aging)
Volume change	D 471
Specific gravity	D 297, hydrostatic method
Temperature retraction (TR-10)	
Type I	D 1414
Type II	D 1329

4.6.2 Air aging at 528°F test. Air aging shall be conducted in accordance with ASTM D 573, except that the rubber shall be aged for 70 hours at 528°F \pm 5°F. Tensile strength, elongation, and hardness changes shall be determined as specified in 4.6.1.

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4.6.2.1 Weight loss test. The weight loss test shall be conducted on samples air-aged in accordance with 4.6.2. Test specimens shall be conditioned for 24 hours in a desiccator before and after air-aging. The specimens shall be weighted immediately after the desiccation period before and after aging. The percentage weight loss shall be calculated as follows:

$$\text{weight loss} = \frac{W_1 - W_2}{W_1} \times 100$$

W_1 = weight of sample before air-aging

where

W_2 = weight of sample after aging.

4.6.3 Oil aging test. Oil aging of specimen's shall be conducted in clean 38 millimeters (mm) OD by 300 mm pyrex glass test tubes fitted with two-hole cork stoppers. Each stopper shall be fitted with two lengths of 8 mm pyrex glass tubing (chimneys), one 3 inch in length, the other 5 inches in length. The 3-inch chimney shall extend through and one-half inch above the top of the stopper. The 5-inch chimney shall extend through and 3-1.2 inches above the top of the stopper. An aluminum block heater shall be used for aging the specimens. Use of an oil bath is permissible, but is not desired. For each test, 140 milliliters (ml) of oil shall be used. The test shall be inserted into the aluminum block or oil bath in such manner that the fluid level in the test tubes shall be approximately 1-5/8 inches above the heating unit of the aluminum block or surface of the oil bath. The distance shall not be measured from the top of the aluminum block or covering of the oil bath. The specimens shall be suspended in the oil by soft iron or nichrome wire hangers as follows:

a. Type I: Three specimens shall be suspended horizontally in the fluid, one each at depths of 1-1/2 inches, 3-1/2 inches, and 5-1/2 inches below the surface of the fluid. Hardness specimens shall be placed in separate chimney stoppered tube keeping approximately the same rubber-to-oil ratio.

b. Type II. Four dumbbells cut with a die "C", conforming to ASTM D 412, shall be tested. There shall be only two specimens aged in a single test tube. The specimens shall be suspended vertically in the fluid, one each at depths of 1 inch and 2 inches below the surface of the fluid. The measurement of specimen depth in the fluid shall be made between the top edge of the specimen and the fluid level. Care shall be taken to prevent contact of specimens with each other or the wall of the test tube.

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4.6.3.1 Oil aging time and temperature. The oil-aging time and temperature shall be 70 hours at 392°F \pm 5°F. After aging and prior to the physical property determinations, the specimens shall be removed from the hot fluid and cooled 30 minutes in fresh fluid. Tensile strength, elongation, hardness, and volume change shall then be determined as specified in 4.6.1.

4.6.4 Fuel aging test. Specimens shall be immersed in test fluid conforming to TT-S-735, type III for 70 hours at 75°F \pm 5°F. The ratio of fluid to rubber shall be approximately 40 ml per gram. Aging shall be conducted in a glass container. An airtight seal shall be maintained for the duration of the test. One sample at a time shall be removed from the fluid, immediately blotted dry, and tested. The tensile strength, elongation hardness and volume change tests shall be conducted in accordance with 4.6.1.

4.6.5 Compression set test. Compression set shall be determined in accordance with ASTM D 395, method B. Specimens for type I materials shall be two O-rings. Two circular plied-up bottoms with dimensions to 1.129 \pm 0.010 inches diameter and approximately 0.5 inch thick shall be used for type II material.

4.6.5.1 Air aged test. Compression set shall be determined on specimens air aged for 70 hours at 75°F +5°F, on specimens air aged for 166 hours at 347°F +5°F and on specimens air aged 22 hours at 392°F +5°F.

4.6.5.2 Oil aged test for specimens. Compression set shall be determined on specimens aged 70 hours 392°F \pm 5°F immersed in ARM-100, or approved equal fluid. The compression set plates for testing type I material shall be approximately 0.375 inches by 2 inches by 4 inches. There shall be six one-fourth inch bolt holes, one on each corner and one located in the middle of each 4-inch edge and on the center line of the corner holes. There shall also be one-fourth inch holes through the middle of each half of the plates to allow fluid to be in contact with the inside diameter of the O-rings. The compression set plates for type I compression seals plates for type I compression seals other than O-rings and type II material shall be in accordance with ASTM D 395. The original thickness of the specimens shall be measured and the test fixtures shall be assembled using two test specimens. The specimens shall be compressed 25 percent. The test fixture shall be placed in a 1 liter stainless steel beaker and 800 milliliters of ARM-100, or approved equal, shall be added to the

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beaker. The beaker shall be fitted with a suitable vented stainless steel cap. The cap shall be sealed with an O-ring conforming to type I, class 1 of this specification (size -240, AS 568 has been used). The beaker shall be placed in a suitable oven at 392°F \pm 5°F with vent open. After the fluid has reached the test temperature (approximately two hours) the vent shall be closed and the beaker left in the oven for a total aging time of 70 hours. At the end of the aging time, the specimens shall be removed from the compression plates immediately and allowed to cool on paper towels for 30 minutes. Excess fluid shall be blotted from the specimens with paper towels and the final thickness determined.

4.6.6 Humidity aged test. Aging shall be conducted in a suitable chamber maintained at 77°F \pm 2°F and 95 \pm 3 percent relative humidity for 28 days. Methods of obtaining these conditions are given in the International Critical Tables of Numerical Data, Physics, Chemistry and Technology, section entitled "Laboratory Methods for Maintaining Constant Humidity". The specimens shall be tested or subsequent exposures initiated within 30 minutes after removal from the humidity chamber.

5. PACKAGING

5.1 Preservation. Preservation shall be level A or C, or commercial as specified (see 6.2).

5.1.1 Level A

5.1.1.1 Type I O-rings. Type I O-rings (require unit pack) shall be packaged in accordance with the requirements of MIL-P-4861.

5.1.1.2 Type II material. Type II material shall be preserved to the MIL-STD-2073 requirements for this level.

5.1.1.3 Type I compression seals other than O-rings and type II material

5.1.1.3.1 Sheets. Rubber sheets shall be interleaved with any suitable paper that will extend over the full area of contact between sheets. Unit quantity shall be a stack not to exceed 10 inches.

5.1.1.3.2 Strip. Rubber strips shall be wound on suitable cores that will provide rigid support and that will not distort nor change shape during handling or shipping. Each roll shall be wrapped in draft paper conforming to UU-P-268 and sealed with tape conforming to PPP-T-45. Unless otherwise specified, each roll shall consist of 75 feet \pm 1 feet of rubber strip.

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5.1.1.3.3 Extruded shapes. Extruded rubber shapes shall be wrapped in any suitable wrapping.

5.1.1.3.4 Molded parts. Molded rubber parts shall be packaged in containers conforming to PPP-B-636. The unit quantity shall be 25, or as specified by the procuring activity (see 6.2).

5.1.2 Level C. Type II material shall be preserved to the MIL-STD-2073-1 requirements for this level. Fluorocarbon elastomer material shall be packaged in a manner which affords adequate protection against deterioration and physical damage during shipment from the supply source to the first receiving activity for immediate use.

5.1.3 Commercial. Type II material shall be preserved in accordance with the applicable requirements of ASTM D 3951.

5.2 Packing. Packing shall be level A, B, C, or commercial as specified (see 6.2).

5.2.1 Level A

5.2.1.1 Type I O-rings. Type I O-rings (requires unit pack) shall be packaged in accordance with the level A requirements of MIL-P-4861.

5.2.1.2 Type I compression seals other than O-rings and type II material. Shipping containers shall contain identical synthetic rubber items of the same shape and size and shall enclose the contents in a snug, tight-fitting manner. The inside height of containers for rubber sheet shall not exceed 10 inches. Rubber strip shall be packaged one roll per container. Containers for extruded rubber shapes shall have an inside maximum cross-sectional area of 36 square inches and, unless otherwise specified by the procuring activity, a maximum length of 10 feet. Unless otherwise specified by the procuring activity, rubber material, other than O-rings shall be packed in wood cleated-plywood shipping container conforming to PPP-B-601, overseas type. As far as practical, containers shall be uniform in shape and size and contain identical quantities. Container closure and strapping shall be in accordance with the appendix to PPP-B-601. Gross weight of containers shall not exceed 200 pounds.

5.2.2 Level B. Type II materials that have been preserved and packaged as specified in 5.1 shall be packaged in exterior type shipping containers that conforms to PPP-B-636, class weather resistant. The closure of the shipping container shall be in accordance with the appendix of the applicable shipping container specification.

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5.2.3 Level C. Type II materials that have been preserved and packaged as specified in 5.1 shall be packed in accordance with the requirements of MIL-STD-2073-1. Fluorocarbon elastomer material preserved and packaged as specified in 5.1.2 shall be packed in manner which affords adequate protection against damage during direct shipment from the supply source to the first receiving activity for immediate use.

5.2.4 Commercial. Type II materials that have been preserved and packaged as specified in 5.1 shall be packed in accordance with the requirements of ASTM D-3951.

5.3 Marking

5.3.1 Level A, B, C. In addition to any special marking or other identification markings required by the contract (see 6.2), each unit pack and exterior container shall be marked in accordance with MIL-STD-129. When applicable, interior packages shall be marked in accordance with 3.6 and as follows:

Rubber (angle, channel, special-shaped section, as applicable)

Type _____, Class _____,

Manufacturer's name and address

Compound number

Cross section and length (inches) or part number

Solid (molded, extruded, as applicable)

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5.3.2 Commercial. Type II material shall be marked in accordance with the applicable requirements of ASTM D-3951.

5.3.3 Palletization. Unitized loads, commensurate with the level of packing specified in the contract or order shall be palletized in accordance with MIL-STD-147. Palletized loads shall be uniform in size and quantities to the greatest extent possible. If the container is of a size which does not conform to any of the pallet patterns specified in MIL-STD-147, the pallet pattern shall first be approved by the contracting officer (see 6.2).

6. NOTES

6.1 Intended use. The rubber procurable to this specification is intended for use where resistance to jet fuel, synthetic engine lubricants and petroleum base hydraulic fluids are required. Generally, materials meeting this specification are usable over temperature range of -20°F to 500°F. Each application, however, has to be considered individually. Instances are known where this material has been used below -20°F and also above 500°F. Material furnished to this specification must be either black or brown in color.

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6.2 Acquisition document. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type and class (sees 1.2)
- c. Material (see 3.2)
- d. Thickness and tolerances (see 3.4)
- e. Dimensions (see 3.4)
- f. Quantity
- g. Detail drawing and additional specification, if any.
- h. Unit quantity of molded parts if other than specified in 5.1.1.3.4.
- i. Whether a first article sample is required (see 3.1).
- j. Applicable levels of preservation and packing (see 5.1 and 5.2).
- k. Any special marking required (see 5.3).
- l. When palletization is required (see 5.3.3)

6.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be first article sample, first production item, or standard production item from the contractors' current inventory and the number of items to be tested as specified in 4.5. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering product which has been previously acquired or tested by the Government and that bidders offering such products, who wish to rely on such production of tests must furnish evidence with the bid that prior Government approval, is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Subject term (key word) listing

Control fluid
Elongation
O-rings
Molded parts
Temperature retraction (TR-10)
Tensile strength

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6.5 Control fluid source. The source for Aerospace Referee Material -100 (ARM- 100) is:

SAE

ATTN: Customer Service Representative

400 Commonwealth Drive

Warrendale, PA 15096

6.6 Change from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - MR

Navy - AS

Air Force - II

Preparing activity:

Air Force - 11

(Project No. 5330-0783)

Review activities:

Navy - SH

Air Force - 82, 99

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

1. RECOMMEND A CHANGE:		1. DOCUMENT NUMBER MTL-R-83248B	2. DOCUMENT DATE (YYMMDD) 90 Jul 13
3. DOCUMENT TITLE Rubber Fluorocarbon Elastomer High Temperature, Fluid, and Compression Set			
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)			
5. REASON FOR RECOMMENDATION			
6. SUBMITTER			
a. NAME (Last, First, Middle Initial)		b. ORGANIZATION	
c. ADDRESS (Include Zip Code)		d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If Applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY			
a. NAME ASD/ENES		b. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (513) 255-6295 785-6295	
c. ADDRESS (Include Zip Code) Wright-Patterson AFB OH 45433-6503		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	