



# AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

485 Lexington Ave., New York, N. Y. 10017

## AMS 7278D

Supersedes AMS 7278C

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### RINGS, SEALING, SYNTHETIC RUBBER High Temperature Fluid Resistant, Fluorocarbon Type 70 - 80

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
2. **FORM:** Molded rings.
3. **APPLICATION:** Sealing rings for use in contact with air or a variety of fuels, lubricants, and hydraulic fluids at temperatures up to 260 C (500 F). Rings may be suitable for use at temperatures appreciably lower than the brittleness point as determined by common tests. The cross section of such rings is usually not over 3/16 in. in diameter or thickness.
4. **TECHNICAL REQUIREMENTS:**
  - 4.1 **Corrosion:** The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service. Discoloration of metal shall not be considered objectionable.
  - 4.2 **Properties:** The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with the issue of specified ASTM methods listed in the latest issue of AMS 2350, insofar as practicable. Tensile strength testing is not required on rings which are too small to permit assembly on rollers for testing and are, after cutting, too short to permit testing as a single strand. Eliminating tensile testing 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. The test of 4.2.6 is not required for routine control.
    - 4.2.1 **As Received:**

|   |        |             |
|---|--------|-------------|
| 4.2.1.1 Hardness, Durometer "A" or equiv.                                   | 75 ± 5 |             |
| 4.2.1.2 Tensile Strength, psi, min  | 1200   | See 4.2.1.6 |
| 4.2.1.3 Elongation, %, min  | 125    | See 4.2.1.6 |
| 4.2.1.4 Tensile Stress at 100% Elongation, psi, min                         | 350    | See 4.2.1.6 |
| 4.2.1.5 Specific Gravity, variation from sample submitted for approval, max | +0.02  |             |
| 4.2.1.6 Use ASTM D1414 for "O" rings; use ASTM D412 for other rings.        |        |             |
    - 4.2.2 **Aromatic Fuel Resistance:**

|                                     |  |                                       |
|-------------------------------------|--|---------------------------------------|
| (Immediate Deteriorated Properties) |  | ASTM D471                             |
|                                     |  | Medium: ASTM Ref. Fuel B              |
|                                     |  | Temperature: 20 - 30 C<br>(68 - 86 F) |
|                                     |  | Time: 70 hr                           |
    - 4.2.2.1 Hardness Change, Durometer "A" or equiv.
 -5 to +5 |  |    - 4.2.2.2 Tensile Strength Change, %, max (based on area before immersion)
 -15 |  |

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|         |  |                            |   |
|---------|--|----------------------------|---|
| 4.2.2.3 | Elongation Change, %, max  | -15                        |   |
| 4.2.2.4 | Volume Change, %   | 0 to +10                   |   |
| 4.2.3   | <u>Synthetic Lubricant Resistance:</u><br>(Immediate Deteriorated Properties)  |                            | See 4.2.3.5   |
| 4.2.3.1 | Hardness Change, Durometer "A"<br>or equiv.  | -15 to +5                  | Medium: ASTM Service<br>Fluid No. 101<br>(ASTM D471)<br>Temperature: 200 C $\pm$ 3<br>(392 F $\pm$ 5.4) |
| 4.2.3.2 | Tensile Strength Change, %, max<br>(based on area before immersion)  | -40                        | Time: 70 hr   |
| 4.2.3.3 | Elongation Change, %, max  | -20                        |   |
| 4.2.3.4 | Volume Change, %   | 0 to +20                   |   |
| 4.2.3.5 | Place 140 ml of test fluid in 38 mm OD x 300 mm long test tubes at room temperature. Immerse test tubes in the heating medium so that 2 in. of each tube extends above the level of the heat transfer oil in oil bath heaters or so that 1 in. of each tube extends above the top insulation of aluminum block or air well heaters. Heat the test fluid to 200 C $\pm$ 3 (392 F $\pm$ 5.4). For rings 1 in. and under in ID, hang three rings in each tube from corrosion resistant steel wire or wires so that the top points of the rings will be 1, 2-1/2, and 4 in. below the surface of the test fluid. For rings over 1 in. but not over 3 in. ID, cut segments from each of three rings, form to 1 in. ID rings, securing the ends of the segments with corrosion resistant steel wire, and hang as for complete rings. For rings over 3 in. ID, cut 5 in. long segments from each of three rings. Hang each segment by a corrosion resistant steel wire so that the segments do not touch each other or the walls of the test tube and so that the mid-length of each segment is at the approximate mid-depth of the test fluid. Stopper the test tubes with new bare, cork stoppers 1-1/2 in. thick having two 8 mm OD glass tubes through the cork, one 3 in. long extending 1 in. below the bottom of the cork and one 5-1/2 in. long extending 3-1/2 in. above the top of the cork. Force the wire or wires from which the rings are hung into the bottom of the cork before inserting in the test tube. After the immersion period, suspend the rings in fresh test fluid at room temperature and allow to cool in this fluid for approximately 30 min. , remove the rings, rinse them briefly in acetone, and blot lightly with filter paper. Determine changes in properties, using the water displacement method for measuring volume change. Record results as the average of the properties for the three specimens. |                            |   |
| 4.2.4   | <u>Dry Heat Resistance:</u>  |                            | ASTM D573   |
| 4.2.4.1 | Hardness Change, Durometer "A"<br>or equiv.  | 0 to +15                   | Temperature: 250 C $\pm$ 3<br>(482 F $\pm$ 5.4)<br>Time: 70 hr  |
| 4.2.4.2 | Tensile Strength Change, %, max  | -30                        |   |
| 4.2.4.3 | Elongation Change, %, max  | -40                        |   |
| 4.2.4.4 | Weight Loss, %, max  | 8.0                        |   |
| 4.2.4.5 | Surface Hardening  | None                       |   |
| 4.2.4.6 | Bend (flat)  | No cracking<br>or checking |   |

4.2.5 Compression Set:

ASTM D395, Method B  
(See 4.2.3.5)

4.2.5.1 Percent of Original Deflection, max  
Ring Cross Section Diameter, Inch

Temperature: 200 C  $\pm$  3  
(392 F  $\pm$  5.4)  
Time: 70 hr

Ø 0.066 to 0.110, incl 55  
Over 0.110 50

4.2.5.2 Percent of Original Thickness, max  
Ring Cross Section Diameter, Inch

Ø 0.066 to 0.110, incl 14  
Over 0.110 13

4.2.5.3 Compression set shall be determined on complete rings if the ID of the ring is 2 in. or less; for larger rings, a section approximately 1 in. long cut from the ring shall be used.

4.2.6 Low Temperature Resistance:

ASTM D1329, modified for  
testing specimens from rings;  
elongate specimen 50%

4.2.6.1 Temperature Retraction,  
TR<sub>10</sub> point, max

-15 C (+5 F)

5. QUALITY: The product shall be uniform in quality and condition, clean, smooth, and free from foreign materials and from internal imperfections detrimental to performance of parts. Surface imperfections shall, unless otherwise specified, be no greater than permitted for Grade A rings in the "O-Ring Inspection Guide, Surface Defects Control", First Edition, published by the Rubber Manufacturers Association, Inc.

6. REPORTS: Unless otherwise specified, the vendor shall furnish with each shipment three copies of a report stating that the product conforms to the requirements of this specification. This report shall include the purchase order number, material specification number, vendor's compound number, batch number unless waived by purchaser, part number, and quantity.

7. PACKAGING AND MARKING: Unless otherwise ordered, rings shall be packaged and identified as follows:

7.1 Individual rings shall be packaged and identified in accordance with the latest issue of AMS 2817 except cure date is not required.

7.2 Sheets or strips of individual ring packages shall be packed in cartons in such a manner that the rings, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any normal hazard. Each carton shall be marked to give the following information:

AMS 7278D  
PART NUMBER \_\_\_\_\_  
PURCHASE ORDER NUMBER \_\_\_\_\_  
QUANTITY \_\_\_\_\_  
COMPOUND NUMBER \_\_\_\_\_  
BATCH NUMBER (Unless waived by purchaser) \_\_\_\_\_  
MANUFACTURER'S IDENTIFICATION \_\_\_\_\_  
DATE OF SHIPMENT \_\_\_\_\_