



AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

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

AMS 3659

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Revised

POLYTETRAFLUOROETHYLENE EXTRUSIONS Premium Strength, Stress Relieved

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **FORM:** Extruded rods, tubes, and shapes.
3. **APPLICATION:** Primarily for parts, such as seals, bearings, insulators, and back-up rings, for use up to 260 C (500 F) requiring chemical inertness and dimensional stability with higher mechanical and electrical properties than AMS 3656.
4. **MATERIAL:** Shall be extruded from polytetrafluoroethylene powder without admixture of fillers, pigments, or adulterants.
5. **TECHNICAL REQUIREMENTS:**
 - 5.1 **General:**
 - 5.1.1 **Color:** May vary from white to mottled gray or brown. Small gray, brown, or black spots shall not in themselves be cause for rejection.
 - 5.2 **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.
 - 5.2.1 **Tensile Strength at 23 C $\pm$ 1** See Note 1
(73.4 F $\pm$ 1.8), psi, min
Nominal Diameter, Inches
Up to 0.500, excl, and all tubes 1800
0.500 to 1.500, incl 1900
Over 1.500 2000
 - 5.2.2 **Elongation at 23 C $\pm$ 1** See Note 1
(73.4 F $\pm$ 1.8), %, min
Nominal Diameter, Inches
Up to 0.500, excl, and all tubes 150
0.500 to 1.500, incl 175
Over 1.500 200
 - 5.2.3 **Specific Gravity at 23 C/23 C** ASTM D792
(73.4 F/73.4 F)
Nominal Diameter, Inches
Up to 0.500, excl, and all tubes 2.14-2.19
0.500 to 1.500, incl 2.15-2.20
Over 1.500 2.15-2.20
Add 2 drops of a wetting agent to the water
 - 5.2.4 **Dielectric Strength (Short time test),** ASTM D149
v per mil, min (See Note 2)
Nominal Diameter, Inches
Up to 0.500, excl, and all tubes 700
0.500 to 1.500, incl 750
Over 1.500 800

5.2.5 Dimensional Stability

See Note 3

Length Change, %, max	
Nominal Diameter, Inches	
Up to 1.500, incl, and all tubes	1.5
Diameter Change, %, max	
Nominal Diameter, Inches	
Up to 1.500, incl, and all tubes	0.5

- Note 1. Tensile strength and elongation shall be determined in accordance with ASTM D638 using a testing speed of 2 in. per min. and measuring elongation over a 2 in. gage length. The test specimen for rod shall conform to Fig. 1 of this specification except that rods 0.250 in. and under in diameter may be tested in full cross-section.
- Note 2. Specimens shall be 0.040 in. $\pm$ 0.001 thick. Test under oil using 1/16 in. diameter corrosion resistant steel electrodes with rounded edges. If flashover is a problem on small diameter rod, specimens shall be prepared by drilling holes from opposite ends of a rod section, leaving a web 0.040 in. $\pm$ 0.001 thick in the middle of the specimen. Electrodes shall be the same as used for the wafer specimen and shall be inserted in the holes in the specimen.
- Note 3. Cut two specimens of rod each 1.000 in. $\pm$ 0.005 in length, and measure their length and diameter to the nearest 0.001 in. at the center point. Mark these points of original measurement so that measurements after heating and cooling are made at the same points. Place the specimens in a heating chamber at approximately 23 C (73 F), raise the temperature of the chamber to 290 C $\pm$ 3 (554 F $\pm$ 5.4). The heating medium may be either oil or air. Hold the specimens at 290 C $\pm$ 3 (554 F $\pm$ 5.4) for 2 hr, then lower the temperature at a rate not exceeding 30 C (54 F) deg per hour to approximately 23 C (73 F). Again measure the length and diameter of the specimens to the nearest 0.001 in. at the center points. Calculate the change in dimensions by the following equation and average the results:

$$D = \frac{L_h - L_i}{L_i} \times 100$$

where: D = dimensional change in percent

L_h = dimension of specimen after heating

L_i = initial dimension of specimen

6. **QUALITY:** The product shall be uniform in quality and condition, clean, smooth, as free from foreign materials as commercially practicable, and free from imperfections detrimental to fabrication, appearance, or performance of parts.
7. **TOLERANCES:** Unless otherwise specified, the following tolerances apply at 23 - 30 C (73.4 - 86 F):

7.1 Rod:

Nominal Diameter Inches	Tolerance, Inch Plus Only
Up to 0.250, incl	0.008
Over 0.250 to 0.500, incl	0.016
Over 0.500 to 0.750, incl	0.020
Over 0.750 to 1.000, incl	0.024
Over 1.000 to 1.250, incl	0.030
Over 1.250 to 1.500, incl	0.038
Over 1.500 to 1.750, incl	0.046
Over 1.750 to 2.000, incl	0.052
Over 2.000 to 2.250, incl	0.068
Over 2.250 to 2.500, incl	0.076

7.2 Tubing:

Nominal OD or ID Inches	ID Tolerance, Inch Minus Only	OD Tolerance, Inch Plus Only
Over 0.187 to 2, incl	0.062	0.062

8. REPORTS:

- 8.1 Unless otherwise specified, the vendor of the product 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, form or part number, and quantity.
- 8.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of material, supplier's compound number, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.
9. PACKAGING: Shall be accomplished in such a manner as to ensure that the product, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any normal hazard.

10. IDENTIFICATION: Each package shall be permanently and legibly marked with the following:

POLYTETRAFLUOROETHYLENE EXTRUSIONS
 Premium Strength, Stress Relieved
 AMS 3659
 SIZE _____
 LOT NUMBER _____
 PURCHASE ORDER NUMBER _____
 QUANTITY _____
 MANUFACTURER'S IDENTIFICATION _____

11. APPROVAL:

- 11.1 To assure adequate performance characteristics, compounds shall be approved by purchaser before material for production use is supplied, unless such approval be waived. Results of tests on production material shall be essentially equivalent to those on the approved sample.
- 11.2 Vendor shall use the same compound and manufacturing processes for production material as for approved sample material. If necessary to make any change in compound or processing which could unfavorably affect any characteristics of the material, vendor shall obtain written permission from purchaser prior to incorporating such change.

12. REJECTION: Material not conforming to this specification or to authorized modifications will be subject to rejection.