

**Polytetrafluoroethylene (PTFE) Moldings
General Purpose Grade, As Sintered**

1. SCOPE:

1.1 Form:

This specification covers virgin, unfilled polytetrafluoroethylene (PTFE) in the form of molded rods, tubes, and shapes. This specification does not apply to product over 12 inches (305 mm) in dimension parallel to the direction of applied molding pressure, rods under 0.750 inch (19.05 mm) in diameter, and tubes having wall thickness under 0.500 inch (12.70 mm).

1.2 Application:

These moldings have been used typically for parts such as seals, bearings, insulators, and back-up rings requiring chemical inertness and good mechanical and electrical properties up to 260 °C (500 °F), but usage is not limited to such applications.

1.3 Classification:

Moldings conforming to this specification are classified as follows:

Type 1: For parts requiring dielectric strength testing (3.3.4).

Type 2: For parts where electrical insulation is not a consideration.

Dielectric strength testing (3.3.4) is not required.

1.3.1 Unless a specific type is ordered, Type 1 shall be supplied.

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1.4 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 following publications form a part of this specification to the extent specified herein. The applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM D 149	Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D 638	Tensile Properties of Plastics
ASTM D 792	Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 1708	Tensile Properties of Plastics by Use of Microtensile Specimens

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 or www.dsp.dla.mil.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The product shall be molded by either compression or isostatic process from polytetrafluoroethylene (PTFE) powder without admixture of fillers, pigments, or adulterants, and sintered.

3.2 Color:

Shall be predominantly white. Surface discoloration from sintering and/or annealing may vary from white to mottled gray or brown. Small gray, brown, or black spots shall not in themselves be unacceptable provided they do not have a detrimental effect on the end usage of the finished product.

3.3 Properties:

The product shall conform to the requirements shown in Table 1; tests shall be performed on the product supplied and in accordance with specified test methods, insofar as practicable.

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.3.1	Tensile Strength at 23 °C ± 1 (73 °F ± 2), minimum	3000 psi (20.7 MPa)	4.5.1
3.3.2	Elongation at 23 °C ± 1 (73 °F ± 2), minimum	200%	4.5.1
3.3.3	Specific Gravity at 23/23 °C (73/73 °F)	2.14 to 2.19	ASTM D 792 Add 2 drops of wetting agent to the water
3.3.4	Dielectric Strength Short Time Test, minimum (applicable only to Type 1 moldings)	750 volts per mil (29.5 kV/mm)	4.5.2

3.4 Quality:

Moldings, as received by purchaser, shall be uniform in quality and condition, smooth, and free from foreign materials and from imperfections detrimental to usage of the moldings.

3.5 Tolerances:

The tolerances shown in Table 2, Table 3, and Table 4 apply at 23 to 30 °C (73 to 86 °F).

3.5.1 Rods:

3.5.1.1 Diameter: Shall be as shown in Table 2.

TABLE 2A - Diameter Tolerances, Inch/Pound Units

Nominal Diameter Inches			Tolerances Inch Plus Only
0.750	to	2.000, incl	0.062
Over 2.000	to	3.000, incl	0.125
Over 3.000	to	5.000, incl	0.187
Over 5.000	to	12.000, incl	0.250

TABLE 2B - Diameter Tolerances, SI Units

Nominal Diameter mm	Tolerances mm Plus Only	
	19.05 to 50.80, incl	1.57
Over 50.80 to 76.20, incl	3.18	
Over 76.20 to 127.00, incl	4.75	
Over 127.00 to 304.80, incl	6.35	

3.5.2 Tubes:

3.5.2.1 Diameter: Shall be as shown in Table 3.

TABLE 3A - Diameter Tolerances, Inch/Pound Units

Nominal OD or ID Inches	ID Tolerance Inch Minus Only	OD Tolerance Inch Plus Only
	Up to 2.000, incl	0.062
Over 2.000 to 3.000, incl	0.125	0.125
Over 3.000 to 5.000, incl	0.187	0.187
Over 5.000 to 12.000, incl	0.250	0.250

TABLE 3B - Diameter Tolerances, SI Units

Nominal OD or ID Millimeters	ID Tolerance Millimeters Minus Only	OD Tolerance Millimeters Plus Only
	Up to 50.80, incl	1.57
Over 50.80 to 76.20, incl	3.18	3.18
Over 76.20 to 127.00, incl	4.75	4.75
Over 127.00 to 304.80, incl	6.35	6.35

3.5.2.2 Out of Roundness: Shall be as shown in Table 4.

TABLE 4A - Maximum Out of Roundness Tolerances, Inch/Pound Units

Nominal OD Inches	Out of Round Inch (See 3.5.2.1)
	Up to 2.000, incl
Over 2.000 to 3.000, incl	0.093
Over 3.000 to 5.000, incl	0.125
Over 5.000 to 8.000, incl	0.187
Over 8.000 to 12.000, incl	0.250

TABLE 4B - Maximum Out of Roundness Tolerances, SI Units

Nominal OD mm		Out of Round Millimeters (See 3.5.2.1)
Up to	50.80, incl	1.57
Over	50.80 to 76.20, incl	2.36
Over	76.20 to 127.00, incl	3.18
Over	127.00 to 203.20, incl	4.75
Over	203.20 to 304.80, incl	6.35

3.5.2.1.1 Out of Round is half the difference of the largest and smallest OD measurements (total indicator reading) at locations 90 degrees apart at any distance along a tube.

3.5.3 Shapes: As agreed upon by purchaser and supplier.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of moldings shall supply all samples for required tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the moldings conform to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of moldings by the manufacturer on each lot, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

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

4.3 Sampling and Testing:

4.3.1 For Acceptance Tests: Sufficient moldings 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 moldings of the same configuration made from the same batch of compound in one production run and presented for manufacturer's inspection at one time. A lot shall consist of not more than 200 pounds (91 kg) of moldings.

4.3.1.2 When a statistical sampling plan has been agreed upon by purchaser and supplier, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 shall state that such plan was used.

4.3.2 For Preproduction Tests: Acceptable to purchaser.

4.4 Approval:

4.4.1 Sample moldings shall be approved by purchaser before moldings for production use are supplied, unless such approval be waived by purchaser. Results of tests on production moldings shall be essentially equivalent to those on the approved sample.

4.4.2 Manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production moldings which are essentially the same as those used on the approved sample. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample moldings. Production moldings made by the revised procedure shall not be shipped prior to receipt of approval.

4.5 Test Methods:

4.5.1 Tensile Strength and Elongation: Shall be determined in accordance with ASTM D 638, using the microtensile specimen of ASTM D 1708. The initial jaw separation shall be 0.875 inch \pm 0.005 (22.22 mm \pm 0.13) and the speed of testing shall be 2 inches per minute (0.8 mm/s). Specimens shall be prepared from slices 0.031 inch \pm 0.002 (0.79 mm \pm 0.05) thick and cut from the product.

4.5.2 Dielectric Strength: Shall be determined in accordance with ASTM D 149 under oil on 0.020 inch \pm 0.002 (0.51 mm \pm 0.05) thick specimens. When practicable, specimens shall be 1 inch (25 mm) in nominal diameter but may be 0.50 inch (12.7 mm) in nominal diameter if 1 inch (25 mm) diameter specimens cannot be obtained from the product. Electrodes shall be of corrosion-resistant steel, nominally 0.25 inch (6.35 mm) in diameter with 0.031 inch (0.79 mm) radius at the edges for 1 inch (25 mm) diameter specimens and nominally 0.062 inch (1.57 mm) in diameter with rounded edges for 0.50 inch (12.7 mm) diameter specimens.

4.6 Reports:

The supplier of moldings shall furnish with each shipment a report showing the results of tests to determine conformance to the technical requirements. This report shall include the purchase order number, lot number, AMS 3660C, type, manufacturer's identification, form and size or part number, and quantity.

4.7 Resampling and Retesting:

If any specimen used in the above test fails to meet the specified requirements, disposition of the moldings may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the moldings represented. Results of all tests shall be reported.