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AEROSPACE MATERIAL SPECIFICATION

AMS 3661B
Superseding AMS 3661A

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POLYTETRAFLUOROETHYLENE FILM
Premium Grade

1. SCOPE:

1.1 Form: This specification covers one grade of polytetrafluoroethylene resin in the form of film.

1.2 Application: Primarily for gaskets and other parts for use up to 260°C (500°F) requiring exacting performance in mechanical, electrical, or chemical service.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D149 - Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D638 - Tensile Properties of Plastics
ASTM D792 - Specific Gravity and Density of Plastics by Displacement
ASTM D1389 - Dielectric Proof-Voltage Testing of Thin Solid Electrical Insulating Materials
ASTM D1708 - Tensile Properties of Plastics by Use of Microtensile Specimens

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material: Film shall, unless otherwise permitted by purchaser, be produced by skiving billets molded or extruded from polytetrafluoroethylene powder without admixture of fillers, pigments, or adulterants.

3.2 Color: Shall be opaque white. Minor discolorations or contamination shall not in themselves be unacceptable.

3.3 Properties: Film shall conform to the following requirements; tests shall be performed on the film supplied and in accordance with specified test methods, insofar as practicable:

3.3.1 Tensile Strength at 23°C ± 1 (73°F ± 2), min — 4.5.1

Nominal Thickness		
Inch	Millimetre	
Up to 0.005, excl	Up to 0.12, excl	3600 psi (25.0 MPa)
0.005 and over	0.12 and over	4000 psi (27.5 MPa)

3.3.2 Elongation (Applicable Only to Widths 0.375 in. (9.5 mm) and over) at 23°C ± 1 (73°F ± 2), min — 4.5.1

Nominal Thickness		
Inch	Millimetre	
Up to 0.005, excl	Up to 0.12, excl	270%
0.005 and over	0.12 and over	300%

3.3.3 Specific Gravity at 23°/23°C (73°/73°F) — 2.14 - 2.21 — ASTM D792 Add 2 drops of wetting agent to the water

3.3.4 Dielectric Strength, Short Time Test, min — 4.5.2

Specimen Thickness		
Inch	Millimetre	
0.003	0.08	2580 V per mil (101,550 V/mm)
0.005	0.12	2000 V per mil (78,750 V/mm)
0.010	0.25	1410 V per mil (55,500 V/mm)

3.3.5 Electrical Flaws: When specified, film 0.003 - 0.010 in. (0.08 - 0.25 mm) incl, in nominal thickness and 2 in. (50 mm) and over in width shall show not more than 50 electrical flaws per 100 ft (30.5 m) of length, determined in accordance with ASTM D1389 at a film-movement speed of 25 ft per min. ± 5 (125 mm/sec ± 25). Other methods of test may be used when agreed upon by purchaser and vendor.

3.4 Quality: Film, as received by purchaser, shall be uniform in quality and Ø condition, clean, smooth, and free from foreign materials and from internal and external imperfections detrimental to usage of the film.

3.5 Tolerances: Unless otherwise specified, the following tolerances apply at 23° - 30°C (73° - 86°F):

TABLE I

Nominal Thickness Inch	Nominal Width Inches	Thickness, Tolerance Inch	
		plus	minus
0.002 to 0.003, incl	Up to 2, incl	0.0005	0.0003
Over 0.003 to 0.005, incl	2 to 12, incl	0.0005	0.0005
Over 0.005 to 0.015, incl	2 to 12, incl	0.0010	0.0010
Over 0.015 to 0.040, incl	2 to 12, incl	0.0015	0.0015
Over 0.040 to 0.061, incl	2 to 12, incl	0.0020	0.0020
Over 0.061 to 0.125, incl	2 to 12, incl	0.005	0.005

TABLE I (SI)

Nominal Thickness Millimetres	Nominal Width Millimetres	Thickness, Tolerance Millimetre	
		plus	minus
0.05 to 0.08, incl	Up to 50, incl	0.012	0.008
Over 0.08 to 0.12, incl	50 to 300, incl	0.012	0.012
Over 0.12 to 0.38, incl	50 to 300, incl	0.025	0.025
Over 0.38 to 1.00, incl	50 to 300, incl	0.038	0.038
Over 1.00 to 1.55, incl	50 to 300, incl	0.050	0.050
Over 1.55 to 3.12, incl	50 to 300, incl	0.12	0.12

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of film shall supply all samples for vendor's tests and shall be responsible for performing all required Ø tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the film conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of film to a purchaser, when a change in material or processing, or both, requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

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

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient film 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 film of the same thickness made from the same batch of compound in one production run and presented for vendor's inspection at one time.

4.3.1.2 An inspection lot shall be not more than 200 lb (90 kg) of film. A lot may be packaged or delivered in small quantities under the basic lot approval provided lot identification is maintained.

4.3.1.3 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6.1 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

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

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

4.5 Test Methods:

4.5.1 Tensile Strength and Elongation: Shall be determined in accordance with ASTM D638, using the micrctensile specimen of ASTM D1708. The initial jaw separation shall be 0.875 in. ± 0.005 (22.00 mm ± 0.12) and the speed of testing shall be 2 in. (50 mm) per minute. Specimens shall be cut with the long axis parallel to the skive marks. Product over 0.062 in. (1.55 mm) thick shall be machined to 0.062 in. ± 0.016 (1.55 mm ± 0.40) thick before cutting specimens.

4.5.2 Dielectric Strength: Shall be determined in accordance with ASTM D149 on specimens sufficiently large to prevent flashover and using electrodes of corrosion-resistant steel, nominally 0.25 in. (6.25 mm) in diameter with 0.031 in. (0.80 mm) radius at the edges. Tests shall be conducted in air for specimens up to 0.010 in. (0.25 mm), incl, in thickness and under oil for thicker specimens. The dielectric strength requirement for thicknesses other than those specified in 3.3.4 shall be calculated from the equation:

$$S = 1000\sqrt{\frac{K}{t}}$$

where, S = dielectric strength in V per mil (mm)
K = 20 in inch/pound units or 787.4 in SI units
t = film thickness in mils (mm)

4.6 Reports:

4.6.1 The vendor of film shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 3661B, vendor's compound number, size, and quantity.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, AMS 3661B, contractor or other direct supplier of film, supplier's compound number, part number, and quantity. When film for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of film to determine conformance to the requirements of this specification and shall include in the report either a statement that the film conforms or copies of laboratory reports showing the results of tests to determine conformance.