



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 3666B
Superseding AMS 3666A

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POLYTETRAFLUOROETHYLENE SHEET, GLASS FABRIC REINFORCED

1. SCOPE:

- 1.1 Form: This specification covers glass-fabric-reinforced polytetrafluoroethylene resin in the form of sheet.
- 1.2 Application: Primarily for electrical, electronic, and mechanical applications requiring a composite having the high strength and nondeforming characteristics of woven glass fabric and the electrical, chemical, and heat resistance and the anti-stick and low-friction properties of polytetrafluoroethylene resin.

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 Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 3824 - Cloth, Type "E" Glass, Finished for Resin Laminates

- 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 Electrical Insulating Materials at Commercial Power Frequencies
ASTM D257 - D-C Resistance or Conductance of Insulating Materials
ASTM D618 - Conditioning Plastics and Electrical Insulating Materials for Testing
ASTM D774 - Bursting Strength of Paper
ASTM D902 - Flexible Resin-Coated Glass Fabrics and Glass Fabric Tapes Used for Electrical Insulation
ASTM D1389 - Dielectric Proof-Voltage Testing of Thin Solid Electrical Insulating Materials

- 2.3 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: Shall consist of woven glass fabric impregnated and coated on both sides with polytetrafluoroethylene resin, the resin being fused after application to the fabric. The surfaces shall be smooth and free of pronounced ripples.

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3.1.1 Glass Fabric: Shall conform to the requirements of AMS 3824 applicable to the style number shown for each nominal thickness:

| Nominal Thickness of Coated Fabric | | Fabric Style |
|---------------------------------------|--------------|--------------|
| Inch | (Millimetre) | |
| 0.003 | (0.08) | 108 |
| 0.005 | (0.13) | 116 |
| 0.006 | (0.15) | 116 |
| 0.010 | (0.25) | 128 |

3.2 Color: Shall be unbleached (light to dark brown).

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

3.3.1 As-Received:

3.3.1.1 Breaking Strength, Warp Threads, min ASTM D902

| Nominal Thickness | | | |
|-------------------|--------------|------------------|-------------|
| Inch | (Millimetre) | lb per in. width | (N/m width) |
| 0.003 | (0.08) | 35 | (6130) |
| 0.005 | (0.13) | 50 | (8760) |
| 0.006 | (0.15) | 50 | (8760) |
| 0.010 | (0.25) | 200 | (35020) |

3.3.1.2 Dielectric Strength, min 4.5.1

| Nominal Thickness | | | |
|-------------------|--------------|-----------|----------|
| Inch | (Millimetre) | V per mil | (V/mm) |
| 0.003 | (0.08) | 700 | (27,560) |
| 0.005 | (0.13) | 600 | (23,620) |
| 0.006 | (0.15) | 600 | (23,620) |
| 0.010 | (0.25) | 500 | (19,680) |

3.3.1.3 Volume Resistivity, min 1×10^{11} ohm-cm 4.5.2

3.3.1.4 Electrical Flaws, max 4.5.3

10 per yd (11/m)

3.3.1.5 Bursting Strength, min 4.5.4

| Nominal Thickness | | | |
|-------------------|--------------|-----|-------|
| Inch | (Millimetre) | psi | (kPa) |
| 0.003 | (0.08) | 25 | (172) |
| 0.005 | (0.13) | 25 | (172) |
| 0.006 | (0.15) | 25 | (172) |
| 0.010 | (0.25) | 100 | (690) |

3.3.2 Heat Resistance: 4.5.5

3.3.2.1 Dielectric Strength, min 60% of as-received value

- 3.4 **Quality:** Sheet shall be uniform in quality and condition, clean, smooth, and free from foreign materials and from imperfections detrimental to fabrication, appearance, or performance of parts.
- 3.5 **Tolerances:** Unless otherwise specified, the following tolerances shall apply; measurements shall be made in accordance with ASTM D902:

| <u>Nominal Thickness</u> | | <u>Tolerance, plus and minus</u> | |
|--------------------------|--------------|----------------------------------|--------------|
| Inch | (Millimetre) | Inch | (Millimetre) |
| 0.003 | (0.08) | 0.0005 | 0.013 |
| 0.005 | (0.13) | 0.0005 | 0.013 |
| 0.006 | (0.15) | 0.001 | 0.03 |
| 0.010 | (0.25) | 0.001 | 0.03 |

4. QUALITY ASSURANCE PROVISIONS:

4.1 **Responsibility for Inspection:** The vendor of sheet shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the sheet conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 **Acceptance Tests:** Tests to determine conformance to the following requirements are classified as acceptance tests and shall be conducted on each lot of sheet:

| Requirement | Reference Paragraph |
|---------------------------------|---------------------|
| Breaking Strength | 3.3.1.1 |
| Dielectric Strength as received | 3.3.1.2 |
| Electrical Flaws | 3.3.1.4 |
| Bursting Strength | 3.3.1.5 |
| Tolerances | 3.5 |

4.2.2 **Qualification Tests:** Tests to determine conformance to all technical requirements of this specification are classified as qualification tests and may be the basis for approval of the sheet (See 4.4.1).

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

4.3 **Sampling:** Shall be as follows; a lot shall be all sheet produced in a single production run from the same batches of raw materials and presented for vendor's inspection at one time:

4.3.1 **Acceptance Tests:** Sufficient sheet shall be taken at random from each lot to perform all required tests. Except as specified in 4.3.1.1, the number of specimens for each test shall be as specified in the applicable test procedure or, if not specified therein, not less than three, with the further exception that, in either case, the electrical flaws test shall be performed on each sheet.

4.3.1.1 When a statistical sampling plan and acceptable quality level (AQL) for the sheet 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 **Qualification Tests:** As agreed upon by purchaser and vendor.

4.4 Approval:

- 4.4.1 Sample sheet shall be approved by purchaser before sheet for production use is supplied, unless such approval be waived. Results of tests on production sheet 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 sheet which are essentially the same as those used on the approved sample sheet. If any change is necessary 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 and processing and, when requested, sample sheet. Production sheet made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

- 4.5.1 Dielectric Strength: Shall be determined in accordance with ASTM D149, short time test, on specimens conditioned in accordance with ASTM D618, Procedure A, using rod-type electrodes and 500 - 600 V per sec rate of rise to breakdown.
- 4.5.2 Volume Resistivity: Shall be determined in accordance with ASTM D257 on specimens conditioned in accordance with ASTM D618, Procedure A.
- 4.5.3 Electrical Flaws: Shall be determined in accordance with ASTM D1389 at 200 - 250 V per mil (7870 - 9840 V/mm) and a speed of 25 ft per min. ± 5 (127 mm/sec ± 25). Flaws shall be marked with a crayon within a 1-in. (25-mm) diameter circle. Testing within 1 in. (25 mm) of the edges is not required.
- 4.5.4 Bursting Strength: Shall be determined in accordance with ASTM D774 in areas determined by 4.5.3 to be free of electrical flaws.
- 4.5.5 Heat Resistance: Specimens of sheet shall be conditioned at 275°C ± 3 (527°F ± 5) for 400 hr ± 2 . The specimens shall then be tested as in 4.5.1 for dielectric strength.

4.6 Reports:

- 4.6.1 The vendor of sheet shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the sheet conforms to the other technical requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, vendor's material designation, 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, material specification number and its revision letter, contractor or other direct supplier of sheet, supplier's compound number, part number, and quantity. When sheet for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of sheet to determine conformance to the requirements of this specification, and shall include in the report a statement that the sheet conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.
- 4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the sheet 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 sheet represented and no additional testing shall be permitted. Results of all tests shall be reported.