



AEROSPACE MATERIAL

Society of Automotive Engineers, Inc. SPECIFICATION

400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 3646A

Superseding AMS 3646

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POLYCHLOROTRIFLUOROETHYLENE SHEET Molded, Unplasticized

1. SCOPE:

- 1.1 **Form:** This specification covers polychlorotrifluoroethylene in the form of molded sheet 0.250 in. and under (6.35 mm) in nominal thickness.
- 1.2 **Application:** Primarily for parts requiring chemical inertness and toughness up to 200°C (390°F) or high frequency electrical insulating properties up to 165°C (330°F). The material also may be used at cryogenic temperatures.

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

- 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 D618 - Conditioning Plastics and Electrical Insulating Materials for Testing

ASTM D638 - Tensile Properties of Plastics

ASTM D792 - Specific Gravity and Density of Plastics by Displacement

ASTM D1430 - Polychlorotrifluoroethylene (PCTFE) Plastics

ASTM D1708 - Tensile Properties of Plastics by Use of Microtensile Specimens

- 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 be manufactured from virgin, unplasticized, polymer of polychlorotrifluoroethylene.

∅ 3.2 **Condition:** Annealed.

- 3.3 **Color:** May range from natural translucent white to gray; localized discoloration resulting from processing will be acceptable.
- ∅

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3.4 **Properties:** The product shall conform to the following requirements; tests shall be performed on the sheet supplied and in accordance with specified test methods, insofar as practicable:

- 3.4.1 **Tensile Strength at 23°C ± 1 (73°F ± 2),**
min avg 4800 psi 4.5.1
(33.1 MPa)
- 3.4.2 **Elongation at 23°C ± 1 (73°F ± 2),**
min 100% 4.5.1
- 3.4.3 **Dielectric Strength at 23°C ± 1 (73°F ± 2), min** 500 V per mil 4.5.2
(19,700 V. mm)
- 3.4.4 **Specific Gravity, at 23°/23°C (73°/73°F)** 2.10 - 2.14 ASTM D792,
Method A
- 3.4.5 **Zero Strength Time at 250°C ± 2** 300 sec ASTM D1430
(482°F ± 4), min

3.4.6 **Dimensional Stability:** No dimension of sheet or fabricated parts shall change more than 0.003 in. per in. (0.003 mm/mm), measured at 20° - 30°C (68° - 86°F) before and after being held for 48 hr ± 5 at 70°C ± 5 (158°F ± 9).

3.5 **Quality:** Sheet shall be uniform in quality and condition, clean, smooth, and free from foreign materials and from internal and external imperfections detrimental to fabrication, appearance, or performance of parts, except as specified in 3.5.1 and 3.5.2.

3.5.1 **Contamination:** Sheet 0.062 in. (1.57 mm) and under in nominal thickness and parts made from such sheet shall have no foreign particles spaced closer than 2 in. (51 mm) to each other or over 1/32 in. (0.8 mm) in the largest dimension. Sheet over 0.062 in. (1.57 mm) in nominal thickness and parts made from such sheet shall have no particles spaced closer than 2 in. (51 mm) to each other or over 1/16 in. (1.6 mm) in the largest dimension. Particles, if present, shall be completely imbedded in the sheet.

3.5.2 **Voids:** Sheet shall contain no imperfections which will prevent fabrication of void-free parts. Fabricated parts shall contain no voids, fissures, or bubbles of entrapped gas.

3.6 **Tolerances:** Unless otherwise specified, the following tolerances shall apply at 20° - 30°C (68° - 86°F):

3.6.1 **Length and Width:** May vary from -0 to + 10% of the specified dimension.

3.6.2 **Thickness:** Shall not vary more than specified in Table I, measured to within the nominal length or width.

TABLE I

Nominal Thickness Inch	Tolerance, Inch					
	Sheet with Largest Dimension Up to 6 in., excl		Sheet with Largest Dimension 6 to 9 in., incl		Sheet with Largest Dimension Over 9 in.	
	plus	minus	plus	minus	plus	minus
0.011 to 0.030, incl	-0.003	0.002	0.006	0.002	0.008	0.002
Over 0.030 to 0.070, incl	0.003	0.002	0.006	0.002	0.010	0.002
Over 0.070 to 0.100, incl	0.006	0.002	0.008	0.002	0.012	0.004
Over 0.100 to 0.250, incl	0.008	0.004	0.012	0.006	0.016	0.008

TABLE I (SI)

Nominal Thickness Millimetres	Tolerance, Millimetre					
	Sheet with Largest Dimension		Sheet with Largest Dimension		Sheet with Largest Dimension	
	Up to 152 mm, excl plus	minus	152 to 229 mm, incl plus	minus	Over 229 mm plus	minus
0.28 to 0.76, incl	0.08	0.05	0.15	0.05	0.20	0.05
Over 0.76 to 1.78, incl	0.08	0.05	0.15	0.05	0.25	0.05
Over 1.78 to 2.54, incl	0.15	0.05	0.20	0.05	0.30	0.10
Over 2.54 to 6.35, incl	0.20	0.10	0.30	0.15	0.41	0.20

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: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and as qualification tests.
- 4.2.1 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: Sufficient sheet shall be taken from each lot to perform all required tests in triplicate; a lot shall be all sheet produced in a single production run from the same batch of raw material and presented for vendor's inspection at one time.
- 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 Tensile Strength and Elongation: Shall be determined in accordance with ASTM D638, using machined Type I or Type II specimens, at a testing speed of 1.0 in. (25 mm) per minute. If product size does not permit obtaining such specimens, tests shall be conducted in accordance with ASTM D1708 at a testing speed of 1.0 (25 mm) per minute.
- 4.5.2 Dielectric Strength: Shall be determined in accordance with ASTM D149, short time test, using 2-in. (51-mm) rod electrodes on 0.062-in. (1.57 mm) thick specimens conditioned in accordance with ASTM D618, Procedure A, and a voltage rise of 500 - 600 V per sec to breakdown.

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 technical requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, 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, 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.

5. PREPARATION FOR DELIVERY:**5.1 Packaging and Identification:**

- 5.1.1 Packaging shall be accomplished in such a manner as to ensure that the sheet, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any normal hazard.
- 5.1.2 Each package shall be permanently and legibly marked to show not less than the following information:
- POLYCHLOROTRIFLUOROETHYLENE SHEET, Molded, Unplasticized
AMS 3646A
THICKNESS _____
SIZE _____
LOT NUMBER _____
PURCHASE ORDER NUMBER _____
QUANTITY _____
MANUFACTURER'S IDENTIFICATION _____
- 5.1.3 Packages shall be prepared for shipment in accordance with commercial practice to ensure carrier acceptance and safe transportation to the point of delivery and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of this product. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.
- 5.1.4 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.1.1 and 5.1.3 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Sheet not conforming to this specification or to authorized modifications will be subject to rejection.

8. NOTES: