

POLYCHLOROTRIFLUOROETHYLENE (PCTFE) SHEET  
Molded, Unplasticized

1. SCOPE:

- 1.1 Form: This specification covers polychlorotrifluoroethylene (PCTFE) in the form of molded sheet 0.250 in. (6.25 mm) and under 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 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 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

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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: 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.

3.4 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:

3.4.1	Tensile Strength at $23^{\circ}\text{C} \pm 1$ ( $73^{\circ}\text{F} \pm 2$ ), min avg	4800 psi (33.0 MPa)	4.5.1
3.4.2	Elongation at $23^{\circ}\text{C} \pm 1$ ( $73^{\circ}\text{F} \pm 2$ ), min	100%	4.5.1
3.4.3	Dielectric Strength at $23^{\circ}\text{C} \pm 1$ ( $73^{\circ}\text{F} \pm 2$ ), min	500 V per mil (19,700 V/mm)	4.5.2
3.4.4	Specific Gravity at $23^{\circ}/23^{\circ}\text{C}$ ( $73^{\circ}/73^{\circ}\text{F}$ )	2.10 - 2.14	ASTM D792, Method A
3.4.5	Zero Strength Time at $250^{\circ}\text{C} \pm 2$ ( $482^{\circ}\text{F} \pm 4$ ), min	300 sec	ASTM D1430
3.4.6	<u>Dimensional Stability:</u> No dimension of sheet or fabricated parts shall change more than 0.003 in. per in. (0.003 mm/mm), measured at $20^{\circ} - 30^{\circ}\text{C}$ ( $68^{\circ} - 86^{\circ}\text{F}$ ) before and after being held for $48 \text{ hr} \pm 5$ at $70^{\circ}\text{C} \pm 5$ ( $158^{\circ}\text{F} \pm 9$ ).		

3.5 Quality: Sheet, as received by purchaser, shall be uniform in quality and condition, clean, smooth, and free from foreign materials and, except as specified in 3.5.1 and 3.5.2, free from imperfections detrimental to usage of the sheet.

- 3.5.1 Contamination: Sheet 0.062 in. (1.55 mm) and under in nominal thickness and parts made from such sheet shall have no foreign particles spaced closer than 2 in. (50 mm) to each other or over 1/32 in. (0.8 mm) in the largest dimension. Sheet over 0.062 in. (1.55 mm) in nominal thickness and parts made from such sheet shall have no particles spaced closer than 2 in. (50 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: Shall be as follows; measurements shall be made 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.

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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 Up to 150 mm, excl		Sheet with Largest Dimension 150 to 225 mm, incl		Sheet with Largest Dimension Over 225 mm	
	plus	minus	plus	minus	plus	minus
0.28 to 0.75, incl	0.08	0.05	0.15	0.05	0.20	0.05
Over 0.75 to 1.75, incl	0.08	0.05	0.15	0.05	0.25	0.05
Over 1.75 to 2.50, incl	0.15	0.05	0.20	0.05	0.30	0.10
Over 2.50 to 6.25, incl	0.20	0.10	0.30	0.15	0.40	0.20

#### 4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of sheet shall supply all samples for vendor's tests 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 sample and to perform any confirmatory testing deemed 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 preproduction tests and shall be performed prior to or on the initial shipment of sheet to a purchaser, on each lot, when a change in material, processing, or both 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 test material 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 sheet 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 sheet produced in a single production run from the same batch of raw material and presented for vendor's inspection at one time. An inspection lot shall not exceed 500 lb (225 kg). A lot may be packaged in small quantities under the basic lot approval provided lot identification is maintained.

4.3.1.2 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 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 sheet shall be approved by purchaser before sheet for production use is supplied, unless such approval be waived by purchaser. 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 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, processing, or both 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 in. (25 mm) per minute.

4.5.2 Dielectric Strength: Shall be determined in accordance with ASTM D149, short time test, using 2-in. (50-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 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, AMS 3646B, vendor's compound number, lot number, size, and quantity.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3646B, 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 either a statement that the sheet conforms or 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: