SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS3650 REV. D

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Superseding AMS3650C

Rods, Sheets, and Molded Shapes, Polychlorotrifluoroethylene (PCTFE) Unplasticized

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

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1. SCOPE:

1.1 Form:

This specification covers a 100% homopolymer of polychlorotrifluoroethylene (PCTFE) in the form of rods, sheets, and molded shapes.

1.2 Application:

Primarily for parts requiring chemical inertness and high impact strength up to 200 °C (392 °F) or high-frequency electrical insulating properties up to 165 °C (329 °F).

1.3 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.

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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 256	Impact Resistance of Plastics and Electric Insulating Materials
ASTM D 257	D-C Resistance or Conductance of Insulating Materials
ASTM D 618	Conditioning Plastics and Electrical Insulating Materials for Testing
ASTM D 638	Tensile Properties of Plastics
ASTM D 638M	Tensile Properties of Plastics (Metric)
ASTM D 792	Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 1430	Polychlorotrifluoroethylene (PCTFE) Plastics
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.

2.2.1 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, 100% homopolymer of polychlorotrifluoroethylene (PCTFE).

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:

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

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3.4.1	Tensile Strength at 23 °C ± 1 (73 °F ± 2), minimum average	4500 psi (31.0 MPa)	4.5.1
3.4.2	Elongation at 23 °C ± 1 (73 °F ± 2), minimum	100%	4.5.1
3.4.3	Impact Strength at 23 °C ± 1 (73 °F ± 2), per inch (25 mm) of notch, minimum	1.25 foot pounds (66.7 J/m)	ASTM D 256
3.4.4	Volume Resistivity at 50% ± 2 Relative Humidity and 23 °C ± 1 (73 °F ± 2), minimum	1.0×10^{14} ohm-cm	ASTM D 257
3.4.5	Dielectric Strength at 23 °C± 1 (73 °F ± 2), minimum	450 volts per mil (17,717 V/mm)	4.5.2
3.4.6	Specific Gravity at 23/23 °C (73°/73 °F)	2.08 - 2.18	ASTM D 792, Method A
3.4.7	Zero Strength Time at 250 °C ± 2 (482 °F ± 4), minimum		ASTM D 1430
	Compression molded	200 seconds	
	Injection molded	130 seconds	
	Extruded parts	100 seconds	

3.4.8 Dimensional Stability: No dimension of raw stock or fabricated parts shall change more than 0.003 inch per inch (0.003 mm/mm), measured at 20 to 30 °C (68 to 86 °F) before and after being held for 48 hours ± 5 at 70 °C ± 5 (158 °F ± 9).

3.5 Quality:

The product, 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 product.

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3.6 Tolerances:

Shall be as follows; measurements shall be made at 20 to 30 °C (68 to 86 °F):

3.6.1 Sheet:

Nominal Thickness		Tolerance, Plus and Minus	
Inch	Millimeters	Inch	Millimeters
Over 0.010 to 0.020, incl	Over 0.25 to 0.51, incl	0.003	0.08
Over 0.020 to 0.040, incl	Over 0.51 to 1.02, incl	0.004	0.10
Over 0.040 to 0.060, incl	Over 1.02 to 1.52, incl	0.010	0.25
Over 0.060 to 0.125, incl	Over 1.52 to 3.18, incl	0.013	0.33
Over 0.125 to 0.250, incl	Over 3.18 to 6.35, incl	0.018	0.46
Over 0.250 to 0.500, incl	Over 6.35 to 12.70, incl	0.030	0.76
Over 0.500 to 0.750, incl	Over 12.70 to 19.05, incl	0.042	1.07
Over 0.750 to 1.000, incl	Over 19.05 to 25.40, incl	0.054	1.37

3.6.2 Molded or Extruded Rod:

Nominal Diameter		Tolerance, Plus	
Inch	Millimeters	Inch	Millimeters
Up to 0.060, incl	Up to 1.52, incl	0.005	0.13
Over 0.060 to 0.125, incl	Over 1.52 to 3.18, incl	0.008	0.20
Over 0.125 to 0.200, incl	Over 3.18 to 6.35, incl	0.013	0.33
Over 0.200 to 0.500, incl	Over 6.35 to 12.70, incl	0.020	0.51
Over 0.500 to 1.000, incl	Over 12.70 to 25.40, incl	0.032	0.81
Over 1.000 to 2.500, incl	Over 25.40 to 63.50, incl	0.050	1.27

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's 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 product conforms to the requirements of this specification.

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4.2 Classification of Tests:

Tests for all technical requirements of this specification are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of a product to a purchaser, 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 test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient product 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 product 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 pounds (227 kg). A lot may be packaged in smaller quantities and delivered under the basic lot approval provided lot identification is maintained.

4.3.1.2 When a statistical sampling plan has 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 product shall be approved by purchaser before product for production use is supplied, unless such approval be waived by purchaser. Results of tests on production product shall be essentially equivalent to those on the approved samples.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the approved sample product. 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 ingredients and/or processing and, when requested, sample product. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval.

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