SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS3645 REV. D

Issued 1967-04
Revised 2001-01
Reaffirmed 2003-03
Stabilized 2012-01

Superseding AMS3645C

Polychlorotrifluoroethylene (PCTFE), Compression Molded Heavy Sections, Unplasticized

RATIONALE

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

STABILIZED NOTICE

This document has been declared "Stabilized" by SAE AMS P, Polymeric Materials Committee, and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE:

1.1 Form:

This specification covers a 100% homopolymer of polychlortrifluoroethylene (PCTFE) in the form of sheet 0.250 inch (6.35 mm) and over in thickness, rod, heavy wall tubing, and large molded and machined parts.

1.2 Application:

Primarily for parts requiring chemical inertness and toughness up to 200 °C (392 °F) or high-frequency electrical insulating properties up to 165 °C (329 °F). These products may be used at cryogenic temperatures.

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.

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 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 REOUIREMENTS:

3.1 Material:

Shall be a virgin, unplasticized, 100% homopolymer of polychlorotrifluoroethylene (PCTFE).

3.2 Condition:

Sheet, rod, tubing, and molded parts shall be annealed. Rods and tubing shall be machined on the outside diameter. Machined parts shall be annealed when so ordered.

3.3 Color:

May range from natural translucent white to gray; localized discoloration resulting from processing is 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:

3.4.1	Tensile Strength at 23 °C ± 1 (73 °F ± 21), minimum average	5000 psi (34.5 MPa)	4.5.1

3.4.2	Elongation at 23 °C ± 1 (73 °F ± 2), minimum		4.5.1
	Average	50%	
	Individual	30%	
3.4.3	Dielectric Strength at 23 °C ± 1 (73 °F ± 2), minimum	450 V per mil (17,717 V/mm)	4.5.2
3.4.4	Specific Gravity at 23°/23 °C (73°/73 °F)	2.12 - 2.17	ASTM D 792, Method A
3.4.5	Zero Strength Time at 250 °C ± 2 (482 °F ± 4), minimum	260 seconds	ASTM D 1430

3.4.6 Dimensional Stability: No dimension of raw stock or fabricated parts shall change more than 0.003 inch/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, condition, smooth, and free from foreign materials and from imperfections detrimental to usage of the product.

3.6 Tolerances:

Shall be as follows; measurements shall be made at 20 to 30 °C (68 to 86 °F) except that closer temperature control may be required for large parts:

3.6.1 Molded and Machined Parts: As specified on the applicable drawing.

3.6.2 Sheet and Discs: Thickness tolerance shall be +10%, -0 for all thicknesses.

3.6.3 Rods:

TABLE I

Nominal Diameter Inches	Diameter Tolerance, Inch plus only
0.250 to 1.000, incl	0.025
Over 1.000 to 2.000, incl	0.050
Over 2.000 to 3.500, incl	0.070
Over 3.500	As specified by purchaser

TABLE I (SI)

Nominal Diameter Millimeters	Diameter Tolerance, Millimeters plus only
6.35 to 25.40, incl	0.64
Over 25.40 to 50.80, incl	1.27
Over 50.80 to 88.90, incl	1.78
Over 88.90	As specified by purchaser

3.6.4 Tubes 0.250 Inch (6.35 mm) and Over in Wall Thickness:

TABLE II

Nominal Outside Diameter Inches	ID Tolerance Inch minus only	Wall Thickness Tolerance Inch plus only
1.000 to 1.500, incl	0.060	0.120
Over 1.500 to 3.000, incl	0.120	0.150
Over 3.000 to 5.000, incl	0.188	0.188
Over 5.000 to 8.000, incl	0.250	0.250
Over 8.000	As specified by purchaser	

TABLE II (SI)

Nominal Outside Diameter Millimeters	ID Tolerance Millimeters minus only	Wall Thickness Tolerance Millimeters plus only
25.40 to 38.10, incl	1.52	3.05
Over 38.10 to 76.20, incl	3.05	3.81
Over 76.20 to 127.00, incl	4.78	4.78
Over 127.00 to 203.20, incl	6.35	6.35
Over 203.20	As specified by purchaser	

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.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of the 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 from 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 sample.

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.