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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 3650B
Superseding AMS 3650A

Issued 2-15-53
Revised 7-1-85

POLYCHLOROTRIFLUOROETHYLENE (PCTFE), UNPLASTICIZED

1. SCOPE:

1.1 Form: This specification covers 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 (390°F) or high-frequency electrical insulating properties up to 165°C (325°F).

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 D256 - Impact Resistance of Plastics and Electric Insulating Materials
ASTM D257 - D-C Resistance or Conductance of Insulating Materials
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 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 Ø polychlorotrifluoroethylene (PCTFE).

3.2 Condition: Annealed.
Ø

3.3 Color: May range from natural translucent white to gray; localized Ø 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:

3.4.1 Ø	Tensile Strength at 23°C ± 1 (73°F ± 2), min avg	4500 psi (31.0 MPa)	4.5.1
3.4.2 Ø	Elongation at 23°C ± 1 (73°F ± 2), min	100%	4.5.1
3.4.3 Ø	Impact Strength at 23°C ± 1 (73°F ± 2), per in. (25 mm) of notch, min	2.75 ft-lb (145 J/m)	ASTM D256
3.4.4 Ø	Volume Resistivity at 50% R.H. and 23°C ± 1 (73°F ± 2), min	1.0 x 10^{14} ohm-cm	ASTM D257
3.4.5 Ø	Dielectric Strength at 23°C ± 1 (73°F ± 2), min	500 V per mil (19,700 V/mm)	4.5.2

3.4.6 Specific Gravity at 23°C ± 1 (73°F ± 2), min — 2.05 — ASTM D792, Method A

3.4.7 Zero Strength Time at 250°C ± 2 (482°F ± 4), min — ASTM D1430

Compression molded	200 sec
Injection molded	130 sec
Extruded parts	100 sec

3.4.8 Dimensional Stability: No dimension of raw stock 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: The product, as received by purchaser, shall be uniform in quality and condition, clean, 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° - 30°C (68° - 86°F):

3.6.1 Sheet:

Nominal Thickness, Inch	Nominal Thickness, Millimetres	Tolerance, Plus and Minus, Inch	Tolerance, Plus and Minus, Millimetres
Over 0.010 to 0.020, incl	Over 0.25 to 0.50, incl	0.003	0.08
Over 0.020 to 0.040, incl	Over 0.50 to 1.00, incl	0.004	0.10
Over 0.040 to 0.060, incl	Over 1.00 to 1.50, incl	0.010	0.25
Over 0.060 to 0.125, incl	Over 1.50 to 3.12, incl	0.013	0.32
Over 0.125 to 0.250, incl	Over 3.12 to 6.25, incl	0.018	0.45
Over 0.250 to 0.500, incl	Over 6.25 to 12.50, incl	0.030	0.75
Over 0.500 to 0.750, incl	Over 12.50 to 18.75, incl	0.042	1.05
Over 0.750 to 1.000, incl	Over 18.75 to 25.00, incl	0.054	1.35

3.6.2 Molded or Extruded Rod:

Nominal Diameter, Inches	Nominal Diameter, Millimetres	Tolerance, Plus, Inch	Tolerance, Plus, Millimetres
Up to 0.060, incl	Up to 1.50, incl	0.005	0.12
Over 0.060 to 0.125, incl	Over 1.50 to 3.12, incl	0.008	0.20
Over 0.125 to 0.250, incl	Over 3.12 to 6.25, incl	0.013	0.32
Over 0.250 to 0.500, incl	Over 6.25 to 12.50, incl	0.020	0.50
Over 0.500 to 1.000, incl	Over 12.50 to 25.00, incl	0.032	0.80
Over 1.000 to 2.500, incl	Over 25.00 to 62.50, incl	0.050	1.25

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 Ø 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 product 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 Ø 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 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 Ø 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 product shall be taken at random from Ø 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 Ø 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 Ø 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 For Preproduction Tests: As agreed upon by purchaser and vendor. Ø

4.4 Approval:

4.4.1 Sample material shall be approved by purchaser before material for production use is supplied, unless such approval be waived by purchaser. Results of tests on production material 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 material which are essentially the same as those used on the approved sample material. 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 material. Production material 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 Ø 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, Ø short time test, using 2-in. (50-mm) rod electrodes on 0.062-in. (1.55-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 the product 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 3650B, vendor's compound number, lot number, form and size or part number, 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 3650B, contractor or other direct supplier of material, supplier's compound number, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification and shall include in the report either a statement that the material 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 product 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 product represented and no additional testing shall be permitted. Results of all tests shall be reported.