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AEROSPACE MATERIAL SPECIFICATION

AMS 3584

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Revised

PLASTIC TUBING, ELECTRICAL INSULATION
Polytetrafluoroethylene, Heat Shrinkable
Overexpanded

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. FORM: Flexible tubing.

3. APPLICATION: Primarily for use as a flexible, electrical insulation tubing whose diameter can be reduced to a predetermined size by heating to a temperature of approximately 327 C (621 F). This material is stable for continuous exposure at -67 C (-88.6 F) to +250 C (+482 F).

4. COMPOSITION: The material shall be a modified polytetrafluoroethylene composition.

5. TECHNICAL REQUIREMENTS:

5.1 Color: The tubing shall be furnished in a standard unpigmented state, transparent milk white to translucent light tan in color.

5.2 Properties: The product shall conform to the requirements of 5.2.1 through 5.2.3 and shall be capable of meeting the requirements of 5.2.4 through 5.2.10. Tests shall be performed in accordance with the issue of specified ASTM methods listed in the latest issue of AMS 2350, insofar as practicable. Unless otherwise specified, tubing shall be tested after being shrunk by heating for 10 min. in a mechanical convection oven which is at 350 C ± 4 (662 F ± 7.2), with an air velocity of 100 - 200 ft per min. past the tubing, removed from the oven, and cooled to room temperature.

5.2.1	Tensile Strength, psi, min	2500	ASTM D638, Speed C (See Note 1)
5.2.2	Elongation, %, min	200	ASTM D638, Speed C (See Note 1)
5.2.3	Heat Shock	Pass	Note 2
5.2.4	Low Temperature Flexibility	Pass	Note 3
5.2.5	Heat Aging	Pass	Note 4
5.2.6	Restricted Shrinkage	Pass	Note 5
5.2.7	Specific Gravity	2.13 - 2.20	ASTM D792, Method A
5.2.8	Water Absorption in 24 hr, %, max	0.01	ASTM D570
5.2.9	Dielectric Strength, short time test, v per mil, min	800	ASTM D876
5.2.10	Volume Resistivity, ohm-cm, min	10^{18}	ASTM D257

Note 1. Five specimens, each 4 in. long, shall be tested, using 1 in. bench marks and 1 in. initial jaw separation. The specimens shall be full sections of tubing for sizes 3/4 and smaller and strip specimens not less than 1/4 in. wide cut longitudinally from sizes 1 and larger. No metal plugs are necessary when testing full sections of tubing. A specimen break at a bench mark or outside the gage length shall be cause for retest.

Note 2. Three specimens in the expanded form (as supplied), each 6 in. long, shall be conditioned for 4 hr in a mechanical convection oven which is at 400 C ± 5 (752 F ± 9), with an air velocity of 100 - 200 ft per min. past the specimens. While in the oven and after removal from the oven, the specimens shall be examined. Tubing shall not drip, flow, or crack. Also, tubing shall be bent through 360 deg in 2 to 4 sec over a steel mandrel of the diameter shown in Table I. The tubing shall remain free from cracks except that any side cracking caused by flattening of the specimen on the mandrel shall be disregarded.

TABLE I

Size	Diameter of Mandrel, Inch
5/64 to 3/8, incl	5/16
1/2 to 3/4, incl	3/8
1 to 1-1/4, incl	7/16

Note 3. Three specimens, each 6 in. long, shall be conditioned at -67 C ± 2 (-88.6 F ± 3.6) for 4 hours. A fixed steel mandrel, selected in accordance with Table I above, shall be conditioned at this temperature. Upon completion of this conditioning and at the same temperature, the specimens shall be wrapped, in 8 - 12 sec, not less than 360 deg about the mandrel. The specimens shall be free from cracks.

Note 4. Specimens shall be prepared as in Note 1 and shall be conditioned for 96 hr in a mechanical convection oven which is at 350 C ± 4 (662 F ± 7.2), with an air velocity of 100 - 200 ft per min. past the specimens. After conditioning, the specimens shall be removed from the oven, cooled to room temperature, and tested for tensile strength, elongation, and dielectric strength. Specimens shall have tensile strength not lower than 2500 psi, elongation not lower than 200%, and dielectric strength not lower than 800 v per mil. Dielectric strength test shall be in accordance with ASTM D876.

Note 5. A specimen in the expanded form (as supplied) shall be shrunk onto a clean metallic mandrel of the configuration and size shown in Fig. 1. The tubing on the mandrel then shall be conditioned for 5 min. in an oven which is at 350 C ± 4 (662 F ± 7.2), with an air velocity of 100 - 200 ft per min. past the specimen. After conditioning, the tubing shall be visually examined and then shall be subjected to the following voltage withstand test. The tubing shall snugly fit the mandrel and shall not be cracked. The test potential shall be applied between the mandrel and a metal foil electrode wrapped around the tubing in accordance with ASTM D876. The test potential then shall be applied in accordance with the short-time test of ASTM D149 using 500 v per sec rate of rise. The specimen shall withstand 2000 v for 1 minute.

5.3 Dimensions After Shrinkage:

5.3.1 Diametral: Three specimens in the expanded form (as supplied), each 6 in. long, shall be measured for length and inside diameter. The specimens shall be conditioned for 10 min. in a mechanical convection oven which is at 350 C ± 4 (662 F ± 7.2), with an air velocity of 100 - 200 ft per min. past the specimens. After conditioning, the specimens shall be removed from the oven, cooled to room temperature, and then remeasured. Longer heating at such temperature shall cause no additional shrinkage. Prior to and after conditioning, the dimensions of the tubing shall be in accordance with Table II. Measurements shall be made in accordance with ASTM D1675.

5.3.2 Longitudinal: In reaching its recovered dimensions, the tubing shall not exhibit a longitudinal change greater than ± 15% computed as follows:

$$\% \text{ change} = \frac{\text{Length after heating} - \text{Length before heating}}{\text{Length before heating}} \times 100$$

6. QUALITY: The product shall be uniform in quality and condition, clean, smooth, and free from foreign materials and from imperfections detrimental to fabrication, appearance, or performance of parts.

7. STANDARD SIZES AND TOLERANCES: Unless otherwise specified, tubing shall be supplied in lengths of 48 in., +1, -0, and in the standard sizes and tolerances shown in Table II. Tolerances apply at 23 - 30 C (73.4 - 86 F).

TABLE II

Expanded (As Supplied)		Recovered Dimensions (After Heating)		
Size	ID, Inches min	ID, Inch max	Nominal Wall Thickness, Inch	Wall Thickness Tolerance, Inch plus and minus
5/64	0.078	0.025	0.009	0.002
1/8	0.125	0.037	0.010	0.002
1/4	0.250	0.063	0.012	0.003
3/8	0.375	0.096	0.012	0.003
1/2	0.500	0.144	0.015	0.004
5/8	0.625	0.178	0.015	0.004
3/4	0.750	0.224	0.015	0.004
1	1.000	0.278	0.015	0.004
1-1/4	1.250	0.347	0.015	0.004

8. REPORTS:

8.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report showing the results of tests made on the product to determine conformance to the requirements of 5.2.1 through 5.2.3 and a statement that the product conforms to all other requirements of this specification. This report shall include the purchase order number, material specification number, vendor's compound number, size, and quantity.

8.2 Unless otherwise specified, 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, 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 a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

9. PACKAGING:

9.1 Packaging shall be accomplished in such a manner as to ensure that the product, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any normal hazard. Unless otherwise specified, standard packages shall contain the following quantities:

Size	Quantity, ft
5/64, 1/8	200
1/4, 3/8, 1/2, 5/8, 3/4	100
1, 1-1/4	48

9.2 Each package shall be permanently and legibly marked with the AMS number, size, quantity, purchase order number, manufacturer's identification, and date of manufacture.