



Designation: D 4969 – 02

Standard Specification for Polytetrafluoroethylene–(PTFE) Coated Glass Fabric¹

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1. Scope*

1.1 This specification covers glass fabric impregnated, coated, and sintered on both sides with PTFE to a nominal thickness of 0.318 mm (0.015 in.) or less.

1.2 The PTFE-coated glass fabric is for electrical, chemical, and mechanical uses.

1.3 The PTFE-coated glass fabric of this specification does not pertain to structural fabric, single-sided PTFE coatings, or materials used for laminates.

1.4 The values stated in SI units as detailed in IEEE/ASTM SI-10.

NOTE 1—There is no ISO standard that covers information included in this specification. A few of these test methods are mentioned in ISO 12086-2: 1995.

2. Referenced Documents

2.1 ASTM Standards:²

- D 123 Terminology Relating to Textile Materials
- D 149 Test Methods for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
- D 257 Test Methods for D-C Resistance or Conductance of Insulating Materials
- D 374 Test Methods for Thickness of Solid Electrical Insulation
- D 578 Specification for Glass Fiber Yarns
- D 579 Specification for Greige Woven Glass Fabrics
- D 618 Method for Conditioning Plastics for Testing
- D 737 Test Method for Air Permeability of Textile Fabrics
- D 751 Test Methods for Coated Fabrics
- D 827 Method of Test for Edge Tearing Strength of Paper³
- D 883 Definitions of Terms Relating to Plastics
- D 902 Methods of Testing Flexible Resin-Coated Glass Fabric and Glass Fabric Tapes Used for Electrical Insulation

- D 1424 Test Method for Tearing Strength of Fabrics by Falling-Pendulum Type (Elmendorf) Apparatus
- D 3892 Practice for Packaging/Packing of Plastics
- D 4441 Specification for Aqueous Dispersions of Polytetrafluoroethylene
- IEEE/ASTM SI-10 Standard for Use of the International System of Units (SI): The Modern Metric System⁴
- 2.2 ISO Standard:⁵
- ISO 12086-2: 1995 Plastics—Fluoropolymer Dispersions and Moulding and Extrusion Materials—Part 2: Preparation of Test Specimens and Determination of Properties

3. Terminology

3.1 *Definitions*—Definitions of terms relating to plastics used in this specification shall be in accordance with Definitions D 883. Definitions of terms relating to textiles used in this specification shall be in accordance with Terminology D 123.

3.1.1 *structural fabric*—PTFE-coated fabric to a thickness of greater than 0.381 mm (0.015 in.).

3.1.2 *lot, n*—one production run or a uniform blend of two or more production runs.

4. Classification

4.1 There shall be six types of PTFE-coated glass fabrics as described in Table 1.

4.2 Use a one-line system to specify materials covered by this specification. The system uses redefined cells to refer to specific aspects of this specification, as illustrated below as follows.

Standard Number Block	Specification			Special Notes
	Type	Grade	Class	
Example: ASTM D4969-XX	IV	–	–	,

For this example, the line call out would be: ASTM D 4969 – XX, IV – – , Porosity 15–30 CFM, and would specify a Type IV porous product which is referenced in Table 1 with no grade or class since these subcategories do not appear in this specification. A comma is used as the separator between the standard number and the type. Separators are not needed between the type, grade, and class because they are, in turn,

⁴ Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

¹ This specification is under the jurisdiction of Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Withdrawn.

*A Summary of Changes section appears at the end of this standard.

TABLE 1 PTFE-Coated Glass Fabric Types

Type	Name	General Description and Common Application
I	Premium	Smooth, defect-free, primarily used as a dielectric application, release sheet, and Military Specification material.
II	Standard	Regular-grade material primarily used for mechanical applications where temperature and easy-release characteristics are required.
III	Mechanical	Regular-grade material primarily used for mechanical applications where smoothness is not a critical requirement.
IV	Porous	Permeable material, with a range of porosity primarily used as a release sheet in molding.
V	Tear resistant	Smooth, flexible, and tear-resistant material for mechanical applications requiring flexible materials.
VI	Conductive	Regular-grade material primarily used for static discharge.

Roman numerals, Arabic digits, and uppercase letters, as provided in Section B8 of *Form and Style for ASTM Standards*. Provision for “Special Notes” is included so that other information can be provided when required. An example would be in this specification where porosity would be defined as 15–30 CFM. When special notes are used, they should be preceded by a comma.

5. Materials and Manufacture

5.1 *Glass Fabric*—The base material used in the manufacture of the products of this specification shall be a woven glass fabric produced in accordance with Specification **D 579**. A guideline for generally acceptable substrate fabrics for the common thickness of PTFE/glass fabric products is given in **Table 2**.

5.2 *Coating*—The glass fabric is impregnated or coated with polytetrafluoroethylene in accordance with Specification **D 4441**. When necessary, use additives to aid the dispersion to achieve the required properties and performance of the final product.

6. Physical Requirements Physical Requirements

6.1 The coating shall penetrate and adhere to the fabric and shall be substantially free of wrinkles, creases, blisters, and other imperfections.

6.2 *Color*:

6.2.1 The material will have a natural color that varies from off-white to dark brown when viewed by the unaided eye. The usual color is tan.

6.2.2 If color is required by the customer, specify it.

6.2.3 Color will be uniform from roll to roll within a lot.

6.2.4 Other colors for products that contain pigments, fillers, and additives will be agreed upon between the suppliers and the customers.

TABLE 2 Acceptable Substrate Fabrics for Common Thickness of PTFE Glass Fabric Products

PTFE/Glass Fabrics Thickness.		Generally Acceptable Woven Glass Fabrics Style Number
mm	(in.)	
0.051	(0.002)	104, 106
0.076	(0.003)	108, 1080
0.102	(0.004)	112, 113, 2113
0.127	(0.005)	116, 1165, 2116, 2165
0.152	(0.006)	116, 1165, 2116
0.203	(0.008)	125, 1528, 7628
0.254	(0.010)	128, 1528, 7628
0.356	(0.014)	141, 1142

6.3 *Thickness*—The thickness of the glass fabric is dependent on glass style and percent PTFE coating. Tolerances are typically $\pm 10\%$ of the finished thickness. Thickness shall be tested in accordance with Test Methods **D 374**.

NOTE 2—Typically, glass and coated glass products are manufactured to a weight per unit area.

6.4 *Breaking Strength*—When tested in accordance with Methods **D 902**, the breaking strength shall be at least 80 % of the specified value stated in Table 6 of Specification **D 579**.

NOTE 3—Reduction of tensile strength is due to added heat required for coating.

6.5 *Edge Tear Strength*—(Elmendorf) Tears shall be tested in accordance with Test Method **D 1424**. Tear values are dependent upon glass style and additives added to the PTFE. Typical Tear Resistant (Type 5) products exhibit two times the values of their counterparts. Conductive (Type 6) products exhibit one half the values of their counterparts. Test values and tolerances shall be determined by the supplier and the customer.

6.6 *Mass*—A sample shall be prepared in accordance with Method **D 751**. The amount of PTFE added shall be agreed upon between the customer and the supplier and shall have a tolerance of $\pm 5\%$ of the total coated product weight.

6.7 *Widths*—The coated glass fabric shall be furnished in the widths and tolerances indicated in **Table 3**, when tested in accordance with Method **D 751**.

6.8 *Conductivity*—For Type 6 material, conductivity shall be tested in accordance with Test Methods **D 257**, using the Flat Metal Plate Method, and a comparison bridge. Material shall be deemed conductive when the resistivity is below $10^6 \Omega/\text{square}$.

6.9 *Dielectric Breakdown*—Type I only.

6.9.1 *Dielectric Breakdown Voltage*—When tested in accordance with Test Methods **D 149** and Methods **D 902**, with a ¼-in. electrode, the dielectric breakdown voltage for the various thickness shall be as specified in **Table 4**.

TABLE 3 Widths of PTFE-Coated Glass Fabric

Nominal Widths		Tolerances	
mm	(in.)	mm	(in.)
3.17 to <12.7	(1/8 to <1/2)	0.397	($\pm 1/64$)
12.7 to <38.1	(1/2 to <1 1/2)	0.794	($\pm 1/32$)
38.1 to <76.2	(1 1/2 to <3)	1.587	($\pm 1/16$)
76.2 to <305	(3 to <12)	1.411	($\pm 1/8$)
305 or greater	(12 or greater)	6.35	($\pm 1/4$)