Designation: D6457 – 08 (Reapproved 2013)

Standard Specification for Extruded and Compression Molded Rod and Heavy-Walled Tubing Made from Polytetrafluoroethylene (PTFE)[1]

This standard is issued under the fixed designation D6457; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification is intended to be a means of calling out plastic product used in the fabrication of end items or parts.

1.2 This specification covers requirements and test methods for the material, dimensions, and workmanship, and the properties of extruded- and compression-molded rod, and heavy-walled tube manufactured from granular unfilled PTFE resin in accordance with Specification D4894.

1.3 This specification covers rod and heavy-walled tubing made wholly from polytetrafluoroethylene and produced in accordance with good commercial practice.

1.4 The properties included in this specification are those required for the compositions covered. Requirements necessary to identify particular characteristics important to specialized applications are described by using the classification system given in Section 4.

1.5 This specification allows for the use of recycled plastics as defined in Guide D7209.

1.6 The values stated in inch-pound units are to be regarded as the standard in all property and dimensional tables.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—Although this specification and ISO 13000-1 and ISO 13000-2 differ in approach or detail, data obtained using either are technically equivalent.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D374 Test Methods for Thickness of Solid Electrical Insulation (Withdrawn 2013)[3]
D638 Test Method for Tensile Properties of Plastics
D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D883 Terminology Relating to Plastics
D1600 Terminology for Abbreviated Terms Relating to Plastics
D1708 Test Method for Tensile Properties of Plastics by Use of Microtensile Specimens
D3892 Practice for Packaging/Packing of Plastics
D4000 Classification System for Specifying Plastic Materials
D4591 Test Method for Determining Temperatures and Heats of Transitions of Fluoropolymers by Differential Scanning Calorimetry
D4894 Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials
D7209 Guide for Waste Reduction, Resource Recovery, and Use of Recycled Polymeric Materials and Products
E94 Guide for Radiographic Examination
IEEE/ASTM SI-10 Standard for Use of the International System of Units (SI): The Modern Metric System

2.2 *ISO Standard:*[4]

ISO 13000-1 Plastics—Polytetrafluoroethylene (PTFE) Semi-Finished Products—Part I: Requirements and Designation
ISO 13000-2 Plastics—Polytetrafluoroethylene (PTFE) Semi-Finished Products—Part II: Preparation of Test Specimens and Determination of Properties

3. Terminology

3.1 *Definitions:*

3.1.1 Terms are defined in accordance with Terminology D883 unless otherwise specified.

3.1.2 *heavy-walled tubing, n*—an annular shape with a minimum wall thickness of 1/16 in.

[1] This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials (D20.15.12 on Fluoropolymers).

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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] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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

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

3.1.4 *rod, n*—a solid cylindrical shape.

3.2 *Abbreviations:*

3.2.1 Abbreviations are in accordance with Terminology D1600 unless otherwise indicated.

3.2.2 *PTFE*—polytetrafluoroethylene

4. Classification

4.1 Product shape and size is defined in the applicable purchase order.

4.2 This specification covers product-extruded and compression-molded as listed in Tables 1 and 2.

4.2.1 The type of PTFE shape product is categorized by type, class, and grade as defined in Tables 1 and 2.

4.2.2 Each type of PTFE shape is categorized into one of the following grades:

4.2.2.1 *Grade 1*—Virgin-extruded or compression-molded product made using only 100 % virgin PTFE resin.

4.2.2.2 *Grade 2*—Recycled-extruded or compression-molded product made using any amount up to 100 % recycled PTFE plastic.

4.2.3 Products can be further differentiated by property requirements, as defined for three classes of PTFE products in Tables 1 and 2.

4.2.3.1 *Class 1*—A type of rod or heavy-walled tubing having maximum physical and electrical properties to meet rigid requirements.

4.2.3.2 *Class 2 (General Purpose)*—A type of rod or heavy-walled tubing having properties required of general electrical, mechanical, and chemical applications.

4.2.3.3 *Class 3*—A type of rod or heavy-walled tubing for noncritical chemical, electrical, and mechanical applications.

4.3 The type, class, and grade is further differentiated based on dimensional stability (elevated temperature excursion test) and internal defect requirements.

4.4 Classification D4000 also is used to describe extruded or compression molded products not included in Tables 1 and 2 by means of a cell callout that includes the applicable table of suffixes using type and specific properties.

4.5 To facilitate the incorporation of future or special materials not covered by Tables 1 and 2, the "as specified" category (00) for type, class, and grade is shown in the table with the basic properties to be obtained from Classification D4000 as they apply.

4.6 *Callout Designation*—A line callout system is used to specify materials in this specification. The system uses pre-defined cells to refer to specific aspects of this specification illustrated as follows:

TABLE 1 Mechanical and Electrical Requirements of PTFE Rod

Type	Description	Grade	Description	Class	Description	Size Range [in.][A]	Specific Gravity (min)[B]	Ultimate Tensile Strength, psi (min)[C]	Tensile Elongation, % (min)[D]	Dielectric Strength, volts/mil (min)[D]	Dimensional Stability[E]	Internal Examination[F]
01	Unfilled PTFE	1	virgin	1	premium	less than ½	2.14	2000	150	700	A or B	C or D
						½ to 1½	2.15	2100	175	750	A or B	C or D
						over 1½	2.15	2200	200	800	A	C or D
				2	general purpose	less than ½	2.12	1700	100	600	A or B	C or D
						½ to 1½	2.13	1800	125	650	A or B	C or D
						less than ½	2.14	1900	150	700	A	C or D
				3	noncritical	less than ½	2.12	1400	50	250	A or B	C or D
						½ to 1½	2.13	1500	75	250	A or B	C or D
						over 1½	2.14	1600	75	250	A	C or D
				0	as specified	-	-	-	-	-	A or B	C or D
01	Unfilled PTFE	2	recycled	1	premium	less than ½	TBD	TBD	TBD	TBD	A or B	C or D
						½ to 1½	TBD	TBD	TBD	TBD	A or B	C or D
						over 1½	TBD	TBD	TBD	TBD	A	C or D
				2	general purpose	less than ½	TBD	TBD	TBD	TBD	A or B	C or D
						½ to 1½	TBD	TBD	TBD	TBD	A or B	C or D
						less than ½	TBD	TBD	TBD	TBD	A	C or D
				3	noncritical	less than ½	TBD	TBD	TBD	TBD	A or B	C or D
						½ to 1½	TBD	TBD	TBD	TBD	A or B	C or D
						over 1½	2.14	1600	75	250	A	D
				0	other	none	-	-	-	-	A or B	C or D
00	Other PTFE	1	virgin	0	as specified	none	-	-	-	-	A or B	C or D
		2	recycled	0	as specified	none	-	-	-	-	A or B	C or D
		0	as specified	0	as specified	none	-	-	-	-	A or B	C or D

[A]One inch equals 25.4 mm.
[B]See 12.2.
[C]See 12.3.
[D]See 12.4.
[E]See 12.5. "A" indicates that the product has no dimensional stability requirements. "B" indicates that product must comply with dimensional stability requirements in 7.3. This requirement applies only to rod that is under 25.4 mm [1 in.] in diameter.
[F]See 12.6. "C" indicates that the product has no internal inspection requirements. "D" indicates that product must comply with the inspection requirements given in 8.3.

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