



Designation: D3307 – 10

Standard Specification for Perfluoroalkoxy (PFA)-Fluorocarbon Resin Molding and Extrusion Materials¹

This standard is issued under the fixed designation D3307; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers melt processable molding and extrusion materials of PFA-perfluoro(alkoxy alkane) fluorocarbon resin. The materials are copolymers of TFE-fluorocarbon resins containing perfluoroalkoxy side chains. These materials were formerly the subject of this specification and Specification D6314.

1.2 This specification is intended to provide a means for calling out plastic materials used in the fabrication of end items or parts. It is not intended for the selection of materials. Material selection should be made by those having expertise in the plastics field after careful consideration of the design and the performance required of the part, the environment to which it will be exposed, the fabrication process to be employed, the costs involved, and the inherent properties of the material other than those covered by this specification.

1.3 This specification does not cover recycled plastics.²

1.4 The tests involved are intended to provide information for identifying the materials covered. It is not the function of this specification to provide engineering data for design purposes. Specimens prepared by injection molding or extrusion could yield test results that may vary from the values in this specification.

1.5 The values stated in SI units³ are to be regarded as standard. The values given in parentheses are for information only.

1.6 The following precautionary caveat pertains only to the test methods portions, Sections 8 and 9 of this specification: *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—This specification, ISO 12086–1(2006), and ISO 12086–2(2006) differ in approach or detail. Data obtained using either may not be technically equivalent.

2. Referenced Documents

2.1 ASTM Standards:⁴

- D150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
- D618 Practice for Conditioning Plastics for Testing
- 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
- D1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D1708 Test Method for Tensile Properties of Plastics by Use of Microtensile Specimens
- D2116 Specification for FEP-Fluorocarbon Molding and Extrusion Materials
- D3892 Practice for Packaging/Packing of Plastics
- D4591 Test Method for Determining Temperatures and Heats of Transitions of Fluoropolymers by Differential Scanning Calorimetry
- D4895 Specification for Polytetrafluoroethylene (PTFE) Resin Produced From Dispersion
- D5033 Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics (Withdrawn 2007)⁵
- D6314 Specification for Fluorocarbon Perfluoromethoxy (MFA) Resin Molding and Extrusion Materials (Withdrawn 2002)⁵

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 (Section D20.15.12).

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² As defined in Guide D5033.

³ As defined in IEEE/ASTM SI-10.

⁴ 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.

⁵ The last approved version of this historical standard is referenced on www.astm.org.

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

TABLE 1 Detail Requirements for Test on Molding and Extrusion Materials

	Type I	Type II	Type III	Type IV	Type V	Type VI	Type VII	Type VIII	Type IX	Type X	Type XI	Type XII	Type XIII	Type XIV
Melt flow, ^A g/10min:														
min	>7	1	>3	>10	1	>3	10	2	>24	1	≥4	≥8	≥18	≥63
max	19	3	7	30	3	10	17	5	≤50	4	8	18	40	81
Melting endotherm peak temperature, ^B min, °C	300	300	300	285	285	285	280	280	300	265	265	265	265	290

^ASee 9.3 of this specification.

^BSee 9.4 of this specification.

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

IEEE/ASTM SI-10 Standard for Use of the International System of Units (SI): The Modern Metric System

2.2 ISO Standards:⁶

ISO 12086-1 Plastics-Fluoropolymer Dispersions and Moulding and Extrusion Materials-Part 1

ISO 12086-2 Plastics-Fluoropolymer Dispersions and Moulding and Extrusion Materials-Part 2

3. Terminology

3.1 Definitions—Definitions are in accordance with Terminologies D883 and D1600.

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

4. Classification

4.1 This specification covers 14 types of PFA-fluorocarbon resins supplied in pellet form for molding and extrusion.

4.2 A one-line system may be used to specify materials covered by this specification. The system uses predefined cells to refer to specific aspects of this specification, illustrated as follows:

Specification				
Standard Number	:Type	: Grade	:Class	: Special
Block	:	:	:	Notes
: :	:	:	:	:
_____	_____	_____	_____	_____

Example: Specification D3307 – 06, I

In this standard, the only specifications are type; no grade or class is required. A comma is used as the separator between the standard number and the type.⁷

5. General Requirements

5.1 The materials shall be of uniform composition and so prepared as to conform to the requirements of this specification.

5.2 The materials described in this specification shall be free of foreign matter to such a contamination level as may be required in 10.4.

⁶ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁷ See ASTM Form and Style Manual.

6. Detail Requirements

6.1 The materials covered by this specification shall conform to the requirements prescribed in Table 1 and Table 2 when tested by the procedures specified herein. Table 2 lists those tests requiring a specimen molded as described in 9.1.

7. Sampling

7.1 Sampling shall be statistically adequate to satisfy the requirements of 10.4.

8. Number of Tests

8.1 One set of test specimens as prescribed in Section 9 shall be considered sufficient for testing each sample. The average result of the specimens tested shall conform to the requirements of this specification.

9. Test Methods

9.1 Test Specimens:

9.1.1 Prepare a molded sheet 1.50 ± 0.25 -mm (0.060 ± 0.010-in.) thick. Use a picture-frame-type chase having a suitable blanked-out section and thickness to produce the desired sheet. Use clean aluminum foil, 0.13 to 0.18 mm (0.005 to 0.007 in.) thick, in contact with the resin. A high temperature mold release agent may be sprayed on the aluminum foil to help prevent the foil from sticking to the sheet. Use steel molding plates at least 1.0 mm (0.040 in.) thick and of an area adequate to cover the chase.

9.1.2 Lay down and smoothly cover one plate with a sheet of aluminum foil. Place the mold chase on top of this assembly. Place within the mold chase sufficient molding material to produce the required sheet in such manner that the polymer charge is a mound in the middle of the chase. Place a second sheet of aluminum foil on top of the granules and add the top mold plate. Place the assembly in a compression molding press having platens that have been heated to $380 \pm 5^\circ\text{C}$ ($716 \pm 10^\circ\text{F}$).

9.1.3 Bring the press platens to incipient contact with the mold assembly. Hold for 2 to 4 min without pressure. Apply approximately 1 MPa (145 psi) and hold for 1 to 1.5 min. Then apply 2 to 4 MPa (290 to 580 psi) and hold for 1 to 1.5 min. Maintain the press at $380 \pm 5^\circ\text{C}$ ($716 \pm 10^\circ\text{F}$) during these steps. Remove the assembly from the press and place between two 20 ± 7 -mm (0.75 ± 0.25 -in.) steel plates whose temperature is less than 40°C (104°F).

9.1.4 When the sheet is cool enough to touch (about 50 to 60°C (122 to 140°F)), remove the aluminum foil from the