



Designation: D6339-05

Standard Specification for Designation: D6339 – 11

Standard Classification System for and Basis for Specifications for Syndiotactic Polystyrene Molding and Extrusion (SPS)¹

This standard is issued under the fixed designation D6339; 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-classification system~~ covers syndiotactic polystyrene materials including homopolymer, copolymers, blends, and impact modified, suitable for molding and extrusion. Recycled product will be addressed in a separate standard.

1.2 This ~~specification is classification system and subsequent line callout (specification)~~ are intended to ~~provide a means of~~ calling out plastic materials used in fabrication of end use items or parts. ~~It is not intended for the selection of materials.~~ Material selection ~~should~~ can be made by those having expertise in the plastics field only 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 inherent properties of the material other than those covered by this ~~specification-classification system~~, and the economics.

1.3 The properties included in this ~~specification-classification system~~ are those required to identify the compositions covered. Other requirements necessary to identify particular characteristics important to specialized applications ~~are~~ are to be called out using the suffixes given in Section 5.

NOTE—~~There is no ISO equivalent.~~ 1—There is no known ISO equivalent to this standard.

2. Referenced Documents

2.1 ASTM Standards:²

D256 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

D618 Practice for Conditioning Plastics for Testing

D638 Test Method for Tensile Properties of Plastics

D648 Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position

D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

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

D1525 Test Method for Vicat Softening Temperature of Plastics

~~D1898 Practice for Sampling of Plastics~~

D1600 Terminology for Abbreviated Terms Relating to Plastics

D3641 Practice for Injection Molding Test Specimens of Thermoplastic Molding and Extrusion Materials

D3892 Practice for Packaging/Packing of Plastics

D4000 Classification System for Specifying Plastic Materials

D5630 ~~Test Method for Ash Content in Plastics~~ Test Method for Ash Content in Plastics

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.2 Military Standard:³

¹ This ~~specification-classification system~~ is under the jurisdiction of ASTM 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 Available from Standardization Documents Order Desk, Bldg. 4 Section D, Philadelphia, PA, 199111-5094, Attn: PODS.

³ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://dodssp.daps.dla.mil.

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

MIL-STD-105 Sampling Procedure and Tables for Inspection by Attributes

2.3 *ISO Standards:*⁴

ISO 75–1 and 2 Plastics: Determination of Temperature of Deflection Under Load

ISO 179–1 Determination of Charpy Impact Strength—Part 1: Non-Instrumented Impact Test

ISO 306 Plastics: Thermoplastic Materials-Determination of Vicat Softening Temperature (VST)

ISO 527–2 Plastics: Determination of Tensile Properties-Part 2: Test Conditions for Moulding and Extrusion Plastics

ISO 1133 Plastics—Determination of the Melt Mass-Flow Rate (MFR) and the Melt Volume-Flow Rate (MVR) of Thermoplastics

~~ISO 1183 Plastics: Methods for Determining the Density and Relative Density of Non-Cellular Plastics—ISO 1183-1 Plastics: Methods for Determining the Density of Non-Cellular Plastics—Part 1: Immersion Method, Liquid Pyknometer Method and Titration Method~~

~~ISO 3451~~ISO 3451-1 Plastics: Determination of Ash-Part 1 General Methods

3. Terminology

3.1 *Definitions*—~~For definitions of technical terms pertaining to plastics used in this specification, see Terminology—The terminology used in this classification system is in accordance with Terminologies D883 and D1600.~~

4. Classification

4.1 Syndiotactic polystyrene materials are classified into groups according to their composition. These groups are subdivided into classes and grades as shown in the basic properties table, Table SPS. Injection molded properties are the preferred standard and are used for the basis of call out examples. Call outs ~~can~~ are allowed to be made in either ASTM or ISO properties where both are given using the same line callout.

NOTE 2—An example of this classification system for SPS is as follows: For SPS0111, the designation SPS would indicate SPS = syndiotactic polystyrene, 01= homopolymer, 1 = general purpose, and 1 (grade) = minimum grade requirements as found in Table SPS.

4.1.1 To facilitate the incorporation of future or special materials the “Other/Unspecified” category (0) for group, class, and grade is shown in Table SPS. The basic properties can be obtained from Tables A or B as they apply (see 4.3).

4.2 Reinforced and filled syndiotactic polystyrene materials are classified in accordance with Table SPS as noted or with Table A.

4.2.1 *Reinforced and Additive Materials*—A single letter will be used for the major reinforcement or combination, or both, along with two digits that indicate the percentage of addition by mass with the tolerances as shown in Table 1.

NOTE 3—This part of the system uses the type and percentages of additive to designate the modification of the basic material. Percentage of additives can be shown on the supplier’s Technical Data Sheet unless it is proprietary. If necessary, additional requirements shall be indicated by the use of the suffix part of the system, as given in Section 5.

NOTE 4—Determine ash content of filled or reinforced materials using Test Method D5630 or ISO 3451–1 where applicable.

4.2.2 *Table A, Detail Requirements*—An identifying number is made up of the letter A and five digits comprising the cell numbers for the new requirements in the designated order as they appear in Table A.

4.2.2.1 Although the values listed are necessary to include the range of properties available in existing materials, ~~users should not infer that~~ every possible combination of the properties exists or can be obtained.

NOTE 5—Using Table SPS and Table A, an example of a reinforced syndiotactic polystyrene of this classification system is as follows: The designation would indicate material requirements from Table A as:

SPS0110G15A12332

where:

- 0110 = Homopolymer, Table SPS,
- G15 = Glass-reinforced at 15 % nominal (see 4.2.1),
- A = Table A for property requirements,
- 1 = Tensile strength 50 MPa,
- 2 = Flexural modulus or tensile modulus (ISO), 4000 MPa/min,
- 3 = Izod impact 70 J/m or 7 kJ/m²(Charpy ISO), minimum,
- 3 = Deflection temperature, 180°C, minimum, and
- 2 = Specific gravity, 1.2, minimum.

If no properties are specified, the designation would be SPS0110G15A00000.

4.3 Table B has been incorporated into this ~~specification~~ classification system to facilitate the classification of special materials where neither Table SPS nor Table A reflect the required properties. Table B shall be used in the same manner as Table A.

NOTE 6—An example of a special material using this classification system is as follows: The following designation would indicate material requirements from Table B as:

SPS0110B76013

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

where:

- 0110 = homopolymer from Table SPS,
- B = Cell Table B for properties requirements,
- 7 = Tensile strength, 70 MPa, minimum,
- 6 = Tensile Modulus, 3500 MPa, minimum,
- 0 = Unspecified Izod impact/ISO Charpy impact,
- 1 = Vicat softening temperature, 80°C, minimum, and
- 3 = Flow rate, 3.0, minimum.

5. Suffix Requirements

~~5.1 When requirements are needed that supersede or supplement the property table or cell table requirements they shall be specified through the use of suffixes. In general, the first suffix letter indicates the special requirements needed and the second letter indicates the condition or test method, or both, with a three-digit number indicating the specific requirement. The suffixes that may be used are listed in Table 3 of Classification~~

5.1 When additional requirements are needed that are not covered by the basic requirements or cell table requirements they shall be indicated through the use of suffixes.

5.2 A list of suffixes can be found in Classification System D4000 (Table 3) and are to be used for additional requirements as appropriate. Additional suffixes will be added to that standard as test methods and requirements are developed and requested.

NOTE 7—Properties of pigmented or colored SPS materials can differ from the properties of natural or unpigmented SPS material, depending on the choice of colorants and the concentration. The main property affected is ductility, as illustrated by a reduction in Izod impact strength. If specific properties of pigmented SPS materials are necessary, prior testing between the materials supplier and end user should be initiated.

6. Basic Requirements

~~6.1 Basic requirements from Table SPS, as they apply, are always in effect unless these requirements are superseded by specific suffix requirements, which always take precedence.~~

6.1 Basic requirements from Table SPS, as they apply, are always in effect unless superseded by specific suffix requirements, which always take precedence.

6.2 The plastics composition shall be uniform and shall conform to the requirements specified herein.

7. General Requirements

~~7.1 The material composition shall be uniform and shall conform to the requirements specified herein.~~

7.1 The material composition shall conform to the requirements in Tables SPS. A, B, and suffix requirements as they apply.

8. Detail Requirements

~~8.1 Test specimens for the various materials shall conform to the requirements prescribed in Tables SPS, A, and B, and suffix requirements as they apply.~~

8.2 For the purpose of determining conformance, all specified limits for a specification (line callout) based on this classification system are absolute limits, as defined by Practice E29.

9. Sampling

~~9.1 Sampling shall be in accordance with a sampling procedure statistically adequate to satisfy the requirements of~~

9.1 Sampling shall be statistically adequate to satisfy the requirements of 13.4. A lot of material shall be considered

9.2 A batch or lot is construed as a unit of manufacture as prepared for shipment, and may be allowed to consist of two or more production runs or batches.

10. Sample Preparation—Injection

10.1 The test specimens shall be molded by an injection molding process in accordance with Practice D3641 as follows:

10.1.1 Pre-drying of pellets is only required for blends of SPS. Four hours of drying at 200°C in a dryer with a dew point of –30°C is recommended for SPS/PA blends.

10.1.2 For injection-molded samples 290 ± 10°C shall be the melt temperature, and 100 ± 10°C or 160 ± 10°C for filled or reinforced materials, shall be the mold temperature.

10.1.2.1 Average injection velocity shall be 200 ± 100 mm/s, and can be calculated using the following equation:

$$AIV = \frac{\pi d^2 Va}{4ns} \quad (1)$$

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where:

d = screw diameter, screw diameter, mm

Va = screw advance speed, mm/s