



Standard Classification System and Basis for Specification for Poly (Phenylene Sulfide) (PPS) Injection Molding and Extrusion Materials Using ISO Methods¹

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1. Scope*

1.1 This classification system covers unfilled, reinforced and filled materials suitable for injection molding and extrusion using ISO methods. The system allows for the use of poly (phenylene sulfide) (PPS) plastic materials that are recycled, reconstituted recycled-regrind, recovered or reprocessed, or both, provided that the requirements as stated in this specification are met. It is the responsibility of the supplier and the buyer of recycled, reconstituted, recycled-regrind, recovered or reprocessed, or both, poly (phenylene sulfide) plastic materials to ensure compliance (see Guide [D7209](#)).

1.2 The properties included in this classification are those required to identify the compositions covered. It is possible that other requirements are necessary to identify particular characteristics important to specialized applications. The use of suffixes as shown in Section 5 is one way of specifying these requirements.

1.3 This classification system and subsequent line callout (specification) are intended to provide a means of calling out plastic materials used in the fabrication of end items or parts. It is not intended for the selection of materials. Material selection needs to be made by those having expertise in the plastic 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 classification.

1.4 The following precautionary caveat pertains only to the test method portion, Section 11, of this classification system: *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 standard and ISO 28078 address the same subject matter, but differ in technical content.

NOTE 2—ASTM [D4067](#) for PPS uses ASTM test methods.

2. Referenced Documents

2.1 ASTM Standards:²

- [D618 Practice for Conditioning Plastics for Testing](#)
 - [D883 Terminology Relating to 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](#)
 - [D4067 Classification System for and Basis for Specification for Reinforced and Filled Poly\(Phenylene Sulfide\) \(PPS\) Injection Molding and Extrusion Materials Using ASTM Methods](#)
 - [D7209 Guide for Waste Reduction, Resource Recovery, and Use of Recycled Polymeric Materials and Products](#)
 - [E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)
- ### 2.2 IEC and ISO Standards:³
- [IEC 60112 Recommended Methods for Determining the Comparative Tracking Index of Solid Insulation Materials](#)
 - [IEC 60243 Recommended Methods for Electric Strength of Solid Insulating Materials at Power Frequencies](#)
 - [ISO 62 Plastics—Determination of Water Absorption](#)
 - [ISO 178 Plastics—Determination of Flexural Properties of Rigid Plastics](#)
 - [ISO 180/1A Plastics—Determination of Izod Impact Strength of Rigid Materials](#)
 - [ISO 294-1 Plastics—Injection Moulding Test Specimens of Thermoplastic Materials](#)
 - [ISO 527 Plastics—Determination of Tensile Properties](#)
 - [ISO 604 Plastics—Determination of Compressive Properties](#)

¹ This classification system is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials (Section D20.15.17).

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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 *ISO and IEC Selected Standards for the Plastics Industry, 2nd Edition*, ASTM, Stock#: ISOPLAS2.

ISO 1133 Plastics—Determination of Mass Flow Rate and Melt Volume Flow Rate

ISO 1183 Plastics—Methods for Determining the Density and Relative Density of Noncellular Plastics

ISO 3167 Plastics—Multipurpose Test Specimens

ISO 3451 Plastics—Determination of Ash

ISO 11443 Plastics—Determination of the Fluidity of Plastics Using Capillary and Split Die Rheometers

ISO 28078 Plastics—Poly(phenylene sulfide) (PPS) Moulding and Extrusion Materials—Part 1: Designation System and Basis for Specifications

2.3 *UL Standards:*⁴

UL 94 Test for Flammability of Plastic Materials for Parts in Devices and Appliances

2.4 *NTIS Standards:*⁵

AD297457 Procedures and Analytical Method for Determining Toxic Gases Produced by Synthetic Compounds

2.5 *Military Standards:*⁶

MIL-M-24519

MIL-P-46174

3. Terminology

3.1 *Definitions*—The terminology used in this classification system is in accordance with Terminology **D883** and Terminology **D1600**.

4. Classification

4.1 Poly(phenylene sulfide) materials are classified according to their composition. These classes are subdivided into grades as shown in the Basic Property Table (Table PPS).

NOTE 3—An example of the use of this classification system for specifying fiberglass reinforced poly(phenylene sulfide) is given as follows: The line callout PPS011G40 (specification) indicates the following:

PPS	=	poly(phenylene sulfide) as found in Terminology D1600 .
01	=	general purpose (group),
1	=	glass reinforced (class), and
G40	=	nominal 40 % glass with the requirements given in Table PPS (grade).

4.1.1 To facilitate incorporation of future or special materials the “other” category for group (00), class (0), and grade (0) is shown in Table PPS. The basic properties of these materials are obtained from Table A as they apply.

4.2 Reinforced, filled, and unfilled versions of poly(phenylene sulfide) materials that are not in Table PPS are specified in accordance with Tables PPS, A, and B. Table PPS is first used to identify the group and class of poly(phenylene sulfide). Table A is then used to specify the property requirements after the addition or reinforcements, pigments, fillers, or lubricants at the nominal level indicated (see 4.2.1) or Table B is used to specify the property requirements of unfilled/unreinforced versions of poly(phenylene sulfide).

4.2.1 Reinforced versions of the basic materials are identified by a single letter that indicates the reinforcement used and two digits that indicate the nominal quantity in percent by weight. Thus, a letter designation G for glass-reinforced and 30 for percent of reinforcement, G30, specifies a filled material with a nominal glass level of 30 %. The reinforcement letter designations and associated tolerance levels are shown as follows:

Symbol	Material	Tolerance (Based on Total Mass)
C	carbon and graphite fiber reinforced	±2 percentage points
G	glass-reinforced	±3 percentage points
L	lubricants (such as PTFE, graphite, silicone)	depends upon material and process. to be specified by supplier/user agreement.
M	mineral-reinforced	±3 percentage points
R	combinations of reinforcements or fillers, or both	±3 percentage points

NOTE 4—This part of the classification system uses the percent of reinforcements or additives, or both, in the callout (specification) of the modified basic material. The types and percentages of reinforcements and additives are usually shown on the supplier’s technical data sheet unless they are proprietary in nature. If necessary, additional callout of these reinforcements and additives are to be accompanied by use of the suffix part of the system (see Section 5).

4.2.2 Specific requirements for reinforced, filled, or lubricated poly(phenylene sulfide) materials shall be identified by using a six-character line callout. The specification shall consist of the letter “A” and the five digits comprising the cell number for the property requirements in the 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, this does not infer that every possible combination of the properties exists or can be obtained.

4.2.3 When the grade of the basic material is not known, or is not important, the use of the “0” grade classification shall be used for the reinforced materials in this system.

NOTE 5—An example of a specification for a reinforced PPS material is given as follows. The specification PPS0110G20A31042 indicates the following material requirements:

PPS0110	=	Glass reinforced poly(phenylene sulfide), from Table PPS,
G20	=	Glass reinforced at 20 % nominal,
A	=	Table A property requirements,
3	=	110 MPa tensile strength, min,
1	=	6000 MPa flexural modulus, min,
0	=	Unspecified Izod strength,
4	=	160 MPa flexural strength, min, and
2	=	1.5×10^3 kg/m ³ density, min.

If no properties are specified, the designation would be PPS010G20A00000.

NOTE 6—An example of a specification for an unfilled/unreinforced PPS material is given as follows. The designation PPS0000B32030 indicates the following material requirements:

PPS0000	=	unfilled/unreinforced poly(phenylene sulfide), from Table PPS,
B	=	Table B property requirements,
3	=	60 MPa tensile strength, min,
2	=	2000 MPa flexural modulus, min,
0	=	unspecified Izod strength,
3	=	80 MPa flexural strength min, and
0	=	unspecified.

If no properties are specified, the designation would be PPS0000B00000.

⁴ Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.

⁵ Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, <http://www.ntis.gov>.

⁶ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil>.