



Designation: D5138 – 23

Standard Classification System and Basis for Specification for Liquid Crystal Polymers Molding and Extrusion Materials (LCP)¹

This standard is issued under the fixed designation D5138; 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 classification system covers liquid crystal polymeric (LCP) materials suitable for injection molding and extrusion. This classification system allows the use of liquid crystal polymers that are recycled, reconstituted, recycled-regrind, recovered, or reprocessed, or a combination thereof, provided that the requirements as stated in this classification system are met. It is the responsibility of the supplier and the buyer of liquid crystal polymers that are recycled, reconstituted, recycled-regrind, recovered, or reprocessed, or a combination thereof, to ensure compliance.

1.2 The properties included in this classification system are those required to identify the compositions covered. Other requirements necessary to identify particular characteristics important to specialized applications are allowed. These shall be agreed upon between the user and the supplier, by using suffixes as given in Section 5.

1.3 This classification system and subsequent line callout (specification) are intended to be a means of calling out plastic materials used in the fabrication of end-use items or parts. It is not intended for the selection of materials. Material selection can 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 classification system.

1.4 The values stated in SI units are to be regarded as standard.

1.5 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,*

health, and environmental practices and determine the applicability of regulatory limitations prior to use.

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

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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
- 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
- D3418 Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry
- D3641 Practice for Injection Molding Test Specimens of Thermoplastic Molding and Extrusion Materials
- D3835 Test Method for Determination of Properties of Polymeric Materials by Means of a Capillary Rheometer
- D3892 Practice for Packaging/Packing of Plastics
- D4000 Classification System for Specifying Plastic Materials
- D5630 Test Method for Ash Content in Plastics

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.

Current edition approved Feb. 1, 2023. Published February 2023. Originally approved in 1990. Last previous edition approved in 2016 as D5138 - 16. DOI: 10.1520/D5138-23.

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.

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

D7209 Guide for Waste Reduction, Resource Recovery, and Use of Recycled Polymeric Materials and Products (Withdrawn 2015)³

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

2.2 *IEC and ISO Standards*:⁴

IEC 112 Recommended Method for Determining the Comparative Tracking Index of Solid Insulation Materials

IEC 243 Recommended Methods of Test for Electrical Strength of Solid Insulating Materials at Power Frequencies

ISO 62 Plastics—Determination of Water Absorption

ISO 75-1 Determination of Temperature of Deflection Under Load—General Test Method

ISO 75-2 Determination of Temperature of Deflection Under Load—Plastics and Ebonite

ISO 178 Plastics—Determination of Flexural Properties of Rigid Materials

ISO 180 Plastics—Determination of Izod Impact Strength of Rigid Materials

ISO 294-1 Plastics—Injection Moulding of Test Specimens of Thermoplastic Materials—General Principles for Injection Moulding

ISO 527-1 Plastics—Determination of Tensile Properties—General Principles

ISO 527-2 Plastics—Determination of Tensile Properties—Test Conditions for Moulding and Extrusion of Plastics

ISO 604 Plastics—Determination of Compressive Properties

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

ISO 11357-1 Plastics—Differential Scanning Calorimetry (DSC)—Part 1: General Principles

ISO 11357-3 Plastics—Differential Scanning Calorimetry (DSC)—Part 3: Determination of Temperature and Enthalpy of Melting and Crystallization

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

ISO 20753 Plastics—Test Specimens

2.3 *Military Standard*:⁵

MIL-M-24519 Molding Plastics—Electrical Thermoplastics

2.4 *Underwriters Laboratories (UL)*:⁶

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

2.5 *National Technical Information Service (NTIS)*:⁷

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

3. Terminology

3.1 *Definitions*—Except for the terms defined below, the terminology used in this classification system is in accordance with Terminologies **D883** and **D1600**.

3.2 *Definitions of Terms Specific to This Standard*:

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>.

⁵ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil>.

⁶ Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, <http://www.ul.com>.

⁷ Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, <http://www.ntis.gov>.

TABLE LCP Liquid Crystal Polymers—Classification

Group	Description	Class	Description	Grade ^A	Description
01	unsubstituted or methyl substituted, wholly aromatic copolyester, polyether, or polyester amide	1	high temperature DTUL ^B >260°C	0	
		2	medium temperature DTUL = 220–260°C	0	
		3	general purpose DTUL <220°C	0	
02	mixed aromatic/aliphatic copolyesters, polyethers, or polyester amides	1	high temperature DTUL >260°C	0	
		2	medium temperature DTUL = 220–260°C	0	
		3	general purpose DTUL <220°C	0	
03	aromatic copolyesters, polyethers, or polyesteramides with aliphatic sidechain	1	high temperature DTUL >260°C	0	
		2	medium temperature DTUL = 220–260°C	0	
		3	general purpose DTUL <220°C	0	
04	blends	1	high temperature DTUL >260°C	0	
		2	medium temperature DTUL = 220–260°C	0	
		3	general purpose DTUL <220°C	0	
00	other	0	other	0	

^A Description unspecified.

^B DTUL is deflection temperature under load measured at 1.8 MPa and is determined in accordance with Table A or Table B.