Designation: D787 – 18

Standard Specification for Ethyl Cellulose Molding and Extrusion Compounds[1]

This standard is issued under the fixed designation D787; 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 requirements for plasticized ethyl cellulose thermoplastic compounds suitable for injection molding and extrusion. It does not include special materials compounded for special applications.

1.2 The values stated in SI units are to be regarded as standard. The English values given are for information only.

1.3 The following precautionary statement pertains only to the Test Methods portion, Section 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

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

1.4 *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
D570 Test Method for Water Absorption 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
D785 Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D883 Terminology Relating to Plastics
D1505 Test Method for Density of Plastics by the Density-Gradient Technique
D3641 Practice for Injection Molding Test Specimens of Thermoplastic Molding and Extrusion Materials
D3892 Practice for Packaging/Packing of Plastics

3. Terminology

3.1 Terms in this specification are in accordance with Terminology D883.

4. Classification

4.1 This specification covers two types and eleven grades of ethyl cellulose molding and extrusion compounds as classified in accordance with Table 1. Type I materials are general purpose and Type II are characterized by improved resistance to impact, especially at low temperatures. The grades are classified in accordance with their physical properties as specified in Table 1.

4.1.1 A typical call out of material covered by this specification would contain the number of this specification and the required type and grade chosen from Table 1, for example, D787 Type 1, Grade 1.

5. Materials and Manufacture

5.1 Materials supplied under this specification shall be ethyl cellulose plastics in the form of pellets unless otherwise specified.

5.2 Material supplied shall be as uniform in composition and size and as free of contamination as can be achieved by good manufacturing practice.

5.3 These materials possibly contain colorants in the nominal amounts ordinarily employed. Only those materials of this kind that meet the properties specified are covered by this standard.

5.4 The color and transparency or opacity of items fabricated under the conditions recommended by the manufacturer

[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.

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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.

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

TABLE 1 Detailed Requirements for Molded Test Specimens

NOTE 1—ft·lbf/in. × 53.3378660 = joules per metre. Megapascals (MPa) = newtons × 10^6 per metre squared.

Property	Type I					Type II					Test Methods
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	
Specific gravity, unpigmented, max at 23/23°C (73.4/73.4°F)	1.13	1.13	1.12	1.12	1.11	1.10	1.12	1.12	1.11	1.11	1.10	D792
Hardness (Rockwell) R scale, min	110	110	105	105	100	95	105	80	75	75	50	D785
Tensile strength at 23°C, min:												
MPa	44.8	41.4	38.1	33.0	31.0	24.2	27.6	24.1	20.7	20.0	15.9	D638
psi	6500	6000	5400	4800	4500	3800	4000	3500	3000	3300	2900	
Impact strength (Izod), min												
at 23°C (73.4°F):												
J/m of notch	90.7	90.7	106.7	106.7	117.3	149.5	186.7	213.5	293.4	213.5	320.3	D256
ft·lbf/in. of notch	1.7	1.7	2.0	2.0	2.2	2.8	3.5	4.0	5.5	4.0	6.0	
at – 40°C (–40°F):												
J/m of notch	26.7	26.7	26.7	26.7	26.7	26.7	53.4	64.1	80.1	53.4	80.1	D256
ft·lbf/in. of notch	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.2	1.5	1.0	1.5	
Deflection temperature, min:												
at 1820-kPa (264-psi) fiber stress:												
°C	82	77	71	66	60	49	66	77	71	60	49	D648
°F	180	170	160	150	140	120	150	170	160	140	120	
at 455-kPa (66-psi) fiber stress:												
°C	94	88	82	77	71	66	82	82	82	77	–	D648
°F	200	190	180	170	160	150	180	180	180	170	–	
Water absorption (24-h immersion), max %	1.7	1.5	1.4	1.2	1.1	1.0	1.3	1.5	1.5	1.5	1.5	D570
Weight loss on heating (72 h at 82°C), max %	0.3	0.4	0.6	0.8	1.5	1.8	2.0	1.2	2.0	2.0	2.0	

of the material shall be comparable within commercial match tolerances to the color and transparency or opacity of samples submitted by the manufacturer.

6. Physical Requirements

6.1 Test specimens of the material shall conform to the requirements prescribed in Table 1.

6.2 Molded specimens for those tests requiring them shall be prepared as described in Section 9.

6.3 Conformance to the requirements of this specification shall be determined by means of the tests identified in Section 10.

7. Sampling

7.1 Sampling shall be statistically adequate to satisfy the requirements of 11.4.

7.2 For sampling purposes, a batch or lot shall be considered a unit of manufacture as prepared for shipment and can consist of a blend of two or more production runs of material.

8. Number of Tests

8.1 Routine testing of each batch or lot shall be limited to properties designated in Table 1 of this specification.

9. Specimen Preparation

9.1 Requirements in Table 1 are based on injection molded specimens 3.2 mm (⅛ in.) thick. Machined specimens from compression-molded blanks or extruded strips can be used if it can be shown that the results are comparable.

9.2 Prior to molding ethyl cellulose, dry the material to a moisture content of 0.2 % or less. A recommended procedure is to keep the material, spread to a maximum depth of 51 mm (2 in.) in a tray, in a circulating-air oven at 76.5 to 88°C (170 to 190°F) for 3 hours. Control the injection molding condition on cycle in accordance with Practice D3641, using a material temperature of 10 to 25°C (13 to 45°F) below the level that causes discoloration of the plastic. Mold temperatures of 48 to 71°C (120 to 160°F) have been found desirable. As a rule, thin section molding and the higher molecular weight compounds require the higher mold temperature.

10. Test Methods

10.1 Determine the properties defined by this specification in accordance with the following methods:

10.1.1 Unless otherwise specified, all tests shall be performed in the standard laboratory atmosphere as defined by Practice D618.

10.1.2 Unless otherwise specified, molded test specimens shall be conditioned in accordance with Procedure A of Practice D618.

10.1.3 *Rockwell Hardness*—Procedure A of Test Method D785.

10.1.4 *Specific Gravity*—Method A of Test Methods D792, or Test Method D1505.