



Standard Classification for Thermoplastic Elastomer-Ether-Ester (TEEE)¹

This standard is issued under the fixed designation D 4550; 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 Department of Defense.

INTRODUCTION

This classification is intended to be a means of calling out 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 inherent properties of the material other than those covered by this specification, and the economics.

1. Scope

1.1 This classification covers segmented block copolyether-ester elastomers suitable for molding and extrusion. This classification allows for the use of segmented block copolyether-ester elastomers that are recycled, reconstituted, recycled-regrind, recovered, or reprocessed, or a combination thereof, provided that the requirements as stated in this classification are met. It is the responsibility of the supplier and the buyer of recycled, reconstituted, recycled-regrind, recovered, or reprocessed, or a combination thereof, copolyether-ester elastomers to ensure compliance (see Guide D 5033).

1.2 The properties included in this classification are those required to identify the compositions covered. There may be other requirements necessary to identify particular characteristics important to specialized applications. These may be specified using the suffixes as given in Section 5.

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 should 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 methods portion, Section 11 of this classification: *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 classification system is similar to ISO FDIS 14910-1/-2 1997, although the technical content is significantly different.

NOTE 2—This classification system is being revised to add international specimens and test procedures as the standard for compliance. The previous test specimens and Tables TEEE and A are included in Appendix X1 as a reference for those wishing to use them. It is recommended that the material manufacturer be consulted on all callouts against this classification system.

2. Referenced Documents

2.1 ASTM Standards:

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing²

D 638M Test Method for Tensile Properties of Plastics [Metric]²

D 790 Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials²

D 883 Terminology Relating to Plastics²

D 1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer²

D 1600 Terminology for Abbreviated Terms Relating to Plastics²

¹ This specification is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

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² Annual Book of ASTM Standards, Vol 08.01.

- D 2240 Test Method for Rubber Property—Durometer Hardness³
 D 3418 Test Method for Transition Temperatures of Polymers by Thermal Analysis⁴
 D 3641 Practice for Injection Molding Test Specimens of Thermoplastic Molding and Extrusion Materials⁴
 D 3892 Practice for Packaging/Packing of Plastics⁴
 D 4000 Classification System for Specifying Plastic Materials⁴
 D 5033 Guide for the Development of Standards Relating to the Proper Use of Recycled Plastics⁵
 D 5630 Test Method for Ash Content in Thermoplastics⁵
 E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specification⁶
 2.2 ISO Standards:⁷

- ISO 178 1993 Plastics—Determination of Flexural Properties
 ISO 294-1 1996 Plastics—Injection Moulding of Test Specimens of Thermoplastic Materials-Part 1: General Principles, Multipurpose-Test Specimens (ISO Mount Type A) and Bars (ISO Mould Type B)
 ISO 527-1 1993 Plastics—Determination of Tensile Properties-Part 1: General Principles
 ISO 527-2 1993 Plastics—Determination of Tensile Properties-Part 2: Test Conditions for Moulding and Extrusion Materials
 ISO 868 1985 Plastics and Ebonite-Determination of Indentation Hardness by Means of a Durometer
 ISO 1133 1997 Plastics—Determination of the Melt Mass-Flow Rate (MFR) and the Melt Volume Flow Rate (MVR) of Thermoplastics
 ISO 3146 1985 Plastics—Determination of Melting Behaviour (Melting Temperature or Melting Range) of Semi-Crystalline Polymers

³ Annual Book of ASTM Standards, Vol 09.01.

⁴ Annual Book of ASTM Standards, Vol 08.02.

⁵ Annual Book of ASTM Standards, Vol 08.03.

⁶ Annual Book of ASTM Standards, Vol 14.02.

⁷ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

TABLE TEEE Requirements for Polyether-Ester Elastomers

Group	Class	Grade	Description ^A	Flexural Modulus ^B ISO 178 MPa	Flow Rate ^C ISO 1133 g/10 min.	Flow Rate Condition	Tensile Strength ^D ISO 527-1, -2 MPa, min	Elongation ^D at Break ISO 527-1, -2 % min
01	1	1		25 to 75	3 to 12	190 /2.16	15	375
		2	Medium Tensile	25 to 75	3 to 12	190 /2.16	10	150
		3		25 to 75	3 to 12	190 /2.16	5	150
		0	Other	25 to 75	3 to 12	...	...	...
	2	1		25 to 75	5 to 24	220 /2.16	15	375
		2		25 to 75	13 to 20	220 /2.16	...	...
		0	Other	25 to 75	5 to 24	...	...	...
		0	Other	25 to 75	...	...	...	...
		0	Other	25 to 75	...	...	...	...
		0	Other	25 to 75	...	...	...	...
02	1	1	Blow Molding	76 to 150	0.5 to 5	230 /2.16	25	400
		0	Other	76 to 150	0.5 to 5	...	...	...
	2	1		76 to 150	3 to 12	190 /2.16	30	300
		2		76 to 150	3 to 12	220 /2.16	10	200
		0	Other	76 to 150	3 to 12	...	...	...
		1		76 to 150	5 to 24	220 /2.16	20	375
	3	2	Medium Tensile	76 to 150	5 to 24	230 /2.16	15	200
		3		76 to 150	5 to 24	220 /2.16	15	100
		0	Other	76 to 150	5 to 24	...	...	...
		0	Other	76 to 150	...	...	...	...
0		Other	76 to 150	...	...	...	...
0		Other	76 to 150	...	...	...	...
03	1	1	Blow Molding	151 to 250	0.5 to 5	230 /2.16	30	250
		0	Other	151 to 250	0.5 to 5	...	...	...
	2	1		151 to 250	3 to 12	220 /2.16	25	300
		2	Heat Stabilized	151 to 250	3 to 12	220 /2.16	25	300
		3		151 to 250	3 to 12	190 /2.16	25	300
		0	Other	151 to 250	3 to 12	...	...	...
	3	1		151 to 250	5 to 24	220 /2.16	25	400
		2	Medium Tensile	151 to 250	5 to 24	230 /2.16	20	200
		3		151 to 250	5 to 24	190 /2.16	25	300
		4		151 to 250	5 to 24	220 /2.16	10	50
0		Other	151 to 250	5 to 24	...	...	...
0		Other	151 to 250	...	...	...	...
04	1	1		251 to 450	3 to 12	230 /2.16	30	400
		2		251 to 450	3 to 12	190 /2.16	35	300
		0	Other	251 to 450	3 to 12	...	...	...
	2	1		251 to 450	5 to 24	240 /2.16	50	100
		0	Other	251 to 450	5 to 24	...	...	...
		1		251 to 450	<55	240 /2.16	15	100
	3	0	Other	251 to 450	<55	...	...	...
		0	Other	251 to 450	...	...	...	...
		0	Other	251 to 450	...	...	...	...
		0	Other	251 to 450	...	...	...	...
05	1	1	Blow Molding	451 to 1000	0.5 to 5	240 /2.16	35	250
		0	Other	451 to 1000	0.5 to 5	...	...	...

TABLE
Continued

Group	Class	Grade	Description ^A	Flexural Modulus ^B ISO 178 MPa	Flow Rate ^C ISO 1133 g/10 min.	Flow Rate Condition	Tensile Strength ^D ISO 527-1, -2 MPa, min	Elongation ^D at Break ISO 527-1, -2 % min
	2	1		451 to 1000	5 to 24	240 /2.16	35	150
		2		451 to 1000	5 to 24	220 /2.16	35	100
		0	Other	451 to 1000	5 to 24	...	...	...
	3	1		451 to 1000	<55	220 /2.16	25	300
		2		451 to 1000	55	240 /2.16	20	...
		0	Other	451 to 1000	55	...	...	...
	0	0	Other	451 to 1000	...	...	...	...
06	1	1		1001 to 2000	5 to 24	240 /2.16	35	150
		2		1001 to 2000	5 to 24	240 /2.16	25	15
		0	Other	1001 to 2000	5 to 24	...	...	...
	0	0	Other	1001 to 2000	...	...	...	...
07	1	1		10 to 50	3 to 15	190 /2.16	15	400
	1	0	Other	10 to 50	3 to 15	...	...	...
	0	0	Other	10 to 50	...	...	...	...
08	1	1		50 to 200	3 to 15	190 /2.16	10	250
		2		50 to 200	3 to 15	220 /2.16	10	150
		3		50 to 200	3 to 15	190 /2.16	5	200
		0	Other	50 to 200	3 to 15	...	...	...
	2	1		50 to 200	5 to 24	220 /2.16	10	150
		2		50 to 200	5 to 24	220 /2.16	15	100
		0	Other	50 to 200	5 to 24	...	...	...
	3	1		50 to 200	<55	220 /2.16	15	60
		2		50 to 200	<55	220 /2.16	10	75
		3		50 to 200	<55	220 /2.16	10	45
		0	Other	50 to 200	<55	...	...	...
	0	0	Other	50 to 200	...	...	...	...
09	1	1		100 to 400	3 to 15	190 /2.16	35	300
		2		100 to 400	3 to 15	190 /2.16	15	250
		3		100 to 400	3 to 15	220 /2.16	10	100
		0	Other	100 to 400	3 to 15	...	...	...
	2	1		100 to 400	5 to 24	220 /2.16	10	50
		0	Other	100 to 400	5 to 24	...	...	...
	3	1		100 to 400	<55	240 /2.16	15	100
		0	Other	100 to 400	<55	...	...	...
	0	0	Other	100 to 400	...	...	...	...
00	0	0	Other	...	...	...	...	...

^A No descriptions unless needed to describe a special grade under the class. All other grades are listed by requirement.

^B Test specimen—80 × 10 × 4 mm. Test speed—2-mm/min.

^C Dry samples 3h at 100°C in dehumidifying oven prior to running test.

^D ISO 527-2 Type 1BA specimen. Test speed—50-mm/min.

TABLE A Detail Requirements Polyether-Ester Elastomers

Designation Order No.	Property	Cell Limits									
		0	1	2	3	4	5	6	7	8	9
1	Flexural modulus, ISO 178, MPa min. ^A	unspecified	10	25	75	150	250	450	1000	2000	specify value
2	Flexural modulus, ISO 178, MPa max. ^A	unspecified	25	75	150	250	450	1000	2000	4000	specify value
3	Tensile strength, ISO 527-1, -2, MPa, min. ^B	unspecified	10	20	30	40	50	60	70	80	specify value
4	Elongation at break, ISO 527-1, -2, %, min. ^B	unspecified	5	10	20	100	200	300	400	500	specify value
5	To be determined	unspecified	...	...	...	...	...	...	...	...	...

^A Test specimen—80 × 10 × 4 mm. Test speed—2-mm/min.

^B ISO 5271-2, Type 1BA specimen.