



Designation: D2103 – 23a

Standard Specification for Polyethylene Film¹

This standard is issued under the fixed designation D2103; 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 the classification of polyethylene film up to 0.254 mm (0.010 in.) in thickness, inclusive. The film can contain additives for the improvement of the surface properties, pigments, or stabilizers, or combinations thereof.

NOTE 1—Film is defined in Terminology D883 as an optional term for sheeting having a nominal thickness no greater than 0.254 mm (0.010 in.).

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

1.3 The following precautionary caveat pertains only to the test method portion, Section 8, 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.*

1.4 This specification allows for the use of recycled polyethylene film or resin as feedstock, in whole or in part, as long as all the requirements as governed by the producer and end user are also met.

NOTE 2—There is no known ISO equivalent to this standard.

1.5 *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

D618 Practice for Conditioning Plastics for Testing

¹ This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.19 on Film, Sheeting, and Molded Products.

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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.

D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D882 Test Method for Tensile Properties of Thin Plastic Sheeting
D883 Terminology Relating to Plastics
D1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics
D1004 Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
D1434 Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting
D1505 Test Method for Density of Plastics by the Density-Gradient Technique
D1709 Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method
D1746 Test Method for Transparency of Plastic Sheeting
D1894 Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting (Withdrawn 2023)³
D1922 Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method
D1938 Test Method for Tear-Propagation Resistance (Trousers Tear) of Plastic Film and Thin Sheeting by a Single-Tear Method
D2457 Test Method for Specular Gloss of Plastic Films and Solid Plastics
D2578 Test Method for Wetting Tension of Polyethylene and Polypropylene Films
D2839 Practice for Use of a Melt Index Strand for Determining Density of Polyethylene
D3892 Practice for Packaging/Packing of Plastics
D4321 Test Method for Package Yield of Plastic Film
D4703 Practice for Compression Molding Thermoplastic Materials into Test Specimens, Plaques, or Sheets
D4976 Specification for Polyethylene Plastics Molding and Extrusion Materials
D5947 Test Methods for Physical Dimensions of Solid Plastics Specimens
D6988 Guide for Determination of Thickness of Plastic Film Test Specimens

³ The last approved version of this historical standard is referenced on www.astm.org.

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

TABLE 1 Type Numbers

Property Order Number	Property	0	1	2	3	4	5	Units
1	Density ^A	unspecified	0.910–<0.926	0.926–<0.941	0.941–0.965	<0.910	...	g/cm ³
2	Impact strength	unspecified	<40	40–70	71–150	151–300	>300	grams
3	Coefficient of friction ^G	unspecified	<0.20	0.20–0.40	0.41–0.70	>0.70	...	...
4	Haze	unspecified	<5.0	5.0–9.0	>9.0	...	...	...
5	Nominal thickness	unspecified	^B	^C	^D	^E	^F	mm (in.)

^AAnnealed density of molded plaques or Melt Index extrudates. $B < 0.0254$ (< 0.0010). $C_{0.0254-0.0508} (0.0010-0.0020)$ $D_{0.0508-0.1016} (0.0020-0.0040)$ $E_{0.1016-0.1778} (0.0040-0.0070)$ $F_{0.1778-\leq 0.2540} (0.0070-\leq 0.0100)$

^GCoefficient of friction listed in this table is based on the kinetic coefficient of friction.

E96/E96M Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
F1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this specification and associated with plastics issues refer to the terminology contained in Terminology **D883**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *treated*—surface characteristics of the film have been modified by flame, corona discharge, or other means to promote the adhesion of inks, etc.

3.2.2 *yield*—the area provided by a given weight of film of specified thickness.

4. Classification

4.1 The film covered in this specification shall be designated by a type number, composed by listing the desired cell limit for each of the five properties, in the order shown in **Table 1**.

NOTE 3—Examples of this classification system are as follows:

(1) A high-clarity packaging film might be described as follows:

Type Number _____ 2 _____ 1 _____ 1 _____ 1 _____ 2
 Density (0.926 to 0.940) _____
 Impact strength (<40) _____
 Coefficient of friction (<0.20) _____
 Haze (<5.0) _____
 Nominal Thickness 0.0254–<0.0508 mm (0.0010–<0.0020 in.) _____

(2) A thin garment bag film might be described as follows:

Type Number _____ 2 _____ 1 _____ 1 _____ 2 _____
 Density (0.926 to 0.940) _____
 Impact strength (<40) _____
 Coefficient of friction (<0.20) _____
 Haze (5.0 to 9.0) _____
 Nominal Thickness 0.0254–<0.0508 mm (0.0010–<0.0020 in.) _____

(3) A tough, thick, pigmented industrial film might be described as follows:

Type Number _____ 1 4 3 3 5
 Density (0.910 to 0.925) _____
 Impact strength (151-300) _____
 Coefficient of friction (0.41 to 0.70) _____
 Haze (>9.0) _____
 Nominal Thickness 0.1778 - ≤ 0.2540 mm (0.0070 - ≤ 0.0100) _____

With this type of classification it is possible to assemble on paper a combination of properties that is impossible to obtain with the present state of technology. A purchaser using this specification for the first time will probably find it necessary to contact material suppliers to learn what materials are commercially available.

4.2 In cases where surface treatment is specified by the purchaser, the test method must be agreed upon between the purchaser and the seller. The recommended test to measure the degree of surface treatment is Test Method **D2578**.

5. General Requirements

5.1 *Appearance*—The material shall have appearance qualities conforming with those produced by good commercial practice. It shall be as free as commercially possible of gels, streaks, pinholes, particles of foreign matter, and undispersed raw material. Gels need to be kept as minimal as possible when recycled materials are used in the films. There shall be no other visible defects such as holes, tears, or blisters. The edges shall