Designation: D2839 – 16 (Reapproved 2023)

# Standard Practice for Use of a Melt Index Strand for Determining Density of Polyethylene[1]

This standard is issued under the fixed designation D2839; 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 practice covers the preparation of a sample for polyethylene density determination in accordance with Test Method D1505. The sample consists of a strand produced by extrusion of the polyethylene in accordance with Test Method D1238, Condition 190/2.16 (Melt Index).

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

1.3 *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.

NOTE 2—The precision data on densities measured using this sample preparation practice is listed in Test Method D1505.

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]

D1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

D1505 Test Method for Density of Plastics by the Density-Gradient Technique

D4703 Practice for Compression Molding Thermoplastic Materials into Test Specimens, Plaques, or Sheets

## 3. Terminology

3.1 *Definitions:*

3.1.1 *melt index strand*—the extrudate produced when polyethylene is extruded in accordance with Test Method D1238, Condition 190/2.16.

## 4. Significance and Use

4.1 This practice has been found to be very useful for preparing polyethylene samples suitable for determination of density by Test Method D1505, for quality control purposes, especially in a resin manufacturing facility where fast, reproducible, comparative results are needed. It is not necessarily recommended for resin specifications that are part of a sales contract between the buyer and the seller.

4.2 The density of a polyethylene sample is highly dependent on the preparation and thermal history of the specimens. The level of density results obtained by this practice of sample preparation differs from that obtained by other methods as described in Practice D4703, Annex A1.

4.3 Before proceeding with this practice, reference shall be made to the specification of the material being tested. Any test specimen preparation, conditioning, dimensions, or testing parameters, or some combination thereof, covered in the materials specification shall take precedence over those mentioned in this practice. If there are no material specifications, the default conditions apply.

## 5. Apparatus

5.1 *Extrusion Plastometer,* as described in Test Method D1238.

5.2 *Hot Plate,* to boil water.

5.3 *Beakers,* 250-mL low form, graduated, with watch-glass covers.

## 6. Sample

6.1 *Polyethylene,* in any form suitable for test in accordance with Test Method D1238.

## 7. Procedure

7.1 Prepare a Melt Index Strand by extruding the sample in accordance with Test Method D1238, Condition 190/2.16,

[1] This practice is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials (D20.15.01).

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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

dropping the strand on a cool metal plate after cutting off. When Procedure B of Test Method D1238 is used, cut off the extrudate at about the time the timer is actuated and discard. Save the portion extruded during the timed interval.

NOTE 3—It has been shown that the measured density of an extruded strand is significantly affected by changes in the localized air velocity due to external drafts, location in relation to HVAC outlets, and so forth. It is advisable to minimize any external airflow and to recognize this when relocating instruments or when comparing results from instruments in different locations.

7.2 Drop the strand into a 250-mL beaker containing at least 200 mL of briskly boiling water, and cover with a watch-glass. Keep a large beaker full of water boiling along with this so that the amount of water can be maintained at 200 mL for the whole period without interrupting the boiling. Let the strand condition in the boiling water for 30 min.

NOTE 4—A time interval of five days at room temperature between extrusion of the strand and dropping into boiling water has not been found critical.

7.3 At the end of the boiling time, remove the beaker from the hot plate, making sure the water level is at approximately 200 mL, and allow to stand on the bench at standard laboratory temperature for 1 h.

NOTE 5—It is acceptable to quench cool the melt strand by omitting procedures 7.2 and 7.3. In such case, after a 10-min cooling period, cut off the density specimen as described in 7.4 and determine the density in accordance with Test Method D1505. This quick approach gives a different result than following 7.2 and 7.3 and shall be reported.

7.4 Remove the strand from the water and cut off a 5-mm (¼-in.) length from the thicker end of the strand. Discard this portion, and, from the next 10 mm (½ in.) of strand, cut at least three short pieces of convenient size for density determination. Cut the strand with a very sharp blade; and cut the strand very slowly to avoid whitening on the sample. Cutting under water will avoid whitening. This whitening appears to affect sample density and shall be avoided. Discard any specimens with bubbles. Discard samples that display visible roughness.

7.5 Determine the density of the specimen in accordance with Test Method D1505 within 24 h of the conditioning described in 7.2 and 7.3.

## 8. Report

8.1 Report the following information:

8.1.1 Any deviations from the procedure, including omission of the conditioning (subsections 7.2 and 7.3).

8.1.2 The density according to the Report Section of Test Method D1505.

## 9. Keywords

9.1 density; melt index strand; PE; polyethylene



## SUMMARY OF CHANGES

Committee D20 has identified the location of selected changes to this standard since the last issue (D2839 - 16) that may impact the use of this standard. (March 15, 2023)

*(1)* Reapproved with no changes.