



Designation: D1505 – 18

Standard Test Method for Density of Plastics by the Density-Gradient Technique¹

This standard is issued under the fixed designation D1505; 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 test method covers the determination of the density of solid plastics.

1.2 This test method is based on observing the level to which a test specimen sinks in a liquid column exhibiting a density gradient, in comparison with standards of known density.

NOTE 1—This test method is equivalent to ISO 1183-2.

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

1.4 *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.*

1.5 *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

D883 Terminology Relating to Plastics

D2839 Practice for Use of a Melt Index Strand for Determining Density of Polyethylene

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

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.70 on Analytical Methods (Section D20.70.01).

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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.

E2935 Practice for Conducting Equivalence Testing in Laboratory Applications

2.2 *ISO Standard:*

ISO 1183-2 Methods for Determining the Density and Relative Density of Noncellular Plastics³

3. Terminology

3.1 Refer to Terminology D883 for definitions of other terms relating to this test method.

3.2 *Definitions:*

3.2.1 *density of plastics*—the weight per unit volume of material at 23°C, expressed as follows:

$$D^{23C}, \text{ g/cm}^3 \quad (1)$$

NOTE 2—Density is to be distinguished from specific gravity, which is the ratio of the weight of a given volume of the material to that of an equal volume of water at a stated temperature.

4. Significance and Use

4.1 The density of a solid is a conveniently measurable property which is frequently useful as a means of following physical changes in a sample, as an indication of uniformity among samples, and a means of identification.

4.2 This test method is designed to yield results accurate to better than 0.05 %.

NOTE 3—Where accuracy of 0.05 % or better is desired, the gradient tube shall be constructed so that vertical distances of 1 mm shall represent density differences no greater than 0.0001 g/cm³.³ The sensitivity of the column is then 0.0001 g/cm³·mm. Where less accuracy is needed, the gradient tube shall be constructed to any required sensitivity.

5. Apparatus

5.1 *Density-Gradient Tube*—A suitable graduate with ground-glass stopper.⁴

5.2 *Constant-Temperature Bath*—A means of controlling the temperature of the liquid in the tube at 23 ± 0.1°C. A thermostatted water jacket around the tube is a satisfactory and convenient method of achieving this.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Tubes similar to those described in Refs (1) and (2) may also be used.

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