



Designation: B703 – 05

Standard Test Method for Apparent Density of Powders Using Arnold Meter¹

This standard is issued under the fixed designation B703; 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 test method covers a procedure for determining the apparent density of both free- and non-free-flowing powders, premixes, and blended mixes.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

B212 Test Method for Apparent Density of Free-Flowing Metal Powders Using the Hall Flowmeter Funnel

B215 Practices for Sampling Metal Powders

B243 Terminology of Powder Metallurgy

B329 Test Method for Apparent Density of Metal Powders and Compounds Using the Scott Volumeter

B417 Test Method for Apparent Density of Non-Free-Flowing Metal Powders Using the Carney Funnel

3. Terminology

3.1 *Definitions*—Useful definitions of terms for metal powders and powder metallurgy are found in Terminology **B243**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *Arnold Density Meter*—This instrument enables the user to determine the density of any powder or mix, whether or not the powder has flow characteristics. It simulates the action of the feed shoe of the press. The values obtained on metal powders are approximately 0.2 g/cm³ higher than those obtained with the Hall, Test Method **B212**; Carney, Test Method **B417**; or Scott, Test Method **B329**, instruments.

¹ This test method is under the jurisdiction of ASTM Committee **B09** on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee **B09.02** on Base Metal Powders.

Current edition approved Oct. 1, 2005. Published October 2005. Originally approved in 1983. Last previous edition approved in 1999 as B703 – 94 (1999) ^{ϵ 1}. DOI: 10.1520/B0703-05.

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.

4. Summary of Test Method

4.1 This test method consists of slowly sliding a bushing partially filled with powder over a hole in a hardened steel block, collecting and weighing the powder, and calculating its apparent density.

5. Significance and Use

5.1 The apparent density is an important measure of a material characteristic inherent in the powder that is useful to the powder producers and end users in determining lot to lot consistency. Knowledge of the apparent density of the final mix as obtained with this test method is very beneficial to the powder metallurgy (P/M) parts fabricator for setting compression ratios for fixed fill die cavities.

5.2 This test method may be part of a purchase agreement between the powder supplier and P/M parts producer, or it may be an internal quality control test for either party.

6. Apparatus

6.1 *Steel Block*³—A hardened, tempered, and demagnetized steel block (60 HRC Min.) having a center hole 31.6640 \pm 0.0025 mm (1.2466 \pm 0.0001 in.) in diameter and a height of 25.4000 \pm 0.0025 mm (1.0000 \pm 0.0001 in.) that corresponds to a volume of 20 cm³ (1.22 in.³) (Fig. 1).

6.2 *Bushing*³, either brass or bronze, approximately 38 mm (1.50 in.) inside diameter (ID) by 45 mm (1.75 in.) outside diameter (OD) by 38 mm long (Fig. 1).

6.3 *Weighing Paper*—A sheet of cellophane or glazed or waxed paper measuring approximately 150 by 150 mm square (6.0 by 6.0 in.).

6.4 *Balance*—A balance having a capacity of at least 200 g suitable for weighing to 0.01 g.

7. Sampling

7.1 Obtain a test sample in accordance with Practices **B215**.

7.2 The powder sample shall be of sufficient volume to fill the bushing to about three quarters of its height.

³ The sole source of supply of the Arnold Density Meter complete with bushing known to the committee at this time is Arnold P/M Consulting Services, 648 Cedar Road, St. Marys, PA 15857. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

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