



Designation: B 703 – 94 (Reapproved 1999)^{ε1}

Standard Test Method for Apparent Density of Powders Using Arnold Meter¹

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^{ε1} NOTE—An editorial change was made in 9.4 in September 1999.

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:

B 212 Test Method for Apparent Density of Free-Flowing Metal Powders²

B 215 Practices for Sampling Finished Lots of Metal Powders²

B 243 Terminology of Powder Metallurgy²

B 329 Test Method for Apparent Density Powders of Refractory Metals and Compounds by Scott Volumeter²

B 417 Test Method for Apparent Density of Non-Free-Flowing Metal Powders²

3. Terminology

3.1 *Definitions*—Useful definitions of terms for metal powders and powder metallurgy are found in Terminology B 243.

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 duplicates the action of the fill shoe of the press, consequently the values obtained on metal powders are approximately 0.2 g/cm³ higher than those obtained with the Hall, Test Method B 212; Carney, Test Method B 417; or Scott, Test Method B 329, instruments.

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, which is useful to the powder producers as well as 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 manufacturer and P/M parts producer, or it may be an internal quality control test for either party.

6. Apparatus

6.1 *Test Block*³—A hardened, tempered, and demagnetized steel block (60 HRC Min.) having a center hole 31.6640 ± 0.0025 mm (1.2466 ± 0.0001 in.) and a height of 25.4000 ± 0.0025 mm (1.0000 ± 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 B 215.

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

¹ This specification is under the jurisdiction of ASTM Committee B-9 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.02 on Base Metal Powders.

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² *Annual Book of ASTM Standards*, Vol 02.05.

³ The Arnold Density Meter complete with bushing is available from Arnold P/M Consulting Services, 648 Cedar Road, St. Marys, PA 15857. Also available from Alcan Powders & Pigments, 901 Lehigh Avenue, Union NJ 07083-7632.