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AMERICAN SOCIETY FOR TESTING AND MATERIALS  
100 Barr Harbor Dr., West Conshohocken, PA 19428  
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# Standard Test Method for Determination of Tap Density of Metallic Powders and Compounds<sup>1</sup>

This standard is issued under the fixed designation B 527; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method specifies a method for the determination of tap density (packed density) of metallic powders and compounds, that is, the density of a powder that has been tapped, to settle contents, in a container under specified conditions.

1.2 *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 Powders<sup>2</sup>

B 215 Practice for Sampling Finished Lots of Metal Powders<sup>2</sup>

B 243 Terminology of Powder Metallurgy<sup>2</sup>

B 329 Test Method for Apparent Density of Powders of Refractory Metals and Compounds by Scott Volumeter<sup>2</sup>

B 417 Test Method for Apparent Density of Non-Free-Flowing Metal Powders<sup>2</sup>

B 703 Test Method for Apparent Density of Metal Powders Using the Arnold Meter<sup>2</sup>

## 3. Significance and Use

3.1 This test method covers the evaluation of the tapped density physical characteristic of metallic powders and compounds. The degree of correlation between the results of this test method and the quality of powders in use will vary with each particular application and has not been fully determined.

## 4. Apparatus

4.1 *Balance*, of appropriate capacity an accuracy to satisfy the requirements shown in Table 1.

4.2 *Graduated Glass Cylinder*,<sup>3</sup> calibrated to contain 100

<sup>1</sup> 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 B09.03 on Refractory Metal Powders.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.05.

<sup>3</sup> Corning No. 3046, Pyrex brand has been found suitable.

TABLE 1 Accuracy and Capacity of Balance

Cylinder Capacity, cm <sup>3</sup>	Apparent Density, g/cm <sup>3</sup>	Mass of Test Portion, g
100	>1	100 ± 0.5
100	<1	50 ± 0.2
25	>7	100 ± 0.5
25	2 to 7	50 ± 0.2
25	<2	20 ± 0.1

cm<sup>3</sup> at 20°C, the height of the graduated portion being approximately 175 mm. The graduations shall be at 1 cm<sup>3</sup> intervals, thus allowing a measuring accuracy of ± 0.5 cm<sup>3</sup>. For apparent densities over 4.0 g/cm<sup>3</sup>, do not use the 100 cm<sup>3</sup> cylinder.

4.2.1 Alternatively, the following may be used:

4.2.1.1 *Graduated Glass Cylinder*, calibrated to contain 25 cm<sup>3</sup> at 20°C, the height of the graduated portion being approximately 135 mm. The graduations shall be at 0.2 cm<sup>3</sup> intervals.

4.2.1.2 A 25-cm<sup>3</sup> cylinder shall be used for powders of apparent density higher than 4 g/cm<sup>3</sup>, in particular for refractory metal powders, but may also be used for powder of lower apparent density.

4.3 *Tapping Apparatus*,<sup>4</sup> which permits the tapping of the graduated cylinder against a firm base. The tapping shall be such that a densification of the powder can take place without any loosening of its surface layers. The stroke shall be 3 mm (0.118 in.) and the tapping frequency shall be between 100 and 300 taps/min. An example of a tapping apparatus is shown in Fig. 1.

## 5. Test Specimen

5.1 For the quantities of powder required for each test, see Table 1. Obtain test powder samples according to Practices B 215.

5.2 In general, the powder should be tested in the as-received condition. In certain instances the powder may be dried. However, if the powder is susceptible to oxidation, the drying shall take place in a vacuum or in inert gas. If the powder contains volatile substances, it shall not be dried.

<sup>4</sup> The following have been found suitable: Shandon Southern Instruments, Inc., Tap-Pak Volumeter Model JEL-ST2 (Manufactured by J. Engelsmann A.G. or Ludwigshafen 9. Rh. West Germany), 515 Broad Street, Sewickly, PA 15143; Vankel Industries, Vanderkamp Tap Density Tester, 36 Meridian Road, Edison, NJ 08820; Quantachrome Corp., Dual Autotap, 6 Aerial Way, Syosset, NY 11791.