



Designation: B212 – 21

Standard Test Method for Apparent Density of Free-Flowing Metal Powders Using the Hall Flowmeter Funnel¹

This standard is issued under the fixed designation B212; 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 describes a procedure for determining the apparent density of free-flowing metal powders, and mixed powders; and is suitable for only those powders that will flow unaided through the specified Hall Flowmeter funnel.

1.2 *Units*—With the exception of the values for mass, volume, and density, for which the use of the gram and the cubic centimetre units is the long-standing industry practice, the values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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.*

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

B215 Practices for Sampling Metal Powders

B243 Terminology of Powder Metallurgy

B873 Test Method for Measuring Volume of Apparent Density Cup Used in Test Methods B212, B329, and B417

E456 Terminology Relating to Quality and Statistics

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.

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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.

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

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, see Terminology B243. Additional descriptive PM information is available under “General Information on PM” on the ASTM B09 web page.

4. Summary of Test Method

4.1 A volume of powder is permitted to flow into a container of definite volume under controlled conditions. The mass of powder per unit volume is determined and reported as apparent density, Hall (AD_H).

5. Significance and Use

5.1 This test method provides a guide for evaluation of an important physical characteristic of a powder known as the apparent density. The measured apparent density bears a relationship to the mass of powder that will fill a fixed volume die cavity. The degree of correlation between the results of this test and the performance of powders during use may vary with each particular application. Note, however, that the presence of moisture, oils, stearic acid, stearates, waxes, and the temperature of the powder mass may alter the physical characteristics of the powder.

6. Apparatus

6.1 *Powder Flowmeter Funnel*³—A calibrated Hall Flowmeter funnel (Fig. 1).

6.1.1 The funnel shall be made of a non-magnetic, corrosion-resistant metallic material having sufficient thickness and hardness to withstand distortion and excessive wear.

6.2 *Density Cup*—A cylindrical brass cup (Fig. 2) having a nominal capacity of 25 cm³. The actual cup volume shall be

³ The sole source of supply of the apparatus known to the committee at this time is ACuPowder International, LLC, 901 Lehigh Ave., Union, NJ 07083-7632. 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

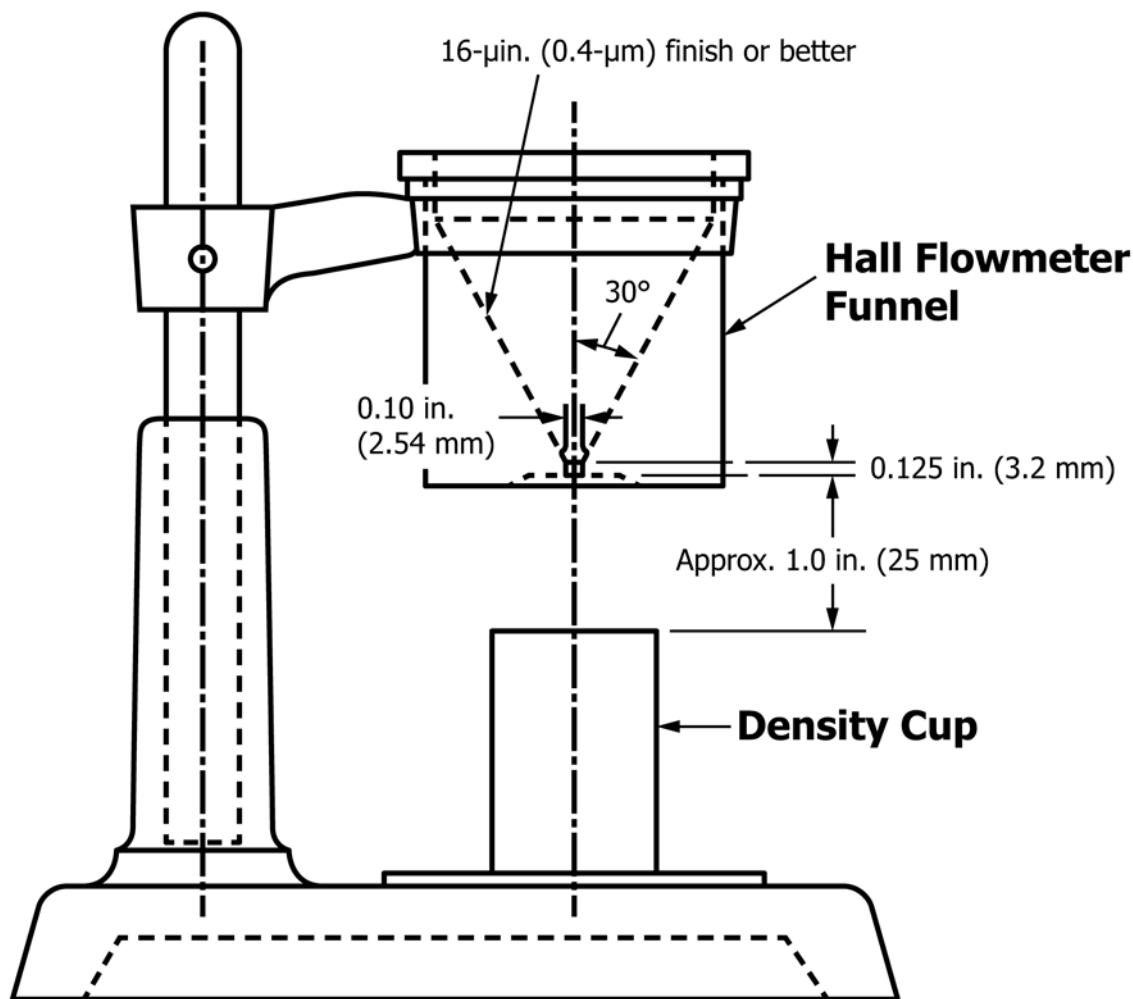


FIG. 1 Flowmeter Apparatus — Hall Funnel

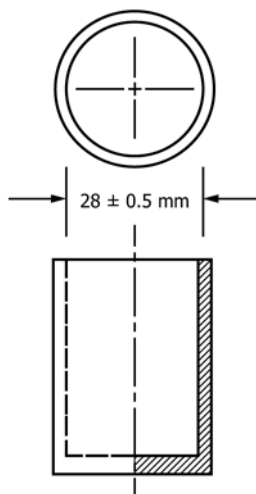


FIG. 2 Density Cup ($25 \pm 0.03 \text{ cm}^3$)

determined according to Test Method B873. If the measured volume of the cup is outside the tolerance in Fig. 2 ($25 \pm 0.03 \text{ cm}^3$) the cup shall not be used.

6.3 *Stand*³—A stand (Fig. 1) to support the Hall Flowmeter funnel concentric with the density cup so that the bottom of the Hall Flowmeter funnel orifice is approximately 1 in. (25 mm)