



Designation: B 855 – 94 (Reapproved 1999)^{e1}

Standard Test Method for Volumetric Flow Rate of Metal Powders Using Arnold Meter and Hall Funnel¹

This standard is issued under the fixed designation B 855; 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.

^{e1} NOTE—An editorial change was made in Section 9.4 in November 1999.

1. Scope

1.1 This test method covers a procedure for measuring the flow characteristics of a given volume of powder.

1.2 The values stated in SI units are to be regarded as the standard (except for the Hall Flowmeter Funnel, which is produced in inch-pound units). 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 213 Test Method for Flow Rate of Metal Powders²

B 215 Practices for Sampling Finished Lots of Metal Powders²

B 243 Terminology of Powder Metallurgy²

B 703 Test Method for Apparent Density of Metal Powders

using the Arnold Meter²

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 *volumetric flow rate*—the time required for a given volume of powder to flow through an orifice in a standard instrument according to a specified procedure.

4. Summary of Test Method

4.1 This test method consists of slowly sliding a bushing partially filled with powder over a 20 cm³ hole in a hardened steel block. The volume of the powder obtained upon removal of the steel block is transferred to a Hall Flowmeter and the flow rate reported in seconds per 20 cm³.

5. Significance and Use

5.1 The volumetric flow rate is a true measure of the flow characteristics of a metal powder. Measuring flow by volume as compared to flow per unit mass eliminates the variable of the powder density.

5.2 The ability of a powder to flow and pack is a function of interparticle friction. As the surface area increases, the amount of friction in a powder mass also increases. Consequently, the friction between particles increases, giving less efficient flow and packing.

5.3 Knowledge of the volumetric flow rate is important to the parts' producer in estimating production rates—compacts per hour, as well as for blending and mixing of powders.

5.4 This test method may be part of the purchase agreement between powder manufacturers and powder metallurgy (P/M) part producers, or it can be an internal quality control test by either the producer or the end user.

6. Apparatus

6.1 *Arnold Density Meter*³—(Test Method B 703) a hardened tempered and demagnetized steel block 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*—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 (1.50 in.) long (Fig. 1).

6.3 *Hall Flowmeter*⁴—(Test Method B 213) A standard flowmeter funnel having a calibrated orifice of 0.10 in. (2.54 mm) in diameter complete with stand (Fig. 2).

6.4 *Base*—A level, vibration-free base to support the Hall Flowmeter.

6.5 *Paper*—Glazed or waxed paper measuring approximately 150 mm by 150 mm square (6.0 in. by 6.0 in.).

6.6 *Timing Device*—Stopwatch or other suitable device.

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

Current edition approved Aug. 15, 1994. Published October 1994.

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 and also from Alcan Powders & Pigments, 901 Lehigh Avenue, Union, NJ 07083-7632.

⁴ The complete Hall Flowmeter is available from Alcan Powders & Pigments, 901 Lehigh Avenue, Union NJ 07083-7632.