



Standard Test Method for Measuring Dimensional Changes of Metal Powder Specimens¹

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^{ε1} NOTE—Editorial corrections were made in Sections 5, 8.6, 9, and 10.4 and Fig. 2.

1. Scope

1.1 This test method primarily covers a procedure for determining the change in dimensions that occurs as a result of pressing and sintering a metal powder specimen. The size change referred to is the difference between the die size and the size of the sintered specimen after it has cooled to room temperature, expressed as a percentage. This size change is a basic characteristic of the metal powder.

1.2 The general procedure of measuring a test specimen and die, then calculating the dimensional change, as described in this test method, also may be used to determine green expansion, heat treat changes, or other dimensional changes of test specimens that result from processing steps.

1.3 The values stated in inch-pound units are to be regarded as the standard. The SI equivalents are in parentheses and may be approximate.

1.4 *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 215 Practices for Sampling Finished Lots of Metal Powders²

B 243 Terminology of Powder Metallurgy²

B 312 Test Method for Green Strength for Compacted Metal Powder Specimens²

3. Terminology

3.1 **Definitions**—For definitions of terms used in this test method, see Terminology B 243.

4. Summary of Test Method

4.1 Test specimens are made from the metal powder lot

under consideration by pressing and sintering or other processing (see 1.2). The absolute dimensional change as a result of pressing and sintering is calculated from measurements taken on the sintered test specimens and from the die cavity.

4.2 When this method is used to compare metal powder lots, specimens from a reference metal powder lot agreed upon by the parties concerned are made and processed at the same time. The dimensional change of the test specimen is calculated and mathematically compared with the dimensional change of the reference specimen.

5. Significance and Use

5.1 The dimensional change obtained under specified conditions of pressing and sintering is a material characteristic inherent in the powder. It is useful to the production, testing, and use of metal powders.

5.2 The absolute dimensional change may be used to classify powders or differentiate one type or grade from another, to evaluate additions to the powder mix or measure process changes, and to guide in the design of tooling.

5.3 The comparative dimensional change is mainly used as a quality control test to measure variations between lots of metal powders of the same material composition.

5.4 Factors known to affect size change are the test specimen process conditions of green density, sinter time, sinter temperature, sinter atmosphere, level of additions to the base metal powder, lubricant type, powder grade, powder type, and powder lot.

6. Apparatus

6.1 **Balance**, suitable for weighing accurately to 0.01 g.

6.2 **Mixer**, capable of thorough and controlled mixing of metal powders and lubricants.

6.3 **Compression-Testing Machine or Powder Press**, capable of applying the required pressure to produce the test specimen.

6.4 **Punches and Die**, for producing a test specimen, are shown in Fig. 1.

6.5 **Micrometers**, capable of measuring the necessary dimensions to 0.0001 in. (0.0025 mm).

6.6 **Sintering Furnace**, capable of maintaining a specified work temperature and having controlled atmosphere and a

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² Annual Book of ASTM Standards, Vol 02.05.