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Standard Test Method for Surface Finish of Powder Metallurgy (PM) Products¹

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1. Scope

1.1 This test method covers measuring the surface finish of powder metallurgy (PM) products at all stages of manufacturing from green compact to fully hardened finished component.

1.2 This test method provides the definition and schematic of some common surface finish parameters (R_a , R_p , and R_{zISO})

1.3 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.

1.4 *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 to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

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

2.2 *MPIF Standard:*³

MPIF Standard 58 Method for Determination of Surface Finish of Powder Metallurgy Products

3. Significance and Use

3.1 The surface finish of a component may be critical for certain applications, affecting properties such as wear resistance, fatigue strength, and coefficient of friction.

3.2 Surface finish may also be critical for component assembly or system performance. Dimensional fit and mating

surface interaction may require certain surface finish requirements to meet performance specifications.

4. Interferences

4.1 Because many conventional PM materials contain open porosity at the surface, special consideration should be taken when measuring surface finish.

4.2 The use of a conical point stylus may result in inaccurate or inconsistent surface finish results because the sharper point of the stylus may drop into open porosity on the surface of the component.

4.3 A chisel point stylus may be used for better accuracy and consistency.

4.4 Because the direction of pressing may cause directionality in surface finish values, the direction of measurement should be specified and reported.

5. Apparatus

5.1 *Surface Finish Measuring Instrument.*

5.2 *Stylus*—Chisel point, 0.050 in. (1.27 mm) length and 0.0004 in. \pm 30 % (0.010 mm \pm 30 %) tip radius as shown in Fig. 1. To limit the possibility of the stylus dropping into open surface porosity, a chisel point stylus is recommended. If a cone stylus is used, filtering software shall also be used to remove the influence of open surface porosity.

6. Sampling, Test Specimens, and Test Units

6.1 The test surface shall be clean and free of any oil, dirt, debris, or foreign material.

6.2 Sufficient surface area shall be available to permit multiple traverses by the measuring instrument.

6.3 The test surface shall be flat over a sufficient length (in accordance with instrument instructions) to allow proper movement of the stylus.

7. Procedure

7.1 The PM parts manufacturer and purchaser shall agree on the desired location and direction for surface finish measurement.

7.2 Place the surface finish instrument in a position suitable for measuring the test sample.

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 B09.05 on Structural Parts.

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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.

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