



Designation: F3049 – 14 (Reapproved 2021)

Standard Guide for Characterizing Properties of Metal Powders Used for Additive Manufacturing Processes¹

This standard is issued under the fixed designation F3049; 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.

1. Scope

1.1 This guide introduces the reader to techniques for metal powder characterization that may be useful for powder-based additive manufacturing processes including binder jetting, directed energy deposition, and powder bed fusion. It refers the reader to other, existing standards that may be applicable for the characterization of virgin and used metal powders processed in additive manufacturing systems.²

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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:³

B212 Test Method for Apparent Density of Free-Flowing Metal Powders Using the Hall Flowmeter Funnel

B213 Test Methods for Flow Rate of Metal Powders Using the Hall Flowmeter Funnel

B214 Test Method for Sieve Analysis of Metal Powders

B215 Practices for Sampling Metal Powders

B243 Terminology of Powder Metallurgy

B329 Test Method for Apparent Density of Metal Powders and Compounds Using the Scott Volumeter

B417 Test Method for Apparent Density of Non-Free-Flowing Metal Powders Using the Carney Funnel

B527 Test Method for Tap Density of Metal Powders and Compounds

B703 Test Method for Apparent Density of Metal Powders and Related Compounds Using the Arnold Meter

B783 Specification for Materials for Ferrous Powder Metallurgy (PM) Structural Parts

B822 Test Method for Particle Size Distribution of Metal Powders and Related Compounds by Light Scattering

B855 Test Method for Volumetric Flow Rate of Metal Powders Using the Arnold Meter and Hall Flowmeter Funnel

B923 Test Method for Metal Powder Skeletal Density by Helium or Nitrogen Pycnometry

B964 Test Methods for Flow Rate of Metal Powders Using the Carney Funnel

E539 Test Method for Analysis of Titanium Alloys by Wavelength Dispersive X-Ray Fluorescence Spectrometry

E572 Test Method for Analysis of Stainless and Alloy Steels by Wavelength Dispersive X-Ray Fluorescence Spectrometry

E1447 Test Method for Determination of Hydrogen in Titanium and Titanium Alloys by Inert Gas Fusion Thermal Conductivity/Infrared Detection Method

E1569 Test Method for Determination of Oxygen in Tantalum Powder by Inert Gas Fusion Technique (Withdrawn 2018)⁴

E1638 Terminology Relating to Sieves, Sieving Methods, and Screening Media

E1941 Test Method for Determination of Carbon in Refractory and Reactive Metals and Their Alloys by Combustion Analysis

E2371 Test Method for Analysis of Titanium and Titanium

¹ This test method is under the jurisdiction of ASTM Committee F42 on Additive Manufacturing Technologies and is the direct responsibility of Subcommittee F42.05 on Materials and Processes.

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² Cooke, A. L., Slotwinski, J. A., "Properties of Metal Powders for Additive Manufacturing: A Review of the State of the Art of Metal Powder Property Testing," NIST IR 7873, July, 2012. Online, Available: http://www.nist.gov/manuscript-publication-search.cfm?pub_id=911339

³ 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.

⁴ The last approved version of this historical standard is referenced on www.astm.org.