



Standard Guide for Evaluating Mechanical Properties of Metal Materials Made via Additive Manufacturing Processes¹

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1. Scope

1.1 This standard serves as a guide to existing standards or variations of existing standards that may be applicable to determine specific mechanical properties of materials made with an additive manufacturing process.

1.2 As noted in many of these referenced standards, there are several factors that may influence the reported properties, including material, material anisotropy, method of material preparation, porosity, method of specimen preparation, testing environment, specimen alignment and gripping, testing speed, and testing temperature. These factors should be recorded, to the extent that they are known, according to Practice F2971 and the guidelines of the referenced standards.

1.3 The following standards are not referred to directly in the guide but also have information that may be useful in the testing of metal test specimens made via additive manufacturing: A370, A1058, B211, B348, B557, B565, B724, B769, E3, E6, E7, E290, E467, E468, E837, E915, E1049, E1823, E1942.

1.4 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.5 *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:²

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A1058 Test Methods for Mechanical Testing of Steel Products—Metric

¹ This test method is under the jurisdiction of ASTM Committee F42 on Additive Manufacturing Technologies and is the direct responsibility of Subcommittee F42.01 on Test Methods.

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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.

B211 Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire

B348 Specification for Titanium and Titanium Alloy Bars and Billets

B557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

B565 Test Method for Shear Testing of Aluminum and Aluminum-Alloy Rivets and Cold-Heading Wire and Rods

B645 Practice for Linear-Elastic Plane-Strain Fracture Toughness Testing of Aluminum Alloys

B646 Practice for Fracture Toughness Testing of Aluminum Alloys

B647 Test Method for Indentation Hardness of Aluminum Alloys by Means of a Webster Hardness Gage

B648 Test Method for Indentation Hardness of Aluminum Alloys by Means of a Barcol Impressor

B724 Test Method for Indentation Hardness of Aluminum Alloys by Means of a Newage, Portable, Non-Caliper-Type Instrument (Withdrawn 2013)³

B769 Test Method for Shear Testing of Aluminum Alloys

B909 Guide for Plane Strain Fracture Toughness Testing of Non-Stress Relieved Aluminum Products

E3 Guide for Preparation of Metallographic Specimens

E6 Terminology Relating to Methods of Mechanical Testing

E7 Terminology Relating to Metallography

E8/E8M Test Methods for Tension Testing of Metallic Materials

E9 Test Methods of Compression Testing of Metallic Materials at Room Temperature

E10 Test Method for Brinell Hardness of Metallic Materials

E18 Test Methods for Rockwell Hardness of Metallic Materials

E21 Test Methods for Elevated Temperature Tension Tests of Metallic Materials

E23 Test Methods for Notched Bar Impact Testing of Metallic Materials

E111 Test Method for Young's Modulus, Tangent Modulus, and Chord Modulus

³ The last approved version of this historical standard is referenced on www.astm.org.