



Designation: E1012 – 19

Standard Practice for Verification of Testing Frame and Specimen Alignment Under Tensile and Compressive Axial Force Application¹

This standard is issued under the fixed designation E1012; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 Included in this practice are methods covering the determination of the amount of bending that occurs during the application of tensile and compressive forces to notched and unnotched test specimens during routine testing in the elastic range. These methods are particularly applicable to the force levels normally used for tension testing, compression testing, creep testing, and uniaxial fatigue testing. The principal objective of this practice is to assess the amount of bending exerted upon a test specimen by the ordinary components assembled into a materials testing machine, during routine tests.

1.2 This practice is valid for metallic and nonmetallic testing.

1.3 *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:²

[E6 Terminology Relating to Methods of Mechanical Testing](#)
[E8/E8M Test Methods for Tension Testing of Metallic Materials](#)

[E9 Test Methods of Compression Testing of Metallic Materials at Room Temperature](#)

[E21 Test Methods for Elevated Temperature Tension Tests of Metallic Materials](#)

[E83 Practice for Verification and Classification of Extensometer Systems](#)

[E251 Test Methods for Performance Characteristics of Metallic Bonded Resistance Strain Gages](#)

[E466 Practice for Conducting Force Controlled Constant Amplitude Axial Fatigue Tests of Metallic Materials](#)

[E606 Test Method for Strain-Controlled Fatigue Testing](#)

[E1237 Guide for Installing Bonded Resistance Strain Gages](#)

2.2 Other Documents:

[VAMAS Guide 42 A Procedure for the Measurement of Machine Alignment in Axial Testing](#)

3. Terminology

3.1 Definitions of Terms Common to Mechanical Testing:

3.1.1 For definitions of terms used in this practice that are common to mechanical testing of materials, see Terminology [E6](#).

3.1.2 *alignment, n*—the condition of a testing machine that influences the introduction of bending moments into a specimen (or alignment transducer) during the application of tensile or compressive forces.

3.1.3 *eccentricity [L], n*—the distance between the line of action of the applied force and the axis of symmetry of the specimen in a plane perpendicular to the longitudinal axis of the specimen.

3.1.4 *reduced parallel section A [L], n*—the central portion of the specimen that has a nominally uniform cross section, with an optional small taper toward the center, that is smaller than that of the ends that are gripped, not including the fillets.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *axial strain, a, n*—the average of the longitudinal strains measured by strain gages at the surface on opposite sides of the longitudinal axis of symmetry of the alignment transducer by multiple strain-sensing devices located at the same longitudinal position.

3.2.1.1 *Discussion*—This definition is only applicable to this standard. The term is used in other contexts elsewhere in mechanical testing.

3.2.2 *bending strain, b, n*—the difference between the strain at the surface and the axial strain (see [Fig. 1](#)).

3.2.2.1 *Discussion*—in general, the bending strain varies

¹ This practice is under the jurisdiction of ASTM Committee [E28](#) on Mechanical Testing and is the direct responsibility of Subcommittee [E28.01](#) on Calibration of Mechanical Testing Machines and Apparatus.

Current edition approved Dec. 15, 2019. Published March 2020. Originally approved in 1989. Last previous edition approved in 2014 as E1012 – 14^{ε1}. DOI: 10.1520/E1012-19.

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.

*A Summary of Changes section appears at the end of this standard