



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

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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, 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.

2. Referenced Documents

2.1 ASTM Standards:²

- E6 Terminology Relating to Methods of Mechanical Testing
- E8 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

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.

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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.

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 section* [L], n —section in the central portion of the specimen which has a cross section smaller than the gripped ends.

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 from point to point around and along the reduced section of the specimen. Bending strain is calculated as shown in Section 10.

3.2.3 *component* (also known as *force application component*), n —any of the parts used in the attachment of the load cell or grips to the testing frame, as well as any part, including the grips used in the application of force to the strain-gaged alignment transducer or the test specimen.

3.2.4 *grips*, n —that part of the force application components that directly attach to the strain-gage alignment transducer or the test specimen.

3.2.5 *microstrain*, n —strain expressed in micro-units per unit, such as micrometers/meter or mils/in.

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