



Standard Practices for Force Verification of Testing Machines¹

This standard is issued under the fixed designation E4; 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 These practices cover procedures for the force verification, by means of standard calibration devices, of tension or compression, or both, static or quasi-static testing machines (which may, or may not, have force-indicating systems). These practices are not intended to be complete purchase specifications for testing machines. Testing machines may be verified by one of the three following methods or combination thereof:

- 1.1.1 Use of standard weights,
- 1.1.2 Use of equal-arm balances and standard weights, or
- 1.1.3 Use of elastic calibration devices.

NOTE 1—These practices do not cover the verification of all types of testing machines designed to measure forces, for example, the constant-rate-of-loading type which operates on the inclined-plane principle. This type of machine may be verified as directed in the applicable appendix of Specification [D76](#).

1.2 The procedures of [1.1.1 – 1.1.3](#) apply to the verification of the force-indicating systems associated with the testing machine, such as a scale, dial, marked or unmarked recorder chart, digital display, etc. *In all cases the buyer/owner/user must designate the force-indicating system(s) to be verified and included in the report.*

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.

1.3.1 Since conversion factors are not required in this practice, either inch-pound units, SI units, or metric values can be used as the standard.

1.4 Forces indicated on displays/printouts of testing machine data systems—be they instantaneous, delayed, stored, or retransmitted—which are verified with provisions of [1.1.1](#),

[1.1.2](#), or [1.1.3](#), and are within the $\pm 1\%$ accuracy requirement, comply with Practices E4.

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

[D76](#) Specification for Tensile Testing Machines for Textiles
[E74](#) Practice of Calibration of Force-Measuring Instruments for Verifying the Force Indication of Testing Machines
[E467](#) Practice for Verification of Constant Amplitude Dynamic Forces in an Axial Fatigue Testing System

3. Terminology

3.1 Definitions:

3.1.1 *accuracy*—the specified permissible variation from the reference value.

3.1.1.1 *Discussion*—A testing machine is said to be accurate if the indicated force is within the specified permissible variation from the actual force. In these methods the word “accurate” applied to a testing machine is used without numerical values, for example, “An accurate testing machine was used for the investigation.” The accuracy of a testing machine should not be confused with sensitivity. For example, a testing machine might be very sensitive; that is, it might indicate quickly and definitely small changes in force, but nevertheless, be very inaccurate. On the other hand, the accuracy of the results is in general limited by the sensitivity.

3.1.2 *calibration, n*—in the case of force testing machines, the process of comparing the force indication of the machine under test to that of a standard, making adjustments as needed to meet error requirements.

¹ These practices are 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.