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.

Designation: E74 – 18$^{\epsilon 1}$

Standard Practices for Calibration and Verification for Force-Measuring Instruments[1]

This standard is issued under the fixed designation E74; 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.

ε[1] NOTE—Editorial corrections were made to 3.2.4.1 and 3.2.9.1 in April 2019.

1. Scope

1.1 The purpose of these practices is to specify procedures for the calibration of force-measuring instruments. Procedures are included for the following types of instruments:

1.1.1 Elastic force-measuring instruments, and

1.1.2 Force-multiplying systems, such as balances and small platform scales.

NOTE 1—Verification by deadweight loading is also an acceptable method of verifying the force indication of a testing machine. Tolerances for weights for this purpose are given in Practices E4; methods for calibration of the weights are given in NIST Technical Note 577(**1**)[2], Methods of Calibrating Weights for Piston Gages.

1.2 The values stated in SI units are to be regarded as the standard. Other metric and inch-pound values are regarded as equivalent when required.

1.3 These practices are intended for the calibration of static force-measuring instruments. It is not applicable for dynamic or high speed force calibrations, nor can the results of calibrations performed in accordance with these practices be assumed valid for dynamic or high speed force measurements.

1.4 *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.*

1.5 *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]

E4 Practices for Force Verification of Testing Machines

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E1012 Practice for Verification of Testing Frame and Specimen Alignment Under Tensile and Compressive Axial Force Application

2.2 *ASME Standard:*

B46.1 Surface Texture, Surface Roughness, Waviness and Lay[4]

FORCE-MEASURING INSTRUMENTS

3. Terminology

3.1 *Definitions:*

3.1.1 *force-measuring instrument*—a system consisting of an elastic member combined with an appropriate instrument for indicating the magnitude (or a quantity proportional to the magnitude) of deformation of the member under an applied force.

3.1.2 *primary force standard*—a deadweight force applied directly without intervening mechanisms such as levers, hydraulic multipliers, or the like, whose mass has been determined by comparison with reference standards traceable to the International System of Units (SI) (**2**) of mass.

3.1.3 *secondary force standard*—an instrument or mechanism, the calibration of which has been established by comparison with primary force standards.

3.2 *Definitions of Terms Specific to This Standard:*

[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] The boldface numbers in parentheses refer to a list of references at the end of this standard.

[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] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

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