



Standard Guide for Evaluating Computerized Data Acquisition Systems Used to Acquire Data from Universal Testing Machines¹

This standard is issued under the fixed designation E1856; 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.

1. Scope*

1.1 This guide is intended to assist the user in the evaluation and documentation of computerized data acquisition systems used to acquire data from quasi-static tests, performed on universal testing machines. The report produced will aid in the correct use and calibration of the computerized universal testing machine.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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

- E4 Practices for Force Verification of Testing Machines
- E6 Terminology Relating to Methods of Mechanical Testing
- E8/E8M Test Methods for Tension Testing of Metallic Materials
- E74 Practice of Calibration of Force-Measuring Instruments for Verifying the Force Indication of Testing Machines
- E83 Practice for Verification and Classification of Extensometer Systems
- E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
- E1012 Practice for Verification of Testing Frame and Specimen Alignment Under Tensile and Compressive Axial Force Application

¹ This guide is under the jurisdiction of ASTM Committee E28 on Mechanical Testing and is the direct responsibility of Subcommittee E28.15 on Automated Testing.

Current edition approved Nov. 15, 2013. Published January 2014. Originally approved in 1997. Last previous edition approved in 2008 as E1856–97(2008). DOI: 10.1520/E1856-13.

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 The definitions of mechanical testing terms that appear in Terminology E6 apply to this guide.

3.2 Definitions:

3.2.1 *resolution, n*—for a particular measurement device, the smallest change in the quantity being measured that causes a perceptible change in the corresponding indication.

3.2.1.1 *Discussion*—Resolution may depend on the value (magnitude) of the quantity being measured.

3.2.1.2 *Discussion*—For paper charts or analog indicators, the resolution should not be assumed to be better (smaller) than $\frac{1}{10}$ of the spacing between graduations. For digital devices, the best resolution potentially achievable is the smallest difference between two different readings given by the display.

3.2.1.3 *Discussion*—For both analog and digital devices, the actual resolution can be significantly poorer than described above, due to factors such as noise, friction, etc.

3.3 Definitions of Terms Specific to This Standard:

3.3.1 *basic data, n*—the digital equivalents of analog counterparts, such as force and displacement measurements, which under static conditions are traceable to national standards (see Fig. 1).

3.3.2 *computerized data acquisition system*—a device that collects basic data from a universal testing machine during a test and calculates and presents derived data based on the basic data collected.

3.3.3 *derived data, n*—additional numbers derived from the basic data through computation using software algorithms, such as a peak force or a modulus value.

3.3.4 *data acquisition rate, n*—the rate at which digital samples of each wave-form (that is, force, strain, displacement, and so forth) are acquired, expressed in samples/second.

3.3.5 *transducer-channel bandwidth*—the frequency at which the amplitude response of a transducer channel has fallen by 3 dB; that is, the measured signal is in error by about 30 % and the phase shift is 45° or greater.

3.3.5.1 *Discussion*—The precise amplitude and phase responses vary with the electrical design of the computerized data acquisition system, but the 3 dB bandwidth (expressed in hertz) is a simple single measure of responsiveness (see Fig. 2).

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