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An American National Standard

Standard Guide for Measurement Systems Analysis (MSA)[1]

This standard is issued under the fixed designation E2782; 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 presents terminology, concepts, and selected methods and formulas useful for measurement systems analysis (MSA). Measurement systems analysis may be broadly described as a body of theory and methodology that applies to the non-destructive measurement of the physical properties of manufactured objects.

1.2 *Units*—The system of units for this guide is not specified. Dimensional quantities in the guide are presented only as illustrations of calculation methods and are not binding on products or test methods treated.

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]

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E456 Terminology Relating to Quality and Statistics

E2586 Practice for Calculating and Using Basic Statistics

E2587 Practice for Use of Control Charts in Statistical Process Control

3. Terminology

3.1 *Definitions:*

3.1.1 Unless otherwise noted, terms relating to quality and statistics are defined in Terminology E456.

3.1.2 *accepted reference value, n*—a value that serves as an agreed-upon reference for comparison, and which is derived as: *(1)* a theoretical or established value, based on scientific principles, *(2)* an assigned or certified value, based on experimental work of some national or international organization, or *(3)* a consensus or certified value, based on collaborative experimental work under the auspices of a scientific or engineering group. **E177**

3.1.3 *calibration, n*—process of establishing a relationship between a measurement device and a known standard value(s).

3.1.4 *gage, n*—device used as part of the measurement process to obtain a measurement result.

3.1.5 *measurement process, n*—process used to assign a number to a property of an object or other physical entity.

3.1.5.1 *Discussion*—The term "measurement system" is sometimes used in place of measurement process. (See 3.1.7.)

3.1.6 *measurement result, n*—number assigned to a property of an object or other physical entity being measured.

3.1.6.1 *Discussion*—The word "measurement" is used in the same sense as measurement result.

3.1.7 *measurement system, n*—the collection of hardware, software, procedures and methods, human effort, environmental conditions, associated devices, and the objects that are measured for the purpose of producing a measurement.

3.1.8 *measurement systems analysis (MSA), n*—any of a number of specialized methods useful for studying a measurement system and its properties.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *appraiser, n*—the person who uses a gage or measurement system.

3.2.2 *discrimination ratio, n*—statistical ratio calculated from the statistics from a gage R&R study that measures the number of 97 % confidence intervals, constructed from gage R&R variation, that fit within six standard deviations of true object variation.

3.2.3 *distinct product categories, n*—alternate meaning of the discrimination ratio.

3.2.4 *gage consistency, n*—constancy of repeatability variance over a period of time.

3.2.4.1 *Discussion*—Consistency means that the variation within measurements of the same object (or group of objects) under the same conditions by the same appraiser behaves in a state of statistical control as judged, for example, using a control chart. See Practice E2587.

[1] This guide is under the jurisdiction of ASTM Committee E11 on Quality and Statistics and is the direct responsibility of Subcommittee E11.20 on Test Method Evaluation and Quality Control.

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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.

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