



Designation: E1732 – 18

Standard Terminology Relating to Forensic Science¹

This standard is issued under the fixed designation E1732; 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 is a compilation of terms and corresponding definitions used in the forensic sciences. Legal or scientific terms that are generally understood or defined adequately in other readily available sources may not be included.

1.2 A definition is a single sentence with additional information included in a *Discussion*. It is reviewed every five years, and the year of last review or revision is appended.

1.3 Definitions identical to those published by another standards organization or ASTM committee are identified with the abbreviation of the name of the organization or the identifying document and ASTM committee; for example, ASME is the American Society of Mechanical Engineering.²

1.4 Definitions of terms specific to a particular field are identified with an abbreviation.³

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:⁴

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

E456 Terminology Relating to Quality and Statistics

E1187 Terminology Relating to Conformity Assessment (Withdrawn 2006)⁵

E1301 Guide for Proficiency Testing by Interlaboratory Comparisons (Withdrawn 2012)⁵

E1402 Guide for Sampling Design

E2161 Terminology Relating to Performance Validation in Thermal Analysis and Rheology

2.2 ISO Standards:⁶

ISO 3534:1993 (E/F) Statistics—Vocabulary and Symbols Part 1: Probability and General Statistical Terms

Part 2: Statistical Quality Control

ISO 3534-1:2006 Statistics—Vocabulary and Symbols—Part 1: General Statistical Terms and Terms Used in Probability

ISO 9000:2005 (E) Standard Quality Management Systems—Fundamentals and Vocabulary

ISO Guide 2 General Terms and Their Definitions Relating to Standardizing Activities

ISO Guide 30 Terms and Definitions Used in Connection with Reference Materials

ISO Guide 35 Reference Materials—General and Statistical Principles for Certification

ISO GUM Guide to the Expression of Uncertainty in Measurement (GUM)

2.3 Other Sources:

EURACHEM *The Fitness for Purpose of Analytical Methods*, EURACHEM Working Group, English Edition

IAAI Glossary *Glossary of Terms Related to Chemical and Instrumental Analysis of Fire Debris*, IAAI Forensic Science Committee⁷

IUPAC Terminology *IUPAC Compendium of Chemical Terminology*, Second Edition, 1997

3. Significance and Use

3.1 These terms have particular application to the forensic sciences. In addition, a hierarchy of sources of definitions were

¹ This terminology is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.92 on Terminology.

Current edition approved May 15, 2018. Published May 2018. Originally approved in 1995. Last previous edition approved in 2017 as E1732 – 17. DOI: 10.1520/E1732-18.

² Any definition that is unsourced has been developed by ASTM Subcommittee E30.92.

³ Abbreviations are as follows: CRIM = criminalistics, QD = questioned documents, ENGR = engineering, TOX = toxicology, PB = pathology/biology, ANTH = anthropology, and ODEN = odontology.

⁴ 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.

⁵ The last approved version of this historical standard is referenced on www.astm.org.

⁶ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

⁷ Available from the International Association of Arson Investigators, Inc. (IAAI), 2111 Baldwin Avenue, Suite 203, Crofton, MD 21114, <https://www.firearson.com>.

used in the development of this terminology. The hierarchy is as follows: *Websters New Collegiate 7th Dictionary*; technical dictionaries; and the *Compilation of ASTM Standard Definitions*.⁸ The subcommittee developed a suitable definition after all of the sources in the hierarchy were found wanting.

4. Terminology

4.1 Definitions:

accelerant, *n*—any material used to initiate or promote the spread of a fire. The most common accelerants are flammable or combustible liquids. Whether a substance is an accelerant depends not on its chemical structure but on its use. **IAAI Glossary**

accuracy, *n*—the closeness of agreement between a test result and the accepted reference value. **E177**

DISCUSSION—(1) In practice, the accepted reference value is substituted for the true value.

(2) The term "accuracy," when applied to a set of test or measurement results, involves a combination of random components and a common systematic error or bias component.

(3) Accuracy refers to a combination of trueness and precision.

ISO 3534:1993(E/F)

associative evidence, *n*—that evidence which tends to link a person, place, or thing with another person, place, or thing.

calibration, *n*—the set of operations that establishes, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system or values represented by a material, and the corresponding known values of measurement.

DISCUSSION—This definition was originally defined in Terminology **E1187**, a standard discontinued by ASTM.

chain of custody, *n*—procedures and documents that account for the possession of a sample by tracking its handling and storage from its point of collection to its final disposition.

class, *n*—a group, set or kind marked by common attributes or a common attribute. **Webster's Unabridged Dictionary**⁹

class characteristic(s), *n*—the attribute(s) that establish membership in a class.

classification, *n*—the systematic arrangement of persons or objects into categories (groups or classes) based on shared traits or characteristics. **Osterburg and Ward**,¹⁰ p. 835

comparison sample, *n*—*fire debris*, (1) a sample of material collected from a fire scene which is, to the best of the investigator's knowledge, identical in every respect to a sample suspected of containing ignitable substance, but which does not contain ignitable substance; (2) a sample of suspected ignitable substance submitted for the purpose of comparing with any ignitable substance separated from a debris sample.

⁸ ASTM Committee on Terminology, *Compilation of ASTM Standard Definitions*, 7th ed., Philadelphia, PA: ASTM, 1990.

⁹ *Webster's Unabridged Dictionary*, 1967, s.v. "class."

¹⁰ Osterburg J.W., and Ward, R.H., *Criminal Investigation: A Method for Reconstructing the Past*, Anderson Pub. Co.: Cincinnati, OH: 1992.

control sample, *n*—material of established origin that is used to evaluate the performance of a test or comparison.

DISCUSSION—A control sample should not be confused with a comparison sample. For example, in fire debris, a control sample might include an empty can from the same lot as that used to collect samples.

criminalistics, *n*—a branch of forensic science concerned with the examination and interpretation of physical evidence, for the purpose of aiding forensic investigation.

exemplar, *n*—a specimen of physical evidence of known origin. **Osterburg and Ward**,¹⁰ p. 837

expanded uncertainty (U), *n*—quantity defining an interval about a result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand.

DISCUSSION—(1) The fraction may be regarded as the coverage probability or level of confidence of the interval.

(2) To associate a specific level of confidence with the interval defined by the expanded uncertainty requires explicit or implicit assumptions regarding the probability distribution characterized by the measurement result and its combined standard uncertainty. The level of confidence that may be attributed to this interval can be known only to the extent to which such assumptions can be justified.

(3) An expanded uncertainty *U* is calculated from a combined standard uncertainty *uc* and coverage factor *k* using:

$$U = k \times uc$$

ISO GUM, EURACHEM

false positive, *n*—a test result that states that a drug is present when, in fact, such a drug is not present in an amount greater than a threshold or designated cut-off concentration.

known, *n*—of established origin associated with the matter under investigation.

limit of detection, *n*—the lowest content that can be measured with reasonable statistical certainty.

EURACHEM

population, *n*—the totality of items or units of material under consideration.

DISCUSSION—The word "items" may be interpreted in the sense of measurements, or possible measurements, of a single characteristic, or occasionally for multiple characteristics, on all items or units of material being considered. The word "totality" may refer to items not available for inclusion in samples as well as those which are available.

E456

procedure, *n*—specified way to carry out an activity or a process.

DISCUSSION—(1) Procedures can be documented or not.

(2) When a procedure is documented, the term "written procedure" or "documented procedure" is frequently used. The document that contains a procedure can be called a "procedure document."

ISO 9000:2005(E)

proficiency testing, *n*—*laboratory*, determination of laboratory testing performance by means of interlaboratory test comparisons. **E1301**

qualitative analysis, *n*—chemical, analysis in which substances are identified or classified on the basis of their chemical or physical properties, such as chemical reactivity,

solubility, molecular weight, melting point, radiative properties (emission, absorption), mass spectra, nuclear half-life, etc. (See also **quantitative analysis**.)

IUPAC Terminology

quality assurance, *n*—all the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfill requirements for quality. **ISO Guide 2**

quantitation limit, *n*—the minimum amount that can be quantitated with acceptable accuracy and precision. **E2161**

quantitative analysis, *n*—*chemical*, analyses in which the amount or concentration of an analyte may be determined (estimated) and expressed as a numerical value in appropriate units. Qualitative analysis may take place without quantitative analysis, but quantitative analysis requires the identification (qualification) of the analytes for which numerical estimates are given. **IUPAC Terminology**

questioned, *n*—associated with the matter under investigation about which there is some question, including, but not limited to, whether the questioned and known items have a common origin.

recovery, *n*—*chemical*, term used in analytical and preparative chemistry to denote the fraction of the total quantity of a substance recoverable following a chemical procedure.

IUPAC Terminology

reference material, *n*—a material or substance, one or more of whose property values are sufficiently homogenous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. **E1301**

repeatability, *n*—precision under repeatability conditions. **E177, E456**

repeatability conditions, *n*—conditions where independent test results are obtained with the same method on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time.

E177, E456

reproducibility, *n*—precision under reproducibility conditions. **E177, E456**

reproducibility conditions, *n*—conditions where test results are obtained with the same method on identical test items in different laboratories with different operators using different equipment. **E177, E456**

sample—subset of a population made up of one or more sampling units. **ISO 3534-1:2006**

population—totality of items under consideration. **ISO 3534-1:2006**

DISCUSSION—Note that a population may be real and finite, real and infinite, or completely hypothetical.

sampling unit—one of the individual parts into which a population is divided. **ISO 3534-1:2006**

sampling, *n*—(the) process of drawing or constituting a sample. **E1402, ISO 3534:1993**

selectivity, *n*—(1) (*qualitative*): the extent to which other substances interfere with the determination of a substance according to a given procedure; (2) (*quantitative*): a term used in conjunction with another substantive (for example, constant, coefficient, index, factor, number) for the quantitative characterization of interferences. **EURACHEM, IUPAC Terminology**

standard, *n*—material of established origin with certified properties.

test, *n*—determination of one or more characteristics according to a procedure. **ISO 9000:2005(E)**

test method, *n*—a definitive procedure that produces a test result. **E456**

traceability—property of a result of a measurement or value of a standard whereby it can be related with a stated uncertainty, to stated references, usually national or international standards through an unbroken chain of comparisons. **ISO Guide 30:1992(E/F)**

DISCUSSION—(1) The concept is often expressed by the adjective traceable.

(2) The unbroken chain of comparisons is called a traceability chain.

(3) (Applicable only to the French text.)

(4) Traceability of values in the certification of reference materials for chemical composition is discussed in ISO Guide 35:1989 (subclause 9.3.1) where attention is drawn to the special problems associated with chemical analysis. Traceability of the chemical species is frequently of equal or greater importance than the traceability of the calibration of the instruments used in the analysis.

validation, *n*—confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.

DISCUSSION—(1) The term “validated” is used to designate the corresponding status.

(2) The use conditions for validation can be real or simulated. **ISO 9000:2005(E)**

verification, *n*—confirmation, through the provision of objective evidence, that specified requirements have been fulfilled.

DISCUSSION—(1) The term “verified” is used to designate the corresponding status.

(2) Confirmation can comprise activities such as: performing alternative calculations; comparing a new design specification with a similar proven design specification; and undertaking tests and demonstrations, and reviewing documents prior to issue. **ISO 9000:2005(E)**

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