

10. GLOSSARY

Accuracy - closeness to the true or accepted (or nominal) value. (See inaccuracy).

Apparent mass vs brass - the mass of normal brass (density 8.4 g/cm³ at 0 °C with a cubical coefficient of expansion of 0.000054/°C) that produces the same balance reading as the object under test when the comparison is made at 20 °C in air with a density of 1.2 mg/cm³.

Bias - see systematic error

Calibration - comparison of a measurement standard or instrument with another standard or instrument to detect, correlate, report, or eliminate by adjustment any inaccuracy of the compared.

Check standard - an artifact that can be systematically measured to provide a data base whereby the performance characteristics of a measurement system may be judged. The check standard must be sufficiently similar to the items tested to permit valid inferences to be drawn from measurements on the former to those on the latter (see transfer standard).

Correction - that quantity when added algebraically to the nominal value defines its true value. Thus, if the true value is larger than the nominal value, the correction required is positive.

Conventions - a system of rules, generally accepted, for use in reporting measurement differences. The following conventions have been adopted for use when reporting differences (d) between nominal values (N) and the actual values (T) of standards (S) and test items (X):

$$S_T = S_N + C_S \\ X_T = X_N + C_X$$

Likewise, in comparing two values,

$$X - S = d$$

If d is positive, X exceeds S.

Density - the ratio of the mass of a portion of a substance to its volume; i.e. density = mass/volume.

Drainage Time - An arbitrarily specified time used in volumetric calibrations to permit the drainage of a reproducible amount of liquid from a volume standard or object calibrated and/or to establish a "wet down" condition. It is measured after flow cessation (which see).

Flow cessation - The moment when a full stream "breaks" and becomes a trickle or drip; important when measuring drainage time (which see).

Inaccuracy - deviation from the true or accepted (or nominal) value.
Inaccuracy may result from both imprecision and bias in the measurement process.

Limiting mean - The value approached by the average of a sequence of independent measurements of the same quantity as the number of measurements included in the set approaches infinity.

Mass - the measure of the inertial property of a body. Qualitatively it can simply be thought of as the quantity of material in a body.

Measurement Assurance Program (MAP) - A quality assurance program for a measurement process that quantifies the total uncertainty of the measurements (both random and systematic components of error) with respect to national or other designated standards.

Measurement Process - A sequence of operations whose purpose is to assign a number(s) that represents how much of a certain property a given substance or object has.

Offset - The difference between a laboratory's assignment for a transfer standard and the NBS assigned value.

Precision - the degree of mutual agreement of independent measurements of a single quantity yielded by repeated applications of a process under specified conditions. It is quantitatively stated by a precision measure such as the standard deviation, for example.

Prover - a volumetric standard larger than 50 L in capacity.

Quality assessment - the procedures and activities utilized to verify that a quality control system is operating within acceptable limits, and to evaluate the quality of the product/measurement produced.

Quality control - the procedures and activities developed and implemented to produce products/measurements of desired quality.

Random errors - errors that vary in a non-reproducible way (fortuitously) around the limiting mean. For a large set of measurements, the errors are distributed evenly above and below the average. Also, small errors occur more frequently than large ones. These errors can be treated statistically by use of the laws of probability.

Standard deviation - a measure of the dispersion of individual members of a population about the limiting mean of the population. It is described by the symbol, σ , and is mathematically defined as the square root of the arithmetic mean of the squares of deviations of the various items from the arithmetic mean of the whole.

Standard deviation, - also called sample standard deviation (symbol, s), a measure of the dispersion of individual members of a sample about the mean of the sample. If the sample is randomly selected from the population, the sample standard deviation is an estimate of the population standard deviation. (see Section 7 for calculations).

Standard deviation, - also called "between" standard deviation, s_b , a measure of the variability of measurements made at different times when using the same measurement procedure.

Standard deviation, - also called "within" standard deviation, s_w , a measure of the variability of a measurement process during a short period of time, usually the time necessary to complete one calibration/measurement using a particular sequence of operations. It is useful in deciding how the precision of measurement is improved by replication at a given time.

Statistical control - a term that describes the operation of a measurement system in a stable and statistically predictable manner. A system so operating will produce measurements randomly distributed about a limiting mean with a fixed standard deviation.

Systematic errors - errors that are reproducible and tend to bias a result in one direction. Their causes can be assigned, at least in principle, and they can have both constant and variable components. These errors cannot be treated statistically.

Test measure - a volumetric standard up to and including 50 L (10 gal) in capacity.

Tolerance - the maximum allowable departure of a standard from its nominal value.

Traceability - the ability to relate an individual measurement result to national standards of measurement.

Transfer standard - an NBS calibrated artifact for use in evaluating a measurement process. It is most useful in evaluating the offset of a measurement process or reference standards.

True mass - the mass of a body. The adjective "true" is frequently used with the word "mass" to clearly differentiate from the apparent mass of a body.

Uncertainty - allowance assigned to a measured value to include two major components of error: bias and random error.

