DEFINITIONS FOR THE PSA-ET PROGRAM

PURPOSE

This CAN-P-1585 Appendix C document lists the Standards Council of Canada (SCC) Environmental Testing Working Group (ETWG) acceptable definitions for accredited environmental testing laboratories in the SCC Program Specialty Area - Environmental Testing (PSA-ET) program.

AUTHORSHIP

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TABLE OF CONTENTS

To ensure clarity and consistency, for the purposes of this PSA-ET program the following definitions shall apply and shall be employed by all environmental testing laboratories accredited under this PSA:

Note: there are new or revised definitions for many terms in VIM 3rd Ed. 2007. Laboratories shall update all their Quality System documents to reflect these revised definitions as defined in this CAN-P-1585 Appendix C.

Acclimation
physiological adjustment of test organisms to one or more (controlled) environmental factors such as temperature.

Accepted reference value
a value that serves as an agreed-upon reference for comparison, and which is derived as:

a) a theoretical or established value, based on scientific principles;
b) an assigned or certified value, based on experimental work of a national or international organization;
c) a consensus or certified value, based on collaborative experimental work under the auspices of a scientific or engineering group;
d) when a), b), and c) are not available, the expectation of the (measurable) quantity, i.e. the mean of a specified population of measurements. (ISO 3534-1, 3.4).

Accuracy (measurement accuracy, accuracy of measurement)
closeness of agreement between a **measured quantity value** and a **true quantity value** of the **measurand**. (VIM 3rd Ed:2007, 2.13).

NOTE (from VIM3):
1. The concept 'measurement accuracy' is not given a **quantity** and is not given a **numerical quantity value.** A **measurement** is said to be more accurate when it offers a smaller **measurement error.**
2. The term 'measurement accuracy' should not be used for **measurement trueness** and the term **measurement precision** should not be used for 'measurement accuracy' which, however, is related to both these concepts.
3. "Measurement accuracy" is sometimes understood as closeness of agreement between measure quantity values that are being attributed to the measurand.

Bias (measurement bias)
estimate of **systematic measurement error** (VIM 3rd Ed:2007, 2.18).

Calibration
operation that, under specified conditions, in a first step, establishes a relation between the **quantity values** with **measurement uncertainties** provided by **measurement standards** and corresponding **indications** with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a **measurement result** from an indication (VIM 3rd Ed: 2007, 2.39).

NOTE (from VIM3):

1. A calibration may be expressed by a statement, calibration function, **calibration diagram, calibration curve,** or calibration table. In some cases it may consist of an additive or multiplicative **correction** of the indication with associated uncertainty.
2. Calibration should not be confused with **adjustment of a measuring system**, often mistakenly called 'self-calibration', nor with **verification** of calibration.
3. Often, the first step alone in the above definition is perceived as being calibration.

Calibration curve

expression of the relation between **indication** and corresponding **measured quantity value** (VIM 3rd Ed: 2007, 4.31).

NOTE (from VIM3):

A calibration curve expresses a one-to-one relation that does not supply a **measurement result** as it bears no information about the **measurement uncertainty**.

NOTE:

- There must be evidence to show that the analytical response is valid at the lower range of the calibration curve, particularly if measurand concentration is routinely in the low range.
- Analytical response, where appropriate, is zeroed using a reagent blank. Either a linear or other suitable curve fit, as appropriate, may be used. Standards and samples must have equivalent reagent backgrounds (e.g., solvent, acid content, etc.).

Calibration hierarchy

sequence of **calibrations** from a reference to the final **measuring system**, where the outcome of each calibration depends on the outcome of the previous calibration (VIM 3rd Ed: 2007, 2.40).

NOTE (from VIM3):

1. **measurement uncertainty** necessarily increases along the sequence of calibrations.
2. The elements of a calibration hierarchy are one or more **measurement standards** and measuring systems operated according to **measurement procedures**.
3. For this definition, the 'reference' can be a definition of a **measurement unit** through its practical realization, or a measurement procedure, or a measurement standard.
4. A comparison between two measurement standards may be viewed as a calibration if the comparison is used to check and, if necessary, correct the **quantity value** and measurement uncertainty attributed to one of the measurement standards.

Certified reference material (CRM)

reference material, accompanied by documentation issued by an authoritative body and providing one or more specified property value with uncertainties and traceabilities, using valid procedures (VIM 3rd Ed: 2007, 5.14).

EXAMPLE (from VIM3):

human serum with assigned **quantity value** for the concentration of cholesterol and associated **measurement uncertainty** stated in an accompanying certificate, used as **calibrator** or **measurement trueness** control material

NOTE (from VIM3):

1. 'Documentation' is given in the form of a 'certificate' (see ISO Guide 31:2000).
2. Procedures for the production and certification of certified reference materials are given, e.g., in ISO Guides 34 and ISO Guide 35.
3. In this definition, "uncertainty" covers both 'measurement uncertainty' and 'uncertainty of a **nominal property**', such as for identity and sequence. "Traceability" covers both '**metrological traceability** of a quantity value' and 'traceability of a nominal property value'.
4. Specified quantity values in certified reference materials require **metrological traceability** with associated measurement uncertainty (Accred. Qual. Assur.: 2006).

5. ISO/REMCO has an analogous definition (Accred. Qual. Assur.: 2006) but uses the modifiers "metrological" and 'metrologically' to refer to both quantity and nominal property.

Coefficient of variation
for a non-negative characteristic the ratio of the standard deviation to the average. (ISO 3534-1, 2.35).

NOTE:
- The ratio may be expressed as a percentage.
- The term 'relative standard deviation' is sometimes used as an alternative to 'coefficient of variation', but this use is not recommended.

Combined standard uncertainty (combined standard measurement uncertainty)
standard measurement uncertainty that is obtained using the individual **standard measurement uncertainties** associated with the **input quantities in a measurement model** (VIM 3rd Ed: 2007, 2.31).

NOTE (from VIM3):
In case of correlations of input quantities in a measurement model, co variances must also be taken into account when calculating the combined standard uncertainty, see also ISO/IEC Guide 98-3:2008, 2.3.4.

Control sample
a sample used as a basis for comparison with test samples, and which undergoes sample processing identical to that carried out for test samples. This includes reference samples, method blanks, control samples (e.g., dilution water as used in toxicological testing) and control cultures (e.g., samples of known biological composition).

Control standard
a standard used as a basis for comparison with calibration standards, prepared independently from the calibration standards, and which undergoes sample processing identical to that carried out for the calibration standards. Includes reagent blanks.

Coverage factor
number larger than one by which a **combined standard measurement uncertainty** is multiplied to obtain an **expanded measurement uncertainty** (VIM 3rd Ed: 2007, 2.38).

NOTE (from VIM3): A coverage factor is usually symbolized *k* (see also ISO/IEC Guide 98-3:2008, 2.3.6).

Coverage interval
interval containing the set of **true quantity values** of a **measurand** with a stated probability, based upon the information available (VIM 3rd Ed: 2007, 2.36).

NOTE (from VIM3):
1. A coverage interval does not need to be centered on the **measured quantity value** (see ISO/IEC Guide 98-3:2008/Suppl. 1).
2. A coverage interval should not be termed 'confidence interval' to avoid confusion with the statistical concept (see ISO/IEC Guide 98-3:2008, 6.2.2).
3. A coverage interval can be derived from an **expanded measurement uncertainty** (see ISO/IEC Guide 98-3:2008, 2.3.5)

Coverage probability
probability that the set of **true quantity values** of a **measurand** is contained within a specified **coverage interval** (VIM 3rd Ed: 2007, 2.37).

NOTE (from VIM3):
1. This definition pertains to the Uncertainty Approach as presented in the GUM.
2. The coverage probability is also termed "level of confidence" in the GUM.

Cross sensitivity
a quantitative measure of the response for an undesired constituent or interference as compared to that for a constituent of interest. (NIST 260-100).

Culture and/or Holding conditions
includes loading density, temperature, illumination, water quality and associated variables such as water flow, aeration, filtration, re-circulation and renewal.

Detection limit (limit of detection)
measured quantity value, obtained by a given **measurement procedure**, for which the probability of falsely claiming the absence of a component in a material is β, given a probability α of falsely claiming its presence (VIM 3rd Ed: 2007, 4.18).

NOTE (from VIM3):
1. IUPAC recommends default values for α and β equal to 0.05.
2. The abbreviation LOD is sometimes used.
3. The term "sensitivity" is discouraged for "detection limit".

NOTE:
- This can also be known as method detection limit. The US EPA has defined MDL as the minimum concentration of a measurand that can be identified, measured and reported with 99% confidence that the measurand concentration is greater than zero; it is determined from data produced by analyzing a sample in a given matrix containing the measurand. Depending on the matrix, the measurand and the instrumentation, the EPA has outlined several specific procedures for determining MDL in their "Methods for the Determination of Metals in Environmental Samples - EPA/600 4-91/010" publication.

For CAN-P-1585:
- In practical terms, the detection limit (LOD) is the lowest concentration of measurand in a real sample matrix that can be reliably detected using a specific analytical procedure (test method) which is statistically different from the response obtained from a reagent blank carried through the complete method (see CAN-P-1585, clause 5.4.5.3)

Duplicate
a separate specimen, taken from the same source as the first specimen, tested at the same time and in the same manner as the first specimen. Duplicates can provide pooled precision data for a homogeneous specimen, the test method, and the test equipment (ASTM Standard E1323).

Duplicate analysis
paired determinations on the same sample performed by one analyst at essentially the same time (ASTM Standard E856).

Duplicate sample
Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. (EPA/600/R-98/018, Guidance for Quality Assurance Project Plans (QA/G-5)).

NOTE (from EPA):
- Duplicate samples are used to assess variance of the total method, including sampling and analysis.

NOTE (from ASTM):
- the ASTM definition is "a second portion of a homogenized sample carried through sample digestion. Analysis results for these samples are used to provide information on the precision of the homogenization process" (ASTM Standard E1726)
- this can also be called a "laboratory duplicate (LD) as defined by ASTM as "a second aliquot of a sample should be analyzed using the same sample preparation, analytical method and QA/QC procedure used for test samples. Its purpose is to determine whether method performance is within accepted control limits" (ASTM Standard D6800)

Expanded uncertainty (expanded measurement uncertainty)
product of a **combined standard measurement uncertainty** and a factor larger than the number one (VIM 3rd Ed: 2007, 2.35).

NOTE (from VIM3):
1. The factor depends upon the type of probability distribution of the **output quantity in a measurement model** and on the selected **coverage probability**
2. The term 'factor' in this definition refers to a **coverage factor**.
1. Expanded measurement uncertainty is termed "overall uncertainty" in paragraph 5 of Recommendation INC-1 (1980) (see the GUM) and simply "uncertainty" in IEC documents.

Holding time
elapsed time between sample collection and either sample preparation or analysis, as appropriate.

Intermediate precision condition (intermediate precision condition of measurement)
condition of **measurement,** out of a set of conditions that includes the same **measurement procedure**, same location, and replicate measurements on the same or similar objects over an extended period of time, but may include other conditions involving changes (VIM 3rd Ed: 2007, 2.22).

NOTE (from VIM3):
1. The changes can include new **calibrations, calibrators**, operators, and **measuring systems**.
2. A specification for the conditions should contain the conditions changed and unchanged, to the extent practical.
3. In chemistry, the term' inter-serial intermediate precision condition of measurement' is sometimes used to designate this concept.

Intermediate precision (intermediate measurement precision)
measurement precision under a set of **intermediate precision conditions of measurement** (VIM 3rd Ed: 2007, 2.23).

NOTE (from VIM3):
Relevant statistical terms are given in ISO 5725-3:1994.

Internal standard
material that has chemical characteristics similar to those of the measurand and provides analytical response which is distinct from the measurand and not subject to interference. It is added to the sample for the purpose of determining measurand concentration. Internal standards may be added to the sample just prior to sample analysis (Type I) or just prior to sample preparation (Type II).

Internal standard method
determination of measurand concentration by using an internal standard measurand (and internal standard) response referenced to Relative Response Factor used to correct for matrix effects.

International measurement standard
measurement standard recognized by signatories to an international agreement and intended to serve worldwide (VIM 3rd Ed: 2007, 5.2).

EXAMPLE (from VIM3):
1) international prototype of the kilogram
3) VSMOW2 (Vienna Standard Mean Ocean Water) distributed by the International Atomic Energy Agency (IAEA) for differential stable isotope amount ratio measurements

Intrinsic standard (intrinsic measurement standard)
measurement standard based on an inherent and reproducible property of a phenomenon or substance (VIM 3rd Ed: 2007, 5.10).

EXAMPLE (from VIM3):
1) triple-point-of-water cell as an intrinsic measurement standard of thermodynamic temperature
3) intrinsic measurement standard of electric resistance based on the quantum Hall effect
4) sample of copper as an intrinsic standard of electric conductivity

NOTE (from VIM3):
1. The **quantity value** of an intrinsic measurement standard is assigned by consensus and does not need to be established by relating it to another measurement standard of the same type. Its **measurement uncertainty** is determined by considering two components: that associated with its consensus quantity value and the second associated with its construction, implementation and maintenance.
2. An intrinsic measurement standard usually consists of a system produced according to the requirements of a consensus procedure and subject to periodic **verification**. The consensus procedure may contain provisions for application of **corrections** necessitated by the implementation.
3. Intrinsic measurement standards that are based on quantum phenomena usually have outstanding **stability**.
4. The adjective 'intrinsic' does not mean that this measurement standard may be implemented and used without special care or that such a measurement standard is immune to internal and external influences.

Limit of linearity
the upper limit of concentration or amount of measurand for which incremental additions produce constant increments of response. (NIST 260-100).

Limit of quantitation
the lower limit of concentration or amount of measurand that must be present before a method is considered to provide quantitative results. By convention, LOQ = 10 s_o, where s_o is the estimate of the standard deviation at the lowest level of measurement. (NIST 260-100).

Matrix duplicate
an intra laboratory split sample used to document the precision of a procedure in a given sample matrix (ASTM Standard D5283).

Measurand
quantity intended to be measured (VIM 3rd Ed: 2007, 2.3).

NOTE (from VIM3):
1. The specification of a measurand requires knowledge of the **kind of quantity**, description of the state of the phenomenon, body, or substance carrying the quantity, including any relevant component, and the chemical entities involved.
2. In the 2nd edition of the VIM and in IEC 60050-300:2001, the measurand is defined as the "quantity subject to measurement".

3. The **measurement,** including the **measuring system** and the conditions under which the measurement is carried out, might change the phenomenon, body, or substance such that the quantity being measured may differ from the **measurand** as defined. In this case, adequate **correction** is necessary.

   EXAMPLE 1
   The potential difference between the terminals of a battery may decrease when using a voltmeter with a significant internal conductance to perform the measurement. The open- circuit potential difference can be calculated from the internal resistances of the battery and the voltmeter.
4. **In chemistry, "analyte", or the name of a substance or compound, are terms sometimes used for 'measurand'. This usage is erroneous because these terms do not refer to quantities.**

NOTE – for CAN-P-1585:
- the term **"analyte"** previously employed in CAN-P-1585:2005 will now be the VIM3:2007 term measurand
- some proficiency testing providers call this term "parameter"

Measurand spike recovery
recovery of measurand spike added to sample prior to sample preparation. Determination of spike recovery is based on results provided by spiked and unspiked sample and is used to account for matrix effects and sample preparation losses.

Measurement error (error of measurement, error)
measured quantity value minus a **reference quantity value** (VIM 3rd Ed: 2007, 2.16).

NOTE (from VIM3):
1. The concept of "measurement error" can be used both
   a) when there is a single reference quantity value to refer to, which occurs if a **calibration** is made by means of a **measurement standard** of negligible **measurement quantity value** having a negligible **measurement uncertainty** or if a **conventional quantity value** is given, in which case the measurement error is known, and
   b) if a **measurand** is supposed to be represented by a unique **true quantity value** or a set of true quantity values of negligible range, in which case the measurement error is not know.
2. Measurement error should not be confused with production error or mistake.

Measurement result (result of measurement)
set of **quantity values** being attributed to a **measurand** together with any other available relevant information (VIM 3rd Ed: 2007, 2.9).

NOTE (from VIM3):
1. A measurement result generally contains "relative information" about the set of quantity values, such that some may be more representative of the measurand than others. This may be expressed in the form of a probability density function (PDF).
2. A measurement result is generally expressed as a single **measured quantity value** and a **measurement uncertainty**. If the measurement uncertainty is considered to be negligible for some purpose, the measurement result may be expressed as a single measured quantity value. In many fields this is the common way of expressing a measurement result.
3. In the traditional literature and in the previous edition of the VIM, measurement result was defined as a value attributed to a measurand and explained to mean an **indication**, or an uncorrected result, or a corrected result, according to the context.

Measurement standard (etalon)
realization of the definition of a given **quantity**, with stated **quantity value** and associated **measurement uncertainty**, used as a reference (VIM 3rd Ed: 2007, 5.1).

EXAMPLE (from VIM3):

1) 1 kg mass standard with an associated **standard measurement uncertainty** of 3μg
4) Hydrogen reference electrode with an assigned quantity value of 7.072 and an associated measurement uncertainty of 0.006
4) set of reference solutions of cortisol in human serum having a certified quantity value with measurement uncertainties for each solution
6) **reference material** providing quantity values with measurement uncertainties for the mass concentration of each of ten different proteins

NOTE (from VIM3):

1. A "realization of the definition of a given quantity" can be provided by a **measuring system**, a **material measure**, or a **reference material.**
2. A measurement standard is frequently used as a reference to establish **measurement quantity values and associated measurement uncertainties** for other **quantities** of the same **kind**, thereby establishing **metrological traceability** through **calibration** of other measuring standards, **measuring instruments**, or measuring systems.
3. The term "realization" is used here in the most general meaning. It denotes three procedures of "realization". The first consists in in the physical realization of the **measurement unit** from its definition and is realization *sensu stricto*. The second, termed "reproduction", consists not in realizing the measurement unit from its definition but in setting up a highly reproducible measurement standard based on a physical phenomenon, as it happens, e.g. in case of use of frequency-stabilized lasers to establish a measurement standard for the metre, of the Josephson effect for the volt or of the quantum Hall effect for the ohm. The third procedure consists in adopting a material measure as a measurement standard. It occurs in the case of the measurement standard of 1 kg.
4. The standard measurement uncertainty associated with a measurement standard is always a component of the **combined standard measurement uncertainty** (see ISO/IEC Guide 98-3:2008, 2.3.4) in a **measurement result** obtained using the measurement standard. Frequently, this component is small compared with other components of the combined standard measurement uncertainty.
5. Quantity value and measurement uncertainty must be determined at the time when the measurement standard is used.
6. Several quantities of the same **kind** or of different kinds may be realized in one device which is commonly also called a measurement standard.
7. The word "embodiment" is sometimes used in the English language instead of "realization".
8. In science and technology, the English word "standard" is used with two different meanings: as a specification, technical recommendation or similar document (in French "norme") and as a measurement standard (in French "étalon"). This Vocabulary is concerned solely with the second meaning.
9. The term "measurement standard" is sometimes used to denote other metrological tools, e.g. 'software measurement standard' (see ISO 5436-2).

Measurement uncertainty (uncertainty of measurement, uncertainty)

non-negative parameter characterizing the dispersion of the **quantity values** being attributed to a measurand, based on the information used (VIM 3rd Ed: 2007, 2.26).

NOTE (from VIM3):

1. Measurement uncertainty includes components arising from systematic effects, such as components associated with **corrections** and the assigned quantity values of **measurement standards**, as well as the **definitional uncertainty**. Sometimes estimated systematic effects are not corrected for but, instead, associated measurement uncertainty components are incorporated.
2. The parameter may be, for example, a standard deviation called **standard measurement uncertainty** (or a specified multiple of it), or the half-width of an interval, having a stated **coverage probability**.
3. Measurement uncertainty comprises, in general, many components. Some of these may be evaluated by **Type A evaluation of measurement uncertainty** from the statistical distribution of the quantity values from series of **measurements** and can be characterized by experimental standard deviations. The other components, which may be evaluated by **Type B evaluation of measurement uncertainty**, can also be characterized by standard deviations, evaluated from probability density functions based on experience or other information.
4. In general, for a given set of information, it is understood that the measurement uncertainty is associated with a stated quantity value attributed to the measurand. A modification of this value results in a modification of the associated uncertainty.

Measured quantity value (measured value, measured value of quantity)
quantity value representing a **measurement result** (VIM 3rd Ed: 2007, 2.10).

NOTE (from VIM3):

1. For a **measurement** involving replicate **indications**, each indication can be used to provide a corresponding measured quantity value. This set of individual measured quantity values can be used to calculate a resulting measured quantity value, usually with a decreased associated **measurement uncertainty**.
2. When the range of the **true quantity values** believed to represent the **measurand** is small compared with the measurement uncertainty, a measured quantity value can be considered to be the best estimate of an essentially unique true quantity value and is often an average or median of individual measured quantity values obtained through replicate measurements.
3. In the case where the range of the true quantity values believed to represent the measurand is not small compared with the measurement uncertainty, a measured value is often an estimate of an average or median of the set of true quantity values.
4. In the GUM, the terms "result of measurement"' and "estimate of the value of the measurand" or just "estimate of the measurand" are used for 'measured quantity value'

Method blank
blank which undergoes sample processing identical to that carried out for the test samples. Blank results are used to assess contamination and/or provide background correction to measurand concentrations.

Method of standard additions
determination of measurand concentration by adding measurand spike to sample. Determination is based on results provided by spiked and unspiked samples. Analytical response must be linear and it is used to correct for matrix effects.

Method reporting limit
the lowest concentration that will be reported for a specific method.

National standard (national measurement standard)
measurement standard recognized by national authority to serve in a state or economy as the basis for assigning **quantity values** to other **measurement standards** for the **kind of quantity** concerned (VIM 3rd Ed: 2007, 5.3).

Nominal value (nominal quantity value)
rounded or approximate **value** of a characterizing **quantity** of a **measuring instrument** or **measuring system** that provides guidance for their appropriate use (VIM 3rd Ed: 2007, 4.6).

EXAMPLE (from VIM3):

3) 0.1 mol/l as the nominal quantity value for amount-of-substance concentration of a solution of hydrogen chloride, HCl
4) -20 °C as a maximum Celsius temperature for storage

NOTE (from VIM3):

"Nominal quality value" and "nominal value" are not to be confused with "nominal property value" (see 1.30, note 2).

Numerical value (numerical quantity value, numerical value of a quantity)
number in the expression of a **quantity value**, other than any number serving as the reference (VIM 3rd Ed: 2007, 1.20).

NOTE (from VIM3):

1. For **quantities of dimension one**, the reference is a **measurement unit** which is a number and this is not considered as a part of the numerical quantity value.
   EXAMPLE In an amount-of-substance fraction equal to 3 mmol/mol, the numerical value is 3 and the unit is mmol/mol. The unit mmol/mol is numerically equal to 0.001, but this number 0.001 is not part of the numerical quantity value, which remains 3.
2. For **quantities** that have a measurement unit (i.e. those other than **ordinal quantities**), the numerical value {Q} of a quantity Q is frequently denoted {Q} = Q/[Q], where [Q] denotes the measurement unit.
   EXAMPLE For a quantity value of 5.7 kg, the numerical quantity value is {m} = (5.7 kg)/kg = 5.7. The same quantity value can be expressed as 5 700 g in which case the numerical quantity value {m} = (5 700 g)/g = 5 700.

Outliers

observations in a sample, so far separated in value from the remainder as to suggest that they may be from a different population, or the result of an error in measurement. (ISO 3534-1, 2.64).

NOTE: ISO 5725-2 specifies the statistical tests and the significance level to be used to identify outliers in trueness and precision experiments.

Precision (measurement precision)

closeness of agreement between **indications** or **measured quantity values** obtained by replicate **measurements** on the same or similar objects under specified conditions. (VIM 3rd Ed: 2007, 2.15).

NOTE (from VIM3):

1. Measurement precision is usually expressed numerically by measures of imprecision, such as standard deviation, variance, or coefficient of variation under the specified conditions of measurement.
2. The 'specified conditions' can be, for example, repeatability conditions of measurement, intermediate precision conditions of measurement, or reproducibility conditions of measurement (see ISO 5725-5:1994).
3. Measurement precision is used to define **measurement repeatability, intermediate measurement precision**, and **measurement reproducibility**.
4. Sometimes "measurement precision" is erroneously used to mean **measurement accuracy**

Primary standard (primary measurement standard)

measurement standard established using a **primary measurement procedure,** or created as an artefact, chosen by convention (VIM 3rd Ed: 2007, 5.4).

EXAMPLE (from VIM3):

1) Primary measurement standard of amount-of-substance concentration prepared by dissolving a known amount of substance of a chemical component to a known volume of solution.
3) Primary measurement standard for isotope amount-of-substance ratio measurements, prepared by mixing known amount- of -substance of specified isotopes.
5) The international prototype of the kilogram as an artefact, chosen by convention.

Proficiency testing

determination of laboratory testing performance by means of interlaboratory comparisons. (ISO/IEC Guide 2).

NOTE (from ISO/IEC Guide 2)

For the purposes of this Guide 2, the term laboratory proficiency testing is taken in its widest sense and includes, for example:

a) Qualitative schemes - for example where laboratories are required to identify a component of a test item.
b) Data transformation exercises - for example where laboratories are furnished with sets of data and are required to manipulate the data to provide further information.

c) Single item testing - where one item is sent to a number of laboratories sequentially and returned to the organizer at intervals.
d) One-off exercises - where laboratories are provided with a test item on a single occasion.
e) Continuous schemes - where laboratories are provided with test items at regular intervals on a continuing basis.
f) Sampling - for example where individuals or organizations are required to take samples for subsequent analysis.

NOTE: Some proficiency testing programs may also refer to this term as proficiency testing scheme or performance evaluation. **For CAN-P-1585** these terms are deemed to be equivalent.

Proficiency testing co-ordinator
The person with responsibility for coordinating all of the activities involved in the operation of a proficiency testing scheme (ILAC Guide 13:08/2007, 1.3.1).

Proficiency test item
a sample, product, artefact, piece of equipment or measurement standard sent to one or more participants in a proficiency testing scheme (ILAC Guide 13:08/2007, 1.3.4).

NOTE: "**proficiency testing sample"** in **CAN-P-1585** is deemed to be equivalent to this term.

Proficiency testing participant (participant)
a laboratory that receives proficiency test items and submits for review by the proficiency test scheme provider (ILAC Guide 13:08/2007, 1.3.3).

Proficiency testing provider (provider)
a body (organisation or firm, public or private) that undertakes the design and conduct of a proficiency testing scheme (ILAC Guide 13:08/2007, 1.3.7).

Proficiency testing round
a single complete sequence of circulation of proficiency testing items to all participants in a proficiency testing scheme (ILAC Guide 13:08/2007, 1.3.5).

Proficiency testing scheme
interlaboratory comparisons designed and operated to assess laboratory performance in specified areas of testing, measurement, calibration or inspection (ILAC Guide 13:08/2007, 1.3.6).

Quantity
property of a phenomenon, body, or substance, where the property has a magnitude that can be expressed as a number and a reference (VIM 3rd Ed: 2007, 1.1).

NOTE (from VIM3):
2. A reference can be a **measurement unit**, a **measurement procedure**, or a **reference material** or a combination of such**.**
3. Symbols for quantities are given in the International Standard ISO 80000 and IEC 8000 series *Quantities and units*. The symbols for quantities are written in italics. A given symbol can indicate different quantities.
5. A quantity as defined here is a scalar. However, a vector or a tensor, the components of which are quantities, is also considered to be a quantity.
6. The concept 'quantity' may be generically divided into, e.g. 'physical quantity', 'chemical quantity' and 'biological quantity' or **base quantity** and **derived quantity**.

Quality control sample

a sample (i.e., test sample or control sample/standard) used either singly or in replicate, as appropriate, to monitor performance characteristics.

Quantity value (value of a quantity, value)
number and reference together expressing magnitude of a **quantity** (VIM 3rd Ed: 2007, 1.19).

EXAMPLE (from VIM3):

Length of a given rod	5.34 m or 534 cm
Mass of a given body	0.152 kg or 152 g
Celsius temperature of a given sample	−5 °C

NOTE (from VIM3):

1. According to the type of reference, a quantity value is either
   - a product of a number and a **measurement unit;** the measurement unit one is generally not indicated for **quantities of dimension one**, or
   - a number and a reference to a **measurement procedure**, or
   - a number and a **reference material**.
2. The number can be complex.
3. A quantity value can be presented in more than one way.
4. In the case of vector or tensor quantities, each component has a quantity value.

Range
the difference between the largest and the smallest observed value of a quantitative characteristic. (ISO 3534-1, 2.30).

NOTE: In practical terms this means that the "range" is the concentration values for which the validated method has acceptable accuracy, precision, repeatability, etc. The analytical range may result from an analytical curve that is linear or non-linear. The Eurachem Guide "The Fitness for Purpose of Analytical Methods…" 6.26 states "… it is necessary to determine the range of measurand concentrations or property values over which the method may be applied."

Random measurement error (random error of measurement, random error)
component of **measurement error** that in replicate **measurements** varies in an unpredictable manner (VIM 3rd Ed: 2007, 2.19).

NOTE (from VIM3):

1. The **reference quantity value** for a random measurement error is the average that would ensue from an infinite number of replicate measurements of the same **measurand**.
2. Random measurement errors of a set of replicated measurements form a distribution that can be summarized by its expectation, which is generally assumed to be zero, and its variance.
3. Random measurement error equals **error of measurement** minus **systematic measurement error.**

Reagent blank
blank which undergoes processing identical to that carried out for calibration standards. Blank results are used to assess contamination and establish the baseline used in the calibration.

Recovery corrected calibration
applies to calibration curve, internal standard method or method of standard additions when standards and samples undergo similar sample processing.

Recovery standard
term applied to a Type I internal standard used with a surrogate.

Reference data
data related to a property of a phenomenon, body, or substance, or a system of components of known composition or structure, obtained from an identified source, critically evaluated, and verified for accuracy (VIM 3rd Ed: 2007, 5.16).

EXAMPLE (from VIM3):
Reference data for solubility of chemical compounds as published by the IUPAC.

NOTE (from VIM3):
1. In this definition, accuracy covers, for example, **measurement accuracy** and 'accuracy of a nominal property value'
2. "Data" is a plural form, "datum" in the singular. "Data" is commonly used in the singular sense, instead of "datum".

Reference material (RM)
material, sufficiently homogeneous and stable with reference to specified properties, which has been established to be fit for its intended use in **measurement**, or in examination of **nominal properties** (VIM 3rd Ed: 2007, 5.13).

NOTE (from VIM3):
1. Examination of a nominal property provides a nominal property value and associated uncertainty. This uncertainty is not a **measurement uncertainty**
2. Reference materials with or without assigned **quantity values** can be used for **measurement precision** control whereas only reference materials with assigned quantity values can be used for **calibration** or **measurement trueness** control.
3. 'Reference material' comprises materials embodying **quantities** as well as **nominal properties**.
   EXAMPLES of reference materials embodying quantities:
   a) water of stated purity, the dynamic viscosity of which is used to calibrate viscometers
   c) fish tissue containing a stated mass fraction of a dioxin, used as a **calibrator**
   EXAMPLES of reference materials embodying nominal properties:
   a) color chart indicating one or more specified colors
   b) DNA compound containing a specified nucleic acid sequence
4. A reference material is sometimes incorporated into a specially fabricated device.
   EXAMPLES
   1) substance of known triple-point in a triple-point cell
   2) glass of known optical density in a transmission filter holder
   3) spheres of uniform particle size mounted on a microscope slide
5. Some reference materials have quantities that are metrologically traceable to a **measurement unit** outside a **system of units**. Such materials include vaccines to which International Units (IU) have been assigned by the World Health Organization.
6. In a given **measurement**, a reference material can only be used for either calibration or quality assurance.
7. The specifications of a reference material should include its material traceability, indicating its origin and processing (Accred. Qual. Assur.: 2006).
8. ISO/REMCO has an analogous definition but uses the term "measurement process" to mean 'examination' (ISO 15189:2007, 3.4), which covers both measurement of a quantity and examination of a nominal property.

Reference sample
reference material whose matrix is equivalent to that of the corresponding test samples and which undergoes sample processing identical to that carried out for the test samples. Includes reference toxicants, measurand spikes, surrogate spikes and reference materials whose assigned values have been determined by design, consensus, comparison or certification.

Reference standard (reference measurement standard)

measurement standard designated for the **calibration** of other measurement standards for **quantities** of a given **kind** in a given organization or at a given location (VIM 3rd Ed: 2007, 5.6).

Reference quantity value
quantity value used as a basis for comparison with values of **quantities** of the same **kind** (VIM 3rd Ed: 2007, 5.18).

NOTE (from VIM3):

1. A reference quantity value can be a **true quantity value** of a **measurand**, in which case it is unknown, or a **conventional quantity value**, in which case it is known.
2, A reference quantity value with associated **measurement uncertainty** is usually referred to
   a) a material, e.g. a **certified reference material**,
   b) a device, e.g. a stabilized laser,
   c) a **reference measurement procedure**,
   d) a comparison of **measurement standards**.

Relative response factor (RRF)
ratio of slopes provided by calibration curves for measurand and corresponding internal standard (or surrogate and corresponding internal standard). Calibration curves may be determined by two precisely determined calibration points. Analytical responses must be demonstrated to be linear.

Relative standard measurement uncertainty
standard measurement uncertainty divided by the absolute value of the **measured quantity value** (VIM 3rd Ed: 2007, 2.32).

Repeatability (measurement repeatability)
measurement precision under a set of **repeatability conditions of measurement**. (VIM 3rd Ed: 2007, 2.21).

Repeatability condition (repeatability condition of measurement)
condition of **measurement,** out of a set of conditions that includes the same **measurement procedure**, same operators, same **measuring system**, same operating conditions and same location, and replicate measurements on the same or similar objects over a short period of time (VIM 3rd Ed: 2007, 2.20).

NOTE (from VIM3):

1) A condition of measurement is a repeatability condition only with respect to a specific set of repeatability conditions.
2) In chemistry, the term 'intra-serial precision condition of measurement' is sometimes used to designate this concept.

NOTE: Repeatability means same analyst, same instrument, same laboratory and same day. [Eurachem/CITAC Guide CG2 6.8.5.3]

Replicate
a second measurement is a replicate of the initial measurement if the second measurement is obtained from an identical sample and under identical conditions as the initial measurement (ASTM Standard D6620).

NOTE (from ASTM D6620):

- Identical, as applied to sample, can mean same sub sample preparation, separate preparation of a distinct sub sample, or a distinct sample obtained from the same population as the initial sample. For this practice, identical means distinct sample obtained from the same population as the initial sample

Replicate analysis
the same specimen tested again, usually at a different time (ASTM Standard E1323).

NOTE (from ASTM E1323):
- Replicate data can be used to provide pooled precision of the test method, equipment, and operator, providing the specimen is homogeneous in nature.

Replicate (repeat) tests
nominally identical tests on different randomly selected test specimens conducted at the same nominal value of the independent variable X (ASTM Standard E1823).

NOTE (from ASTM E1823):
- Such replicate or repeat tests should be conducted independently; for example, each replicate test should involve a separate set of the test machine and its settings.

Reproducibility (measurement reproducibility)
measurement precision under **reproducibility conditions of measurement**. (VIM 3rd Ed: 2007, 2.25).

Reproducibility condition (reproducibility condition of measurement)
condition of **measurement,** out of a set of conditions that includes different locations, operators, **measuring systems**, and replicate measurements on the same or similar objects (VIM 3rd Ed: 2007, 2.24).

NOTE (from VIM3):
1. The different measuring systems may use different **measurement procedures**.
2. A specification should give the conditions changed and unchanged, to the extent practical.

NOTE: Reproducibility means different analyst, different instrument, different laboratory and different day. [Eurachem/CITAC Guide CG2 6.8.5.3].

Resolution
smallest change in a **quantity** being measured that causes a perceptible change in the corresponding **indication** (VIM 3rd Ed: 2007, 4.14).

NOTE (from VIM3):
Resolution can depend on, for example, noise (internal or external) or friction. It may also depend on the **value** of the quantity being measured.

Robustness
the degree to which a measurement procedure or method is immune to variations induced by operational parameters including, but not restricted to, environmental factors, chemical parameters, electrical/site services and human activity. [Taylor, 1987]

NOTE:
- This term is also sometimes defined as ruggedness.
- In any analytical procedure performance can be influenced by a number of different variables, such as: matrix interferences in the samples; reagent concentrations; temperature; etc. Experimental design is usually used to describe the stages of identifying the different factors that affect the result of an experiment, designing the experiment so that the effect of these factors is minimised, and using statistical analysis to

separate the effects of the factors involved. For example a ruggedness test will indicate firstly whether a particular method will stand up to everyday use, and will indicate which parts of the method are vulnerable to change and need to be subject to quality control. [Eurachem/CITAC Guide CG2 6.7.3.1]

- Functional relationships for parameters determine to be sensitive to these factors should be known and their relative effects on measured values documented. Such data is used to determine the tolerances within which these parameters must be kept to obtain results within acceptable limits. Robustness should be tested when developing every method or standard operating procedure.
- Taylor gives an experimental-statistical procedure to determine robustness.

Sample
for environmental testing laboratories, a sample generally refers to a water sample (grab sample/composite sample), soil sample, air sample etc. For the purposes of this document, the term "sample" is synonymous with the term "test item" in CAN-P-4E (ISO/IEC 17025:2005).

Sample analyses
all procedures carried out on samples (and standards) subsequent to sample preparation. This includes any chemical or biological alteration to the sample as well as subsequent measurement of specific sample characteristics.

Sample collection
all procedures carried out on a sample at the time of sample collection, including filtration to remove unwanted material from the sample or to isolate the sample.

Sample history requirements
includes requirements for sample collection, chemical preservation, sample container, storage conditions, holding time, and sample pre-treatment.

Sample preparation
all procedures such as purging, aeration, pH adjustment, extraction, clean-up, digestion, distillation etc. carried out on samples (or standards) prior to analysis.

Sample pre-treatment
all pre-treatment procedures carried out on a collected sample prior to sample preparation or analysis, including removal of unwanted material, removal of moisture, sub-sampling and homogenization.

Secondary standard (secondary measurement standard)
measurement standard established through **calibration** with respect to a **primary measurement standard** for a **quantity** of the same kind (VIM 3rd Ed: 2007, 5.5).

NOTE (from VIM3):

1. Calibration may be obtained directly between a primary measurement standard and the secondary measurement standard, or involve an intermediate **measuring system** calibrated by the primary measurement standard and assigning a **measurement result** to the secondary measurement standard.
2. A measurement standard having its **quantity value** assigned by a ratio **primary measurement procedure** is a secondary measurement standard.

Selectivity (selectivity of a measuring system)
property of a **measuring system**, using a specified **measurement procedure**, whereby it provides measured **quantity values**, for one or more **measurands**, such that the values of each measurand are independent of other measurands or other **quantities** in the phenomenon, body or substance being investigated (VIM 3rd Ed: 2007, 4.13).

EXAMPLE (from VIM3):

1) Capability of a measuring system including a mass spectrometer to measure the ion current ratio generated by two specified compounds without disturbance by other specified sources of electric current.
4) Capability of a measuring system for ionizing radiation to respond to a radiation to be measured in the presence of concomitant radiation.
6) Capability of a mass spectrometer to measure the amount-of-substance abundance of the ^{28}Si isotope and the ^{30}Si isotope in silicon from a geological deposit without influence between the two, or from the ^{29}Si isotope.

NOTE (from VIM3):

2. In chemistry, the measured quantities often involve different components in the system undergoing measurement and these quantities are not necessarily of the same kind.
3. In chemistry, selectivity of a measuring system is usually obtained for quantities with selected components in concentrations within stated intervals.

NOTE:

- It is sometimes quantified as cross sensitivity.
- It is also sometimes defined as specificity.

Sensitivity

quotient of the change in an **indication** of a **measurement system** and the corresponding change in the **value** of the **quantity** being measured (VIM 3rd Ed: 2007, 4.12).

NOTE (from VIM3):

1. Sensitivity of a measuring system can depend on the value of the quantity being measured.
2. The change considered in the value of the quantity being measured must be large compared with the **resolution**

NOTE: For CAN-P-1585 the sensitivity of the method, defined as the detector response per unit measurand concentration, is given by the slope of the calibration curve.

Significant figures

the number of figures required to express a numerical determination such that only the last figure is uncertain, which is dependent upon a method's precision.

NOTE: To determine the number of significant figures in any value, start from the left most non-zero figure and count through the last figure, including zeros.

Standard reference data

reference data issued by a recognized authority(VIM 3rd Ed: 2007, 5.17).

EXAMPLE (from VIM3):

1) Values of the fundamental physical constants, as regularly evaluated and published by ICSU CODATA (e. g. in 2005).
2) Relative atomic mass values, also called atomic weight values, of the elements, as evaluated every two years by IUPAC-CIAAW at the IUPAC General Assembly and published in *Pure Appl. Chem. or in J. Phys. Chem. Ref. Data.*

Standard uncertainty (standard measurement uncertainty, standard uncertainty of measurement)

measurement uncertainty expressed as a standard deviation (VIM 3rd Ed: 2007, 2.30).

Storage conditions

includes sample temperature, exclusion of light, exclusion of air, etc., during both sample transport and sample storage at the laboratory.

Surrogate
has chemical characteristics similar to those of a measurand. It provides analytical response which is distinct from the measurand and not subject to interference. It is added to sample prior to sample preparation and it is used to assess recovery of a measurand.

Surrogate spike recovery
recovery of surrogate spike added to sample prior to sample preparation. It is used to account for matrix effects and sample preparation losses.

Systematic error (systematic measurement error, systematic error of measurement)
component of **measurement error** that in replicate **measurements** remains constant or varies in a predictable manner (VIM 3rd Ed: 2007, 2.17).

NOTE (from VIM3):
1. A **reference quantity value** for a systematic measurement error is a **true quantity value**, or a **measured quantity value** of a **measurement standard** of negligible **measurement uncertainty**, or a **conventional quantity value**.
2. Systematic measurement error, and its causes, can be known or unknown. A **correction** can be applied to compensate for a known systematic measurement error.
3. Systematic measurement error equals measurement error minus **random measurement error**.

Target uncertainty (target measurement uncertainty)
measurement uncertainty specified as an upper limit and decided on the basis of the intended use of **measurement results** (VIM 3rd Ed: 2007, 2.34).

Test
technical operation that consists of the determination of one or more characteristics of a given product, process or service according to a specified procedure (ISO/IEC Guide 2).

NOTE: For CAN-P-1585 the term is deemed to be equivalent to a unique combination of matrix, measurand(s) and test method (e.g. lead in water by ICP, iron, lead and manganese in water by ICPMS).

Test group
a term used to describe one or more measurands in a specific sample matrix that is/are offered as a unique set of Proficiency Testing samples (ex. major ions in water, PAHs in water, PHC in soil or designated as C1A, C1B, 11-13, 104, 4060, 4080, etc).

NOTE: This term may also be referred to as “domain” or “group” by proficiency testing providers. **For-CAN-P-1585** the terms are deemed to be equivalent.

Test method
specified procedure for performing a test (ISO/IEC Guide 2).

Test organism history requirements
includes culture and/or holding conditions, quarantine requirements, feeding requirements, acclimation requirements, and disease control and treatment.

Traceability (metrological traceability)

property of a **measurement result** whereby the result can be related to a reference through a documented unbroken chain of **calibrations**, each contributing to the **measurement uncertainty** (VIM 3rd Ed: 2007, 2.41).

NOTE (from VIM3):

1. For this definition, a 'reference' can be a definition of a **measurement unit** through its practical realization, or a **measurement procedure** including the measurement unit for a non- **ordinal quantity**, or a **measurement standard**.
2. Metrological traceability requires an established **calibration hierarchy**.
3. Specification of the reference must include the time at which this reference was used in establishing the calibration hierarchy, along with any other relevant metrological information about the reference, such as when the first calibration in the calibration hierarchy was performed.
4. For **measurements** with more than one **input quantity in the measurement model**, each of the input **quantity values** should itself be metrologically traceable and the calibration hierarchy involved may form a branched structure or a network. The effort involved in establishing metrological traceability for each input quantity value should be commensurate with its relative contribution to the measurement result.
5. Metrological traceability of a measurement result does not ensure that the measurement uncertainty is adequate for a given purpose or that there is an absence of mistakes.
6. A comparison between two measurement standards may be viewed as a calibration if the comparison is used to check and, if necessary, correct the quantity value and measurement uncertainty attributed to one of the measurement standards.
7. The ILAC considers the elements for confirming metrological traceability to be an unbroken **metrological traceability chain** to an **international measurement standard** or a **national measurement standard**, a documented measurement uncertainty, a documented measurement procedure, accredited technical competence, metrological traceability to SI, and calibration intervals (see ILAC P-10:2002).
8. The abbreviated term "traceability" is sometimes used for 'metrological traceability' as well as for other concepts, such as 'sample traceability' or 'document traceability' or 'instrument traceability', where the history ('trace') of an item is meant. Therefore, the full term is preferred.

Traceability chain (metrological traceability chain)
sequence of **measurement standards** and **calibrations** that is used to relate a **measurement result** to a stated reference (VIM 3rd Ed: 2007, 2.42).

NOTE (from VIM3):

1. A metrological traceability chain is defined through a **calibration hierarchy**.
2. A metrological traceability chain is used to establish **metrological traceability** of the measurement result.
3. A comparison between two measurement standards may be viewed as a calibration if the comparison is used to check and, if necessary, correct the **quantity value** and **measurement uncertainty** attributed to one of the measurement standards.

Trueness (measurement trueness, trueness of measurement)
closeness of agreement between the average of an infinite number of replicate **measured quantity values** and a **reference quantity value**. (VIM 3rd Ed: 2007, 2.14).

NOTE (from VIM3):

1. Measurement trueness is not a **quantity** and thus cannot be expressed numerically, but measures for closeness of agreement are given in ISO 5725.
2. Measurement trueness is inversely related to **systematic measurement error**, but is not related to **random measurement error**.
3. **Measurement accuracy** should not be used for "measurement trueness" and vice versa.

True value (true quantity value, true value of a quantity)
quantity value consistent with the definition of a **quantity** (VIM 3rd Ed: 2007, 2.11).

NOTE (from VIM3):

1. In the Error Approach to describing **measurement**, a true quantity value is considered unique and, in practice, unknowable. The Uncertainty Approach is to recognize that, owing to the inherently incomplete amount of detail in the definition of a quantity, there is not a single true quantity value but rather a set of true quantity values consistent with the definition. However, this set of values is, in principle and in practice, unknowable. Other approaches dispense altogether with the concept of true quantity value and rely on the concept of **metrological compatibility of measurement results** for assessing their validity.
2. In the special case of a fundamental constant, the quantity is considered to have a single true quantity value.
3. When the **definitional uncertainty** associated with the **measurand** is considered to be negligible compared to the other components of the **measurement uncertainty**, the measurand may be considered to an "essentially unique" quantity value. This is the approach taken by the GUM and associated document, where the word "true" is considered to be redundant.

Type A evaluation of measurement uncertainty (Type A evaluation)

evaluation of a component of **measurement uncertainty** by a statistical analysis of **measured quantity values** obtained under defined **measurement** conditions (VIM 3rd Ed: 2007, 2.28).

NOTE (from VIM3):

1. For various types of measurement conditions, see **repeatability condition of measurement, intermediate precision condition of measurement** and **reproducibility condition of measurement**.
2. For information about statistical analysis, see e. g. ISO/IEC Guide 98-3:2008
3. See also ISO/IEC Guide 98-3:2008, 2.3.2, ISO 5725, ISO 13528, ISO/TS 21748, ISO 21749.

Type B evaluation of measurement uncertainty (Type B evaluation)

evaluation of a component of **measurement uncertainty** determined by means other than a **Type A evaluation of measurement uncertainty** (VIM 3rd Ed: 2007, 2.29).

EXAMPLE (from VIM3):

Evaluation based on information
- associated with authoritative published **quantity values**;
- associated with the quantity value of a **certified reference material**;
- obtained from a **calibration** certificate
- about drift;
- obtained from the **accuracy class** of a verified **measuring instrument**;
- obtained from limits deduced through personal experience.

NOTE (from VIM3): -See also ISO/IEC Guide 98-3:2008, 2.3.3.

Uncertainty budget

statement of a **measurement uncertainty**, of the components of that measurement uncertainty, and of their calculation and combination (VIM 3rd Ed: 2007, 2.33).

NOTE (from VIM3):

An uncertainty budget should include the **measurement model**, estimates and measurement uncertainties of the **quantities** in the measurement model, covariance's, type of applied probability density functions, degrees of freedom, type of evaluation of measurement uncertainty, and any **coverage factor**.

Verification

provision of objective evidence that a given item fulfils specified requirements (VIM 3rd Ed: 2007, 2.44).

EXAMPLE (from VIM3):

1) Confirmation that a given **reference material** as claimed is homogeneous for the **quantity value** and **measurement procedure** concerned, down to a test portion having a mass of 10 mg.

2) Confirmation that stated performance properties or legal requirements of a **measuring system** is achieved.
3) Confirmation that a stated **target measurement uncertainty** can be met.

NOTE (from VIM3):
1. When applicable, **measurement uncertainty** should be taken into consideration.
2. The item may be, e.g., a process, measurement procedure, material, compound, or measuring system.
3. The specified requirements may be, e.g., that a manufacturer's specifications are met.
4. Verification in legal metrology, as defined in VIML, and in conformity assessment in general, pertains to the examination and marking and/or issuing of verification certificate for a measuring system.
5. Verification should not be confused with **calibration.** Not every verification is a **validation**.
6. In chemistry, verification of identity of entity involved, or of activity, requires a description of the structure or properties of that entity or activity.

NOTE: Laboratories shall adhere to the verification requirements in CAN-P-1629

Validation

verification, where the specified requirements are adequate for a intended use (VIM 3rd Ed: 2007, 2.45).

EXAMPLE (from VIM3):
A **measurement procedure**, ordinarily used for the **measurement** of mass concentration of nitrogen in water, may be validated also for the measurement in human serum.

NOTE: Laboratories shall adhere to the verification requirements in CAN-P-1629

Working interval (measuring interval)

set of **values** of **quantities** of the same **kind** that can be measured by a given **measuring instrument** or **measuring system** with specified **instrumental uncertainty**, under defined conditions (VIM 3rd Ed: 2007, 4.7).

NOTE (from VIM3):
1. In some fields the term is "measuring range" or "measurement range".
2. The lower limit of a measurement interval should not be confused with **detection limit**.

Working standard (working measurement standard)

measurement standard that is used routinely to calibrate or verify **measuring instruments** or **measuring systems** (VIM 3rd Ed: 2007, 5.7).

NOTE (from VIM3):
1. A working measurement standard is usually calibrated with respect to a **reference measurement standard**.
2. In relation to **verification**, the terms are "check standard" or "control standard" are also sometimes used.