The International Vocabulary of Metrology
Basic and general Concepts and associated Terms - VIM: the JCGM 200 Guide [ISO/IEC Guide 99]

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condition for consistent translation of terms in other languages used on the "intercontinental" scene

one must *understand* the concept
behind the term
before being able
to translate the term (!)

Some key definitions of the revised VIM:

2.3 **measurand**

quantity intended to be measured

1.1 **quantity**

property of a phenomenon, body or substance,

where the property has a magnitude that can be expressed as a number and a reference

1.10 **base unit**

measurement unit that is adopted by convention for a **base quantity**

Note 3 For number of entities, the

introduces the *intention* of the analyst

("*intended* to be measured")

similarly,

"fitness for *intended* use" is used further on

rather than

"fitness for purpose"

2.6 **measurement procedure**

detailed description of a **measurement** according to one or more **measurement principles** and to a given **measurement method,** based on a **measurement model** and including any calculation to obtain a **measurement result**

Note 2 A **measurement procedure** can include a statement concerning a **target measurement uncertainty**

- prevents to state that a measurement method has a constant measurement uncertainty, whether it is carried out carefully or sloppily
- a measurement procedure contains a detailed description and therefore obliges to decide a priori on its *intended* use as a
  - "reference measurement procedure", or as a
  - "primary measurement procedure" (see further)
- a measurement method has no (approximately) constant measurement uncertainty,
  but a given measurement procedure has
- introduces the concept of
  "target measurement uncertainty" as a measure of "fitness for *intended* use"

2.7 **reference measurement procedure**

measurement procedure accepted as providin **measurement results** fit for their *intended* use i assessing **measurement trueness** of **measured quantity values** obtained from other measurement procedures for **quantities** of the same **kind**, in **calibration**, or in characterizing **reference materials**

2.8 **primary reference measurement procedure**

reference measurement procedure used to obtain a **measurement result** without relation to a **measurement standard** for a **quantity** of the same **kind**

Note 1 The Consultative Committee for Amount of Substance – Metrology in Chemistry (CCQM) uses the term "primary method of measurement" for this

this definition prevents to use "primary" for

- "prestige" reasons
- political reasons
- commercial reasons

this also applies to the (mis)use of the concept

'primary measurement standard'

(see further)

2.9 **measurement result**

set of **quantity values** being attributed to a **measurand** together with any other available information

Note 2 a measurement result is generally expressed as a single **measured quantity value** and a **measurement uncertainty**

2.36 **measurement uncertainty**

non-negative parameter characterizing the dispersion of the **quantity values** being attributed to a **measurand**, based on the information used

2.28 **Type A evaluation of measurement uncertainty**

evaluation of a component of **measurement uncertainty** by a statistical analysis of **measured quantity values** obtained under defined measurement conditions

2.29 **Type B evaluation of measurement uncertainty**

evaluation of a component of **measurement uncertainty** determined by means other than a statistical analysis of **Type A evaluation of measurement uncertainty**

These very important definitions put the ultimate task –and responsibility– for the measurement result
(back) to the analyst responsible
because his/her professional skill and judgement is essential:

GUM 3.4.8: "The evaluation of uncertainty is neither a routine task nor a purely mathematical one; it depends on detailed knowledge of the nature of the measurand and of the measurement"

GUM 4.3.2: "Type B evaluation of standard uncertainty ... calls for insight based on experience and general knowledge, and is a skill to be learned

2.40 **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

Note 1 M**easurement uncertainty** necessarily increases along the sequence of calibrations

2.41 **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 uncertainy**

2.42 **metrological traceability chain**

sequence of **measurement standards** and **calibrations** that is used to relate a **measurement result** to a reference

Note 1 A metrological traceability chain is defined through a **calibration hierarchy**

Note 2 A metrological traceability chain is used to establish **metrological traceability** of a measurement result

2.43 **metrological traceability to a measurement unit**

metrological traceability where the reference is the definition of a **measurement**

- strictly speaking, ultimate metrological traceability is
  not to the measurement unit chosen, but
  to the definition of that measurement unit,
  nor is it –ultimately–
  to a practical realization of that measurement unit

but *to the definition of that measurement unit through its practical realization*

- metrological traceability is a *prerequisite* to evaluation of measurement uncertainty

2.46 metrological comparability of measurement results

comparability of **measurement results**, for **quantities** of a given **kind**, that are metrologically traceable to the same reference

Note 1 A metrological traceability chain is defined through a **calibration hierarchy**

Note 2 Metrological comparability of measurement results does not necessitate that the **measured quantity values** and associated **measurement uncertainties** compared be of the same magnitude

2.43 metrological compatibility of measurement results

property of a set of measurement results for a specified **measurand**, such that the absolute value of the difference of any pair of **measured quantity values** from two different measurement results is smaller than some chosen multiple of the **standard measurement uncertainty** of that difference

- metrological comparability of measurement results is caused by metrological traceability to the same reference

- metrological compatibility is related to metrological equivalence of measurement results

- metrological comparability of measurement results is "vertical" in the same metrological traceability chain because it has to do with metrological traceability, whereas

- metrological equivalence of measurement results is "horizontal" because it has to do with different metrological traceability chains

5.1 **measurement standard**

realization of the definition of a given **quantity**, with stated **quantity value** and associated **measurement uncertainty**, used as a reference

Note 7 The word "embodiment" is sometimes used in the English language instead of "realization"

5.4 **primary measurement standard**

measurement standard established using a **primary reference measurement procedure**, or created as an artifact, chosen by convention

5.13 **calibrator**

with sincere wishes to all

for a good discussion at

AMCTM 2008

under the guidance of our Chair

Franco Pavese