

A. Definitions

Reference material (RM)

Option 1: Material or substance, one or more of whose property values are sufficiently homogeneous and well established to be fit for its intended use in measurement or in examination of nominal properties.

Note 1 - Examination of a nominal property provides a nominal property value and associated uncertainty. This uncertainty is not a measurement uncertainty.

Note 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.

Note 3 - 'Reference material' comprises materials embodying quantities as well as nominal properties.

EXAMPLE 1: Examples of reference materials embodying quantities:

- a) water of stated purity, the dynamic viscosity of which is used to calibrate viscometers;
- b) human serum without an assigned quantity value for the amount-of-substance concentration of the inherent cholesterol, used only as a measurement precision control material;
- c) fish tissue containing a stated mass fraction of a dioxin, used as a calibrator.

EXAMPLE 2: Examples of reference materials embodying nominal properties:

- a) colour chart indicating one or more specified colours;
- b) DNA compound containing a specified nucleotide sequence;
- c) urine containing 19-androstenedione

Note 4 - A reference material is sometimes incorporated into a specially fabricated device.

EXAMPLE 1 Substance of known triple-point in a triple-point cell.

EXAMPLE 2 Glass of known optical density in a transmission filter holder.

EXAMPLE 3 Spheres of uniform size mounted on a microscope slide.

Note 5 - Some reference materials have assigned quantity values 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.

Note 6 - In a given measurement, a given reference material can only be used for either calibration or quality assurance.

Note 7 - The specifications of a reference material should include its material traceability, indicating its origin and processing (Accred. Qual. Assur.: 2006) [45].

Note 8 - ISO/REMCO has an analogous definition[45] 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.²

Option 2: Material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process.

Note 1 – RM is a generic term.

Note 2 – Properties can be quantitative or qualitative (i.e., identity of substances or species)

Note 3 – Uses may include the calibration of a measurement system, assessment of a measurement procedure, assigning values to other materials, and quality control.

Note 4 – A single RM cannot be used for both calibration and validation of results in the same measurement procedure.

Note 5 – VIM has an analogous definition (ISO/IEC Guide 99:2007, 5.13), but restricts the term “measurement” to apply to quantitative values and not to qualitative properties. However, Note 3 of ISO/IEC Guide 99:2007, 5.13, specifically includes the concept of qualitative attributes, called “nominal properties”.³

Certified reference material (CRM)

Option 1: Reference material, accompanied by documentation issued by an authoritative body and providing one or more specified property values with associated uncertainties and traceabilities, using valid procedures.

EXAMPLE: Human serum with assigned quantity value for the concentration of cholesterol and associated measurement uncertainty stated in an accompanying certificate, used as a calibrator or measurement trueness control material.

Note 1 - ‘Documentation’ is given in the form of a ‘certificate’ (see ISO Guide 31:2000).

Note 2 - Procedures for the production and certification of certified reference materials are given, e.g. in ISO Guide 34 and ISO Guide 35.

Note 3 - In this definition, “uncertainty” covers both ‘measurement uncertainty’ and ‘uncertainty associated with the value 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’.

Note 4 - Specified quantity values of certified reference materials require metrological traceability with associated measurement uncertainty (Accred. Qual. Assur.: 2006) [45].

Note 5 - ISO/REMCO has an analogous definition (Accred. Qual. Assur.: 2006) [45] but uses the modifiers ‘metrological’ and ‘metrologically’ to refer to both quantity and nominal property.²

Option 2: Reference material, characterized by a metrologically valid procedure for one or more specified properties, accompanied by a certificate that provides the value of the specified property, its associated uncertainty, and a statement of metrological traceability.

Note 1 – The concept of value includes qualitative attributes such as identity or sequence. Uncertainties for such attributes may be expressed as probabilities.

Note 2 – Metrologically valid procedures for the production and certification of reference materials are given in, among others, ISO Guide 34 and 35.

Note 3 – ISO Guide 31 gives guidance on the contents of certificates.³

B. General Information

Table 982.35 lists selected issuing organizations and shows source codes together with names and addresses of these organizations.

Organizations listed are only representative of those supplying RMs. No claim is made as to completeness of information supplied. Catalogs or literature describing RMs are available from individual organizations. Because inventories of RMs are continually changing, inquiries should be made of the organizations concerning current availability of specific RMs.

Table 982.35: Sources of reference materials- organizations and addresses

AACC

American Association of Cereal Chemists
Check Sample Service
3340 Pilot Knob Rd
St. Paul, MN 55121-2097, USA
E-mail: bsimdars@scisoc.org
Website: <http://www.aaccnet.org>
Phone: 651-454-7250
Fax: 651-454-0766

AOCS

American Oil Chemists' Society
Smalley Check Sample Program
2211 West Bradley Avenue
Champaign, IL 61821-1827, USA
E-mail: technical@aocs.org
Website: <http://www.aocs.org/tech>
Phone: 217-359-2344
Fax: 217-351-8089

BAM

Federal Institute for Materials Research and Testing
Unter den Eichen 87
D-12200 Berlin, Germany
E-mail: info@bam.de
Website: <http://www.bam.de>
Phone: +49-30-81 04-0
Fax: +49-30-8 11 20 29

IRMM

Institute for Reference Materials and Measurements
Joint Research Centre, European Commission
Retieseweg 111, 2440
Geel, Belgium
Email: jrc-irmm-rm-sales@ec.europa.eu
Website: <http://www.irmm.jrc.be>
Phone: +32-14-571 705
Fax: +32-14-590 406

IAEA

International Atomic Energy Agency
Analytical Quality Control Services
Laboratory Seibersdorf
PO Box 100
Wagraer Strasse 5
A-1400 Vienna, Austria
E-mail: official.mail@iaea.org
Website: <http://www.iaea.org>
Phone: +431 2600-0
Fax: +431 2600-7

LGC Promochem

Laboratory of the Government Chemist
National Physical Laboratory
Office of Reference Materials
Queens Road
Teddington, Middlesex TW11 OLY, UK
E-mail: atcc@lgc.co.uk
Website: <http://www.lgc.co.uk/ref.asp>
Phone: 44 (0) 20 8943 8489
Fax: 44 (0) 20 8943 8405

NIES

National Institute for Environmental Studies
16-2, Onagava
Tsukuba-Shi, Ibaraki 305-8506, Japan
E-mail: www@nies.go.jp
Website: <http://www.nies.go.jp/>
Phone: +81-298-50-2422
Fax: +81-298-50-2572

NIST

National Institute of Standards and Technology
Standard Reference Materials Group
100 Bureau Drive, Stop 2322
Gaithersburg, MD 20899-2322, USA
E-mail: srminfo@nist.gov
Website: <http://ts.nist.gov/ts/htdocs/230/232/232.htm>
Phone: 301-975-6776
Fax: 301-948-3730

NRCC

National Research Council of Canada
Certified Reference Materials Program

Institute for Marine Biosciences
1411 Oxford St.
Halifax, NS, Canada B3H 3Z1
E-mail: crm.imb@nrc.ca

Website: <http://imb-ibm.nrc-cnrc.gc.ca/crmp/>

Phone: 902-426-8281

Fax: 902-426-5426

Institute for National Measurement Standards

1200 Montreal Road, Bldg M-36

Ottawa, ON, Canada K1A 0R6

Email: crm.inms@nrc-cnrc.gc.ca

Website: http://inms-ienm.nrc-cnrc.gc.ca/en/calserv/crm_e.php

Phone: 613-993-2359

Fax: 613-993-2451

USP

U.S. Pharmacopeial Convention, Inc.

USP-NF Reference Standards

12601 Twinbrook Parkway

Rockville, MD 20852, USA

E-mail: custsvc@usp.org

Website: <http://www.usp.org>

Phone: 301-881-0666

Fax: 301-816-8148

References:

1. Technical Division on Reference Materials-Minutes of Executive Committee Meeting, January 22, 2003, AOAC INTERNATIONAL, Gaithersburg, MD, USA
2. International Vocabulary of Metrology - Basic and General Concepts and Associated Terms, 3rd ed. BIPM/IEC/IFCC/ISO/IUPAC/IUPAP/OIML, International Organization for Standardization (ISO), JCGM/WG2 2008 (VIM)
3. Reference Materials – General and Statistical Principles for Certification, ISO Guide 35, 3rd Ed., 2006, International Organization for Standardization (ISO), 1993 (REMCO)