TECHNICAL REPORT

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Reference materials — Establishing and expressing metrological traceability of quantity values assigned to reference materials

Matériaux de référence — Etablissement et expression de la traçabilité métrologique de valeurs assignées à des matériaux de référence

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Foreword

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ISO/TR 16476 was prepared by the ISO Committee on Reference Materials (ISO/REMCO).

Introduction

Reference materials (RM), in particular when certified (CRM), are a major tool for assuring the quality and reliability of results obtained in measurement and testing. CRM property values, in particular used for assessing the trueness of a measurement procedure as implemented in a laboratory, also establish traceability of the measurement result. Which reference the property values assigned to (C)RM should be traceable to, and how this traceability should be established, demonstrated, and reported on certificates is, therefore, a question of primary importance, mainly for RM producers. However, users of (C)RMs should also know what the endpoint of their traceability chain is, in particular for all purposes of cross-border acceptance of measurement results.

It was therefore considered necessary to conduct a study into existing principles for, and requirements to, the traceability of (C)RM, in particular with a specific view to the current definition of metrological traceability given by the Vocabulary of International Metrology (VIM), edition 3, 2007.

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1 Scope

This Technical Report investigates, discusses, and specifies further, the general principles of establishing traceability of measurement results laid down in the Joint BIPM, OIML, ILAC and ISO Declaration on Metrological Traceability [1], in particular for values assigned to (certified) reference materials. The document covers the following topics:

a) a study into existing principles for, and requirements to, the traceability of the value assigned to the property of a (C)RM, with a specific view to the current definition of metrological traceability given by the 2007 edition of the VIM (published also as JCGM 200:2008[2] and ISO/IEC Guide 99:2007[21]);

b) the development of a sensible, widely applicable approach to the understanding of the traceability of a value assigned to (C)RM property;

c) recommendations on how traceability should be established, demonstrated, and reported on certificates and other documents accompanying (C)RM.

The developed approach is exemplified for measurement procedures not covered earlier by other guidance documents on the topic.

2 The VIM definition of metrological traceability

The recent edition of the VIM[2],[21] defines *metrological traceability* (term 2.41) as

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	
NOTE 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.
NOTE 2	Metrological traceability requires an established calibration hierarchy.
NOTE 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.
NOTE 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.
NOTE 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.