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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 334, *Reference materials*.

This first edition cancels and replaces ISO Guide 33:2015, which has been technically revised.

The main changes are as follows:

- title modified;
- 1.5 removed;
- 5.3 and 5.4 removed;
- [Figure 1](#) revised and explanation inserted;
- [6.1.4](#): former [Annex A](#) Table A.1 inserted as [Table 1](#);
- [9.1.3](#) removed;
- [9.2.1](#) revised;
- [9.3.1](#) and [9.3.2](#) revised and merged into [9.3.1](#)
- [10.2.1](#) moved to [10.1.1](#) and former [10.1.1](#) added as [10.1.2](#);
- [12.2](#) and [12.3](#) moved into the new [Annex C](#);
- former [Annex B](#) now [Annex A](#);
- former [Annex C](#) now [Annex B](#);
- Bibliography revised.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document provides general recommendations on the use of reference materials (RMs). These recommendations are exemplified by real-world examples, which to some degree also reflect the level of complexity associated with RMs. This level of detail is deemed to be useful for users of RMs and anyone who has a responsibility in the quality management in laboratories, e.g. drafters, reviewers, managers and assessors of procedures, working instructions and standard operating procedures.

For certified reference materials (CRMs), the metrological traceability of the property values to international scales or other measurement standards has been established. For RMs that are not CRMs, this kind of traceability of property values has often not been established. Nevertheless, these RMs can still be used for assessing parts of measurement procedures, including evaluating various levels of precision.

Mainstream applications of RMs are listed in [6.1.1](#). Not all types of RMs can be used for all indicated purposes.

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# Reference materials — Requirements and recommendations for use

## 1 Scope

This document describes good practice in using reference materials (RMs), and certified reference materials (CRMs) in particular, in measurement processes. These uses include:

- the assessment of precision and trueness of measurement methods;
- quality control;
- assigning values to materials;
- calibration;
- establishing conventional scales.

This document also relates key characteristics of various types of RMs to the different applications.

The preparation of RMs for calibration is also part of the scope of ISO 17034 and ISO 33405. The treatment in this document is limited to the fundamentals of small-scale preparation of RMs and the value assignment, as used by laboratories to calibrate their equipment. Larger scale production of such RMs, with the possible aim of distribution, is beyond the scope of this document. This type of activity is covered in ISO 17034 and ISO 33405.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO Guide 30, *Reference materials — Selected terms and definitions*

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO Guide 30 and ISO/IEC Guide 99 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>