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Accuracy (trueness and precision) of measurement methods and results —

Part 5: Alternative methods for the determination of the precision of a standard measurement method

Exactitude (justesse et fidélité) des résultats et méthodes de mesure —

Partie 5: Méthodes alternatives pour la détermination de la fidélité d'une méthode de mesure normalisée

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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.

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This document was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 6, *Measurement methods and results*.

This second edition cancels and replaces the first edition (ISO 5725-5:1998), which has been technically revised. It also incorporates the Technical Corrigendum ISO 5725-5:1998/Cor.1:2005.

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The main changes are as follows:

- ~~alternative~~ experimental designs (split-level and design for heterogeneous material) have been transferred to ISO 5725-3;
- ~~an~~ additional robust approach, the Q method, which has improved breakdown properties, has been added.

A list of all parts in the ISO 5725 series can be found on the ISO website.

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.

Introduction

This document uses two terms, trueness and precision, to describe the accuracy of a measurement method. Trueness refers to the closeness of agreement between the average value of a large number of test results and the true or accepted reference value. Precision refers to the closeness of agreement between test results.

General consideration of these quantities is given in ISO 5725-1 and so is not repeated here. This document should be read in conjunction with ISO 5725-1 because the underlying definitions and general principles are given there.

ISO 5725-2 is concerned with estimating, by means of interlaboratory experiments, standard measures of precision, namely the repeatability standard deviation and the reproducibility standard deviation. It gives a basic method for doing this, including methods of calculation. This document describes alternative calculation methods to this basic method:

- The basic method requires the preparation of a number of identical samples of the material for use in the experiment. With heterogeneous materials this may not be possible, so that the use of the basic method then gives estimates of the reproducibility standard deviation that are inflated by the variation between the samples. The design for a heterogeneous material given in this document yields information about the variability between samples which is not obtainable from the basic method; it may be used to calculate an estimate of reproducibility from which the between-sample variation has been removed.
- The basic method requires tests for outliers to be used to identify data that should be excluded from the calculation of the repeatability and reproducibility standard deviations. Excluding outliers can sometimes have a large effect on the estimates of repeatability and reproducibility standard deviations, but in practice, when applying the outlier tests, the statistical expert may have to use judgement to decide which data to exclude. This document describes robust methods of data analysis that may be used to calculate repeatability and reproducibility standard deviations from data containing outliers without using tests for outliers to exclude data, so that the results are no longer affected by the statistical expert's judgement.

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