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

Part 2:
Basic method for the determination of repeatability and reproducibility of a standard measurement method

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

Partie 2: Méthode de base pour la détermination de la répétabilité et de la reproductibilité d'une méthode de mesure normalisée

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Contents

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 5725-2 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 6, *Measurement methods and results*.

ISO 5725 consists of the following parts, under the general title *Accuracy (trueness and precision) of measurement methods and results*:

— *Part 1: General principles and definitions*

— *Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

— *Part 3: Intermediate measures of the precision of a standard measurement method*

— *Part 4: Basic methods for the determination of the trueness of a standard measurement method*

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

— *Part 6: Use in practice of accuracy values*

Parts 1 to 6 of ISO 5725 together cancel and replace ISO 5725:1986, which has been extended to cover trueness (in addition to precision) and intermediate precision conditions (in addition to repeatability and reproducibility conditions).

Annex A forms an integral part of this part of ISO 5725. Annexes B and C are for information only.

Introduction

0.1 ISO 5725 uses two terms "trueness" and "precision" to describe the accuracy of a measurement method. "Trueness" refers to the closeness of agreement between the arithmetic mean of a large number of test results and the true or accepted reference value. "Precision" refers to the closeness of agreement between test results.

0.2 General consideration of these quantities is given in ISO 5725-1 and so is not repeated in this part of ISO 5725. ISO 5725-1 should be read in conjunction with all other parts of ISO 5725, including this part, because it gives the underlying definitions and general principles.

0.3 This part of ISO 5725 is concerned solely with estimating by means of the repeatability standard deviation and reproducibility standard deviation. Although other types of experiment (such as the split-level experiment) are used in certain circumstances for the estimation of precision, they are not dealt with in this part of ISO 5725 but rather are the subject of ISO 5725-5. Nor does this part of ISO 5725 consider any other measures of precision intermediate between the two principal measures; those are the subject of ISO 5725-3.

0.4 In certain circumstances, the data obtained from an experiment carried out to estimate precision are used also to estimate trueness. The estimation of trueness is not considered in this part of ISO 5725; all aspects of the estimation of trueness are the subject of ISO 5725-4.

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

Part 2:
Basic method for the determination of repeatability and reproducibility of a standard measurement method

1 Scope

1.1 This part of ISO 5725

— amplifies the general principles to be observed in designing experiments for the numerical estimation of the precision of measurement methods by means of a collaborative interlaboratory experiment;

— provides a detailed practical description of the basic method for routine use in estimating the precision of measurement methods;

— provides guidance to all personnel concerned with designing, performing or analysing the results of the tests for estimating precision.

NOTE 1 Modifications to this basic method for particular purposes are given in other parts of ISO 5725.

Annex B provides practical examples of estimating the precision of measurement methods by experiment.

1.2 This part of ISO 5725 is concerned exclusively with measurement methods which yield measurements on a continuous scale and give a single value as the test result, although this single value may be the outcome of a calculation from a set of observations.

1.3 It assumes that in the design and performance of the precision experiment, all the principles as laid down in ISO 5725-1 have been observed. The basic method uses the same number of test results in each laboratory, with each laboratory analysing the same levels of test sample; i.e. a balanced uniform-level experiment. The basic method applies to procedures that have been standardized and are in regular use in a number of laboratories.

NOTE 2 Worked examples are given to demonstrate balanced uniform sets of test results, although in one example a variable number of replicates per cell were reported (unbalanced design) and in another some data were missing. This is because an experiment designed to be balanced can turn out to be unbalanced. Stragglers and outliers are also considered.

1.4 The statistical model of clause 5 of ISO 5725-1:1994 is accepted as a suitable basis for the interpretation and analysis of the test results, the distribution of which is approximately normal.

1.5 The basic method, as described in this part of ISO 5725, will (usually) estimate the precision of a measurement method:

a) when it is required to determine the repeatability and reproducibility standard deviations as defined in ISO 5725-1;

b) when the materials to be used are homogeneous, or when the effects of heterogeneity can be included in the precision values; and