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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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Contents	Page
1 Scope	1
2 Normative references	1
3 Definitions	2
4 Split-level design	2
4.1 Applications of the split-level design	2
4.2 Layout of the split-level design	2
4.3 Organization of a split-level experiment	3
4.4 Statistical model	4
4.5 Statistical analysis of the data from a split-level experiment	5
4.6 Scrutiny of the data for consistency and outliers	6
4.7 Reporting the results of a split-level experiment	7
4.8 Example 1: A split-level experiment — Determination of protein	7
5 A design for a heterogeneous material	13
5.1 Applications of the design for a heterogeneous material	13
5.2 Layout of the design for a heterogeneous material	14
5.3 Organization of an experiment with a heterogeneous material	15
5.4 Statistical model for an experiment with a heterogeneous material	16
5.5 Statistical analysis of the data from an experiment with a heterogeneous material	17
5.6 Scrutiny of the data for consistency and outliers	20
5.7 Reporting the results of an experiment on a heterogeneous material	21
5.8 Example 2: An experiment on a heterogeneous material	21
5.9 General formulae for calculations with the design for a heterogeneous material	29
5.10 Example 3: An application of the general formulae	30
6 Robust methods for data analysis	33
6.1 Applications of robust methods of data analysis	33
6.2 Robust analysis: Algorithm A	35
6.3 Robust analysis: Algorithm S	36
6.4 Formulae: Robust analysis for a particular level of a uniform-level design	38
6.5 Example 4: Robust analysis for a particular level of a uniform-level design	38
6.6 Formulae: Robust analysis for a particular level of a split-level design	42
6.7 Example 5: Robust analysis for a particular level of a split-level design	42
6.8 Formulae: Robust analysis for a particular level of an experiment on a heterogeneous material	45
6.9 Example 6: Robust analysis for a particular level of an experiment on a heterogeneous material	45
Annexes	
A (normative) Symbols and abbreviations used in ISO 5725	50
B (informative) Derivation of the factors used in algorithms A and S	53
C (informative) Derivation of equations used for robust analysis	55
D (informative) Bibliography	56

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Foreword

ISO (the International Organization for Standardization) is a world-wide 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 organisations, 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.

ISO 5725-5 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 conditions and reproducibility conditions).

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

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Introduction

0.1 This part of 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 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.

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

0.3 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 using the uniform-level design. This part of ISO 5725 describes alternative methods to this basic method.

- a) With the basic method there is a risk that an operator may allow the result of a measurement on one sample to influence the result of a subsequent measurement on another sample of the same material, causing the estimates of the repeatability and reproducibility standard deviations to be biased. When this risk is considered to be serious, the split-level design described in this part of ISO 5725 may be preferred as it reduces this risk.
- b) 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 part of ISO 5725 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.
- c) 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 data analyst may have to use judgement to decide which data to exclude. This part of ISO 5725 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 data analyst's judgement.