International Standard 5725

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Precision of test methods — Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests

Fidélité des méthodes d'essai — Détermination de la répétabilité et de la reproductibilité d'une méthode d'essai normalisée par essais interlaboratoires

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5725 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods.*

This second edition cancels and replaces the first edition (ISO 5725-1981), of which it constitutes a minor revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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0 Introduction

0.1 Tests performed on presumably identical material (see 4.2) in presumably identical circumstances do not, in general, yield identical results. This is attributed to unavoidable random errors inherent in every test procedure; the factors that may influence the outcome of a test cannot all be completely controlled. In the practical interpretation of test data, this variability has to be taken into account. For instance, the difference between a test result and some specified value may be within the scope of unavoidable random errors, in which case a real deviation from such a specified value has not been established. Similarly, comparing test results from two batches of material will not indicate a fundamental quality difference if the difference between them can be attributed to inherent variation in the test procedure.

0.2 Many different factors (apart from variations between supposedly identical specimens) may contribute to the variability of a test procedure, including the following :

a) the operator;

b) the equipment used;

c) the calibration of the equipment;

d) the environment (temperature, humidity, air pollution, etc.).

The variability between tests performed by different operators and/or with different equipment will usually be greater than between tests carried out by a single operator using the same equipment.

0.3 Precision is a general term for the variability between repeated tests. Two measures of precision, termed repeatability and reproducibility, have been found necessary and, for many practical cases, sufficient for describing the variability of a test method. Repeatability refers to tests performed under conditions that are as constant as possible, with the tests performed during a short interval of time (see 4.3) in one laboratory by one operator using the same equipment. On the other hand, reproducibility refers to tests performed in widely varying conditions, in different laboratories with different operators and different equipment. Under repeatability conditions factors a) to d) listed in 0.2 are considered constants and do not contribute to the variability, while under reproducibility conditions they vary and contribute to the variability of the test results. Thus repeatability and reproducibility are two extremes, the first measuring the minimum and the second the maximum variability in results. Other intermediate measures of variability between these two extremes are conceivable, such as repetition of tests within a laboratory at longer time intervals, or by different operators, or including the effects of recalibration but these are not considered in this International Standard. If, in a particular situation, some intermediate measure should be needed, it must be clearly defined by some responsible authority, together with the circumstances under which it applies and the method by which it should be determined.

0.4 The definitions used in this International Standard are given in clause 3 and the symbols and subscripts used are given in annex C.

A bibliography of the publications referred to in this International Standard is appended.

1 Scope

This International Standard establishes practical definitions of repeatability r and reproducibility R which lend themselves to numerical estimation by experiment (see clause 3). It does not provide any measure of the errors in estimating the values of r and R. It discusses the implications of these definitions of r and R.

This International Standard establishes basic principles for the layout, organization and analysis of experiments designed for estimating r and R (see clauses 6 to 17). Experiments for this purpose will be referred to as precision experiments. Only the simplest type of experiment for the estimation of r and R is considered, which consists of tests on samples of identical material by several laboratories.

This International Standard also presents rules for the interpretation and application of these estimates of r and R in practical situations (see clauses 18 to 20).

This International Standard does not deal with determining the accuracy of the test method, as measured by the difference between the overall mean value and the true value or conventional true value.

2 Field of application

This International Standard deals exclusively with test methods which yield a single numerical figure as the test result, although this single figure may be the outcome of a calculation from a set of observations.