International Standard

ISO 5725-5

Second edition

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

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ISO/PRF 5725-5
https://standards.iteh.ai/catalog/standards/iso/06cf0162-5768-4c01-9d30-fb581d750786/iso-prf-5725-5

PROOF/ÉPREUVE

Reference number
ISO 5725-5:2025(en)

© ISO 2025

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ISO/PRF 5725-5
https://standards.iteh.ai/catalog/standards/iso/06cf0162-5768-4c01-9d30-fb581d750786/iso-prf-5725-5

COPYRIGHT PROTECTED DOCUMENT

© ISO 2025

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **iv**

Introduction ..... **v**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Symbols and abbreviations **1**

5 Robust methods for data analysis: Algorithms A and S **3**
5.1 Applications of robust methods of data analysis 3
5.2 Robust analysis: Algorithm A 5
5.3 Robust analysis: Algorithm S 7
5.4 Formulae: robust analysis for a particular level of a uniform-level design 8
5.5 Formulae: robust analysis for a particular level of a split-level design 9
5.6 Formulae: robust analysis for a particular level of an experiment on a heterogeneous material 9

6 Robust methods for data analysis: Q method and Hampel estimator **10**
6.1 Rationale for computationally intensive estimators 10

7 Robust statistical analysis of results by means of the Q/Hampel method in a one-way replicated design **11**
7.1 Introduction to the Q/Hampel method 11
7.2 Determination of the robust reproducibility standard deviation s_R using the Q method 11
7.3 Determination of the robust repeatability standard deviation s_r using the Q method 12
7.4 Determination of the robust mean x^* using the Hampel estimator 13

8 Robust statistical analysis of results by means of the Q/Hampel method in a staggered nested design with two factors **13**
8.1 Data layout and nomenclature 13
8.2 Determination of the robust reproducibility standard deviation s_R using the Q method 14
8.3 Determination of the robust intermediate standard deviation using the Q method 14
8.4 Determination of the robust repeatability standard deviation s_r using the Q method 15
8.5 Determination of the robust mean x^* using the Hampel estimator 16

Annex A (normative) **Determination of the robust mean using the Hampel estimator** **17**

Annex B (informative) **Derivations** **19**

Annex C (informative) **Examples** **22**

Bibliography **38**

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ISO/PRF 5725-5
https://standards.iteh.ai/catalog/standards/iso/06cf0162-5768-4d01-9c80-fb581d750786/iso-prf-5725-5

© ISO 2025 – All rights reserved

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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.

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.

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.

iTeh Standards
Document Preview
ISO/PRF 5725-5
https://standards.iteh.ai/catalog/standards/iso/06cf0162-5768-4a01-9d30-fb581d750786/iso-prf-5725-5

© ISO 2025 – All rights reserved

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.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ISO/PRF 5725-5
https://standards.iteh.ai/catalog/standards/iso/06cf0162-5768-4c01-9d30-fb581d750786/iso-prf-5725-5

© ISO 2025 – All rights reserved

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ISO/PRF 5725-5
https://standards.iteh.ai/catalog/standards/iso/06cf0162-5768-4c01-9d30-fb581d750786/iso-prf-5725-5