

INTERNATIONAL STANDARD

ISO
11648-1

First edition
2003-03-15

Statistical aspects of sampling from bulk materials —

Part 1: General principles

Aspects statistiques de l'échantillonnage des matériaux en vrac —

Partie 1: Principes généraux



Reference number
ISO 11648-1:2003(E)

© ISO 2003

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO 2003

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope.....	1
2 Normative references	1
3 Terms, definitions, symbols and abbreviated terms.....	1
4 Purpose and application of statistics in sampling from bulk material.....	11
5 Particular problems for sampling bulk materials	11
6 Differences between particulates, liquids and gases	13
7 Experimental methods for obtaining variance components at various stages of sampling	14
8 Adjusting the sampling plan to obtain desired precision.....	19
9 Estimating precision.....	20
10 Checking for bias	20
11 Precision and bias at measurement stage	22
Annex A (informative) Explanatory notes on definitions	23
Annex B (informative) Fully-nested experiments	28
Annex C (informative) Statistical analysis of serial data.....	36
Annex D (normative) Estimating precision	74
Annex E (normative) Checking for bias	78
Bibliography	91

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11648-1 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*.

ISO 11648 consists of the following parts, under the general title *Statistical aspects of sampling from bulk materials*:

- *Part 1: General principles*
- *Part 2: Sampling of particulate materials*

It is the intention of ISO/TC 69/SC 3 to develop additional parts under this general title for the sampling of liquids and gases, if the need exists.

Introduction

This first part of ISO 11648 gives a broad outline of the statistical aspects of sampling from bulk material.

International Standards dealing with the methods for sampling for bulk materials, such as solid fuels, iron ores, etc., have already been published and some of these are being revised by the responsible technical committees. This International Standard provides a source of information for technical terms and sampling techniques for types of bulk materials for which International Standards on sampling have not yet been written. This International Standard may also act as a bridge for mutual understanding of terms and methods between Technical Committees.

Statistical aspects of sampling from bulk materials —

Part 1: General principles

1 Scope

This part of ISO 11648 establishes the general principles for the application and statistical treatment of the sampling of bulk materials. It also provides general guidance and examples for estimating necessary variances and checking precision and bias when the average value of a quality characteristic is investigated. Furthermore, this part of ISO 11648 gives information relating to the statistical analyses of serial data, by the use of variograms and correlograms.

This part of ISO 11648 also defines the basic terms with definitions for the sampling of bulk materials. These terms are necessary for providing a better understanding of sampling techniques as well as making it easier to fulfil requirements.

NOTE Part 2 of ISO 11648 is applicable to particulate materials in bulk.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

ISO 3534 (all parts), *Statistics — Vocabulary and symbols*

ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3534 and the following apply.

NOTE 1 The text (bulk material) shown after terms means the definition given is confined to the field of bulk sampling.

NOTE 2 For further information on definitions, see Annex A.

3.1.1

bulk material

amount of material within which component parts are not initially distinguishable on the macroscopic level