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## Random sampling and randomization procedures

*Modes opératoires d'échantillonnage et de répartition aléatoires*



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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.

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 24153 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 5, *Acceptance sampling*.

## Introduction

Random sampling and randomization procedures are the cornerstone to the validity of many statistical methods used in experimentation, whether for industrial quality control and improvement purposes or for designed experiments in the medical, biological, agricultural, or other scientific fields. Many statistical standards address the conduct of such experimentation. In particular, all of the following acceptance-sampling standards have been designed on the premise that random sampling is employed to select the required sampling units for lot disposition purposes:

ISO 2859 (all parts), *Sampling procedures for inspection by attributes*

ISO 3951 (all parts), *Sampling procedures for inspection by variables*

ISO 8422, *Sequential sampling plans for inspection by attributes*

ISO 8423, *Sequential sampling plans for inspection by variables for percent nonconforming (known standard deviation)*

ISO 13448 (all parts), *Acceptance sampling procedures based on the allocation of priorities principle (APP)*

ISO 14560, *Acceptance sampling procedures by attributes — Specified quality levels in nonconforming items per million*

ISO 18414, *Acceptance sampling procedures by attributes — Accept-zero sampling system based on credit principle for controlling outgoing quality*

ISO 21247, *Combined accept-zero sampling systems and process control procedures for product acceptance*

In addition, ISO 2859-3 and ISO 21247 include provisions for random sampling to be applied to determine whether a lot should be inspected or not under skip-lot sampling procedures, and to decide which units require inspection from a production process under continuous sampling plans, respectively. Consequently, it is of great importance to the valid operation of all of the above standards that sampling be effectively random in its application.

Although the principles of this International Standard are universally applicable where random sampling is required and the sampling units can be clearly defined, preferably on the basis of discrete items, there are many situations in which the material of interest does not lend itself to being quantified on a discrete-item basis, as in the case of a bulk material. In such situations, the user is advised to consult the following ISO International Standards for appropriate guidance:

ISO 11648 (all parts), *Statistical aspects of sampling from bulk materials*

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# Random sampling and randomization procedures

## 1 Scope

This International Standard defines procedures for random sampling and randomization. Several methods are provided, including approaches based on mechanical devices, tables of random numbers, and portable computer algorithms.

This International Standard is applicable whenever a regulation, contract, or other standard requires random sampling or randomization to be used. The methods are applicable to such situations as

- a) acceptance sampling of discrete units presented for inspection in lots,
- b) sampling for survey purposes,
- c) auditing of quality management system results, and
- d) selecting experimental units, allocating treatments to them, and determining evaluation order in the conduct of designed experiments.

Information is also included to facilitate auditing or other external review of random sampling or randomization results where this is required by quality management personnel or regulatory bodies.

This International Standard does not provide guidance as to the appropriate random sampling or randomization procedures to be used for any particular experimental situation or give guidance with respect to possible sampling strategy selection or sample size determination. Other ISO standards (such as those listed in the Introduction) or authoritative references should be consulted for guidance in such areas.

## 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 3534-1, *Statistics — Vocabulary and symbols — Part 1: General statistical terms and terms used in probability*

ISO 3534-2, *Statistics — Vocabulary and symbols — Part 2: Applied statistics*

ISO 3534-3, *Statistics — Vocabulary and symbols — Part 3: Design of experiments*

ISO 80000-2, *Quantities and units — Part 2: Mathematical signs and symbols to be used in the natural sciences and technology*

## 3 Terms, definitions, and symbols

For the purposes of this document, the terms and definitions given in ISO 3534-1, ISO 3534-2, ISO 3534-3, and the following apply.