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**Statistical aspects of sampling from bulk  
materials —**

**Part 2:  
Sampling of particulate materials**

*Aspects statistiques de l'échantillonnage des matériaux en vrac —*

*Partie 2: Échantillonnage des matériaux particuliers*



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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 3.

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 part of ISO 11648 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 11648-2 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 3, *Application of statistical methods in standardization*.

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 to ISO 11648 to cover the sampling of liquids and gases, if the need exists.

Annexes A to J of this part of ISO 11648 are for information only.

## Introduction

This part of ISO 11648 gives the basic methods for sampling bulk particulate materials in bulk (e.g. ores, mineral concentrates, coal, industrial chemicals in powder and granular form, and agricultural products such as grain) from moving streams and stationary situations.

Part 1 of ISO 11648 gives a broad outline of the statistical aspects of sampling from bulk materials.



# Statistical aspects of sampling from bulk materials —

## Part 2: Sampling of particulate materials

### 1 Scope

This part of ISO 11648 establishes the basic methods for sampling particulate materials in bulk (e.g. ores, mineral concentrates, coal, industrial chemicals in powder or granular form, and agricultural products such as grain) from moving streams and stationary situations, including stopped-belt sampling, to provide samples for measuring one or more variables in an unbiased manner and with a known degree of precision. The variables are measured by chemical analysis and/or physical testing. These sampling methods are applicable to materials that require inspection to verify compliance with product specifications or contract settlements, to calculate the value of the lot mean of a measurable quantity as a basis for settlement between trading partners, or to estimate the set of variables and variances that describes a system or procedure.

Stopped-belt sampling is the reference method against which other sampling procedures are compared. Dynamic sampling from moving streams is the preferred method whereby a sampling device (called a cutter) is passed through the stream of the particulate material. A complete cross-section of the moving stream can be removed as a primary increment at a conveyor belt transfer point with a falling-stream cutter, or removed from the belt with a cross-belt cutter. In both cases, the selection and extraction of increments can be described by a one-dimensional dynamic sampling model.

Static sampling of bulk material from stationary situations, such as stockpiles, rail or road wagons, the holds of ships and barges, silos, and even comparatively small volumes, is used only where sampling from moving streams is not possible. Such sampling from three-dimensional lots is prone to systematic errors, because some parts of the lot usually have reduced or no chance of being collected for the gross sample. This is in violation of the requirement of the three-dimensional sampling model that all parts have an equal probability of being collected. The procedures described in this part of ISO 11648 for sampling from stationary lots of bulk particulate material with implements such as mechanical augers merely minimize some of the systematic sampling errors.

For these reasons, this part of ISO 11648 is primarily concerned with dynamic sampling from moving streams or stopped-belt static sampling from conveyor belts and is based on a sampling model for one-dimensional lots. Nonetheless, procedures for static sampling from three-dimensional lots are provided where these situations cannot be avoided.

This part of ISO 11648 is concerned with the methods of sampling particulate materials in bulk with the objective of obtaining unbiased measurements of one or more variables of the material with a known degree of precision. However, it does not provide methods for deciding whether to accept or reject a bulk material lot with specified degrees of risk of accepting a sub-standard lot, or of rejecting what is in fact an acceptable lot. These latter procedures are usually called acceptance sampling or sampling inspection methods.