
**Sampling procedures for inspection
by attributes —**

Part 10:
**Introduction to the ISO 2859 series
of standards for sampling for inspection
by attributes**

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Règles d'échantillonnage pour les contrôles par attributs —

*Partie 10: Introduction au système d'échantillonnage pour les contrôles
par attributs de l'ISO 2859*

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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 2859-10 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 5, *Acceptance sampling*.

This first edition of ISO 2859-10 cancels and replaces ISO 2859-0:1995, which has been technically revised.

ISO 2859 consists of the following parts, under the general title *Sampling procedures for inspection by attributes*:

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ISO 2859-10:2006
- *Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*
 - *Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection*
 - *Part 3: Skip-lot sampling procedures*
 - *Part 4: Procedures for assessment of declared quality levels*
 - *Part 5: System of sequential sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection*
 - *Part 10: Introduction to the ISO 2859 series of attribute sampling standards*

This first edition of ISO 2859-10 is significantly different from ISO 2859-0:1995 which it cancels. It contains a brief summary of each part of ISO 2859 whereas the previous edition contained detailed description of the theory behind acceptance sampling by attributes and a detailed discussion of ISO 2859-1. The theory behind these standards has now been placed in ISO/TR 8550-1. In addition, ISO 2859-2, ISO 2859-3, ISO 2859-4 and ISO 2859-5 are listed in this edition; these parts were not present when the first edition was published.

Introduction

This general introduction to the ISO 2859 acceptance sampling series describes the attribute sampling schemes and plans set forth in ISO 2859-1, ISO 2859-2, ISO 2859-3, ISO 2859-4 and ISO 2859-5. This introduction treats the subject of sampling inspection by attributes in a general way, introducing the essential operating procedures and the ways in which the systems were designed to be used. To understand fully the concepts and their applications, it is necessary to consult ISO 2859-1, ISO 2859-2, ISO 2859-3, ISO 2859-4, ISO 2859-5 and ISO/TR 8550-1.

The individual parts of this series of international standards extend this introductory explanation to more specific applications that are appropriate for the particular standard.

It is emphasized that ISO 2859-1 provides sampling schemes indexed by acceptance quality limit (AQL). The quality measure used can be percent nonconforming or the number of nonconformities per 100 items. ISO 2859-1 was developed primarily for the inspection of a continuing series of lots all originating from the same production or servicing process. In this situation, adequate protection (or the maximum process average percent nonconforming) is maintained by use of the switching rule from normal to tightened inspection should a certain (limiting) number of unacceptable lots be found in a short series of successive lots.

ISO 2859-2 provides sampling plans applicable for use when individual or isolated lots are to be sampled. These sampling plans are in many instances identical to those in ISO 2859-1. All the tables of sampling plans in ISO 2859-2 include information regarding the quality level required to assure a high probability of lot acceptance.

ISO 2859-3 provides skip-lot procedures for use when the process quality is markedly superior to the AQL for a defined long period of delivery or observation. When the quality level is in this state of excellence, it is sometimes more economical to use ISO 2859-3 than to use the reduced sampling procedure of ISO 2859-1. Like ISO 2859-1, ISO 2859-3 is applicable to a continuing series of lots from a single source.

ISO 2859-4 provides a procedure that may be used to verify a quality level that has been declared for some entity. This function is not appropriate for the other parts of the series. The main reason for this is that those procedures have been indexed in terms of quality levels that are relevant solely for the purpose of acceptance sampling, and the various risks have been balanced appropriately. The procedures in ISO 2859-4 have been developed in response to the need for sampling procedures suitable for formal, systematic inspections such as reviews or audits.

ISO 2859-5 provides a method of establishing sequential sampling plans of discriminatory power essentially equivalent to that of corresponding plans of ISO 2859-1.

A complementary system of sampling plans for inspection by variables, also indexed by AQL, is provided by the ISO 3951 series, *Sampling procedures for inspection by variables*.

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Sampling procedures for inspection by attributes —

Part 10:

Introduction to the ISO 2859 series of standards for sampling for inspection by attributes

1 Scope

This part of ISO 2859 provides a general introduction to acceptance sampling by attributes and provides a brief summary of the attribute sampling schemes and plans used in ISO 2859-1, ISO 2859-2, ISO 2859-3, ISO 2859-4 and ISO 2859-5, which describe specific types of attribute sampling systems. It also provides guidance on the selection of the appropriate inspection system for use in a particular situation.

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 2859-1:1999, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 2859-2:1985, *Sampling procedures for inspection by attributes — Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection*

ISO 2859-3, *Sampling procedures for inspection by attributes — Part 3: Skip-lot sampling procedures*

ISO 2859-4:2002, *Sampling procedures for inspection by attributes — Part 4: Procedures for assessment of declared quality levels*

ISO 2859-5:2005, *Sampling procedures for inspection by attributes — Part 5: System of sequential sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3534-1, *Statistics — Vocabulary and symbols — Part 1: Probability and general statistical terms*

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

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 2859-1, ISO 2859-2, ISO 2859-3, ISO 2859-4, ISO 2859-5, ISO 3534-1 and ISO 3534-2 apply.

4 General introduction to acceptance inspection

4.1 Aim of sampling inspection

The principal purpose of acceptance sampling inspection is to see that the producer submits lots of a quality that is at, or better than, a mutually agreed level. All ISO 2859 series standards are based on a common parameter, e.g. AQL or LQ.

The producer may use these sampling procedures to ensure that the quality level will be acceptable to the consumer. In all these procedures, it must be recognized that the financial resources are not unlimited. The cost of the item should reflect the cost of inspection as well as the cost of production.

A real effort shall be made to ensure that a system is devised that clearly places responsibility for quality with the producer. Inspection can appear to divert the responsibility for quality from the producer to the inspector. This may happen whenever there is a belief that the inspector is there to sort things out, so that, within limits, what happens in production will be caught by inspection. Sampling inspection has little effect on the quality of the product lot or batch.

Sampling schemes and plans designated in the ISO 2859 series are applicable, but not limited, to inspection of

- end items,
- components and raw materials,
- operations,
- materials in process,
- supplies in storage,
- maintenance operations,
- data or records, and
- administrative procedures.

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4.2 Acceptance sampling

Acceptance sampling inspection has the merit of putting the responsibility for quality where it belongs, with the producer. The inspector is no longer regarded as the person who corrects errors. The producer must see that the product is of high quality, otherwise there will be inconvenience and expense with unacceptable lots. Sampling inspection can and should lead to less inspection work, lower cost and good quality for the consumer.

The sampling inspection schemes of ISO 2859-1, ISO 2859-2, ISO 2859-3 and ISO 2859-5 provide for quantification of the risk of accepting unsatisfactory product (known as the consumer's risk) and the risk of not accepting satisfactory product (known as the producer's risk), and for choosing a plan that allows no more risk than is acceptable.

4.3 Other inspection practices

4.3.1 General

In addition to the sampling plans of ISO 2859-1, ISO 2859-2, ISO 2859-3, ISO 2859-4 and ISO 2859-5, which are based on the mathematical theory of probability, there are other inspection practices, for example:

- a) sampling based on experience with the product, the process, the supplier and the consumer (see 4.3.2);
- b) ad hoc sampling, for example the inspection of a fixed percentage, or occasional random checks (see 4.3.3);
- c) 100 % inspection (see 4.3.4);
- d) other "sampling" practices (see 4.3.5).

4.3.2 Statistical sampling

Sampling based on experience with the product, the process, the producer and the consumer can be statistically evaluated, provided that random sampling and a predefined set of rules for varying sample size and sampling frequency are used.

An example is the procedure described in ISO 2859-1, which uses a set of switching rules. When the quality is very good, it is possible to switch to reduced inspection. This provides a procedure where, if smaller samples are used, the producer's risk is reduced but the consumer's risk is increased. If the process average is consistently smaller than the specified acceptance quality limit (AQL), this is justified. When the process average over at least 10 lots has been very much smaller than the AQL, some consumers resort to skip-lot procedures (see ISO 2859-3). This can be even more economical than the reduced inspection described in ISO 2859-1.

In some instances, particularly when routine or non-critical items are involved, some consumers may feel safe in resorting to the practice of inspecting small samples of the product and, provided there are zero nonconforming items, accepting the lot. For example, a sample size of eight with an acceptance number of zero is equivalent to the small lot sampling plans with an AQL of 1,5 % normal, or 0,65 % reduced inspection. See Tables 2-A and 2-C in ISO 2859-1:1999.

Conversely, in ISO 2859-1, when two out of five or fewer successive lots fail inspection, normal inspection is discontinued and tightened inspection is instituted. Once tightened inspection has been instituted, normal inspection is not restored until five successive lots have been accepted on tightened inspection. This requirement is intentionally severe, because evidence of unacceptable quality has been found, as a result of which, the producer forfeits the right to the benefit of the doubt. If, while operating on tightened inspection, the cumulative number of lots not accepted on original tightened inspection reaches five, inspection by sampling shall be discontinued until there is evidence that corrective action has been taken and has been fully effective.

4.3.3 Ad hoc sampling

Ad hoc sampling should not be used because it will lead to unknown risks that may be too high. Furthermore, there is no formal basis for either the acceptance or non-acceptance of the lot. Examples of ad hoc sampling include sampling of a fixed percentage of a lot or a convenience sample taken at haphazard times.

4.3.4 100 % inspection

100 % inspection can be a formidable task unless it is performed with automatic test equipment, or lot sizes are small. In addition, it is not always fully effective, particularly when a large number of items have one or more characteristics that are marginal in appearance, performance or dimension (close to or concentrated about a tolerance or limit of appearance or performance). Sampling inspection may be done with more care and is less prone to the effects of human fatigue. Under these conditions, sorting by manual or automatic methods is likely to classify some conforming items as nonconforming and vice versa. In addition, 100 % inspection can sometimes degenerate into superficial 100 % inspection when, in fact, sufficient money, time and staff are not available. In addition, 100 % inspection is not viable if the inspection method necessitates destruction of the product. It has to be understood, however, that 100 % inspection may form a necessary part of the inspection process for both the consumer and the producer, or a rejected lot must be screened to remove nonconforming product. There are situations in which it cannot be avoided, for example, when inspecting for critical nonconformities that are so important that every item must be examined when inspections are non-destructive. When inspection is destructive, some risks are inevitable.