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ISO 28598-2

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Acceptance sampling procedures based on the allocation of priorities principle (APP) —

Part 2: Coordinated single sampling plans for acceptance sampling by attributes

Règles d'échantillonnage pour acceptation fondées sur le principe d'attribution de priorités (APP) —

Partie 2: Plans d'échantillonnage simple coordonnés pour l'échantillonnage pour acceptation par attributs

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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.

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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

This first edition of ISO 28598-2 cancels and replaces ISO 13448-2:2004, of which it constitutes a minor revision to change the reference number from 13448-2 to 28598-2.

With the view to achieve a more consistent portfolio, TC 69/SC 5 has simultaneously renumbered the following standards, by means of minor revisions:

Old reference	New reference	Title
ISO 2859-10:2006	ISO 28590:2017	Sampling procedures for inspection by attributes — Introduction to the ISO 2859 series of standards for sampling for inspection by attributes
ISO 8422:2006	ISO 28591:2017	Sequential sampling plans for inspection by attributes
ISO 28801:2011	ISO 28592:2017	Double sampling plans by attributes with minimal sample sizes, indexed by producer's risk quality (PRQ) and consumer's risk quality (CRQ)
ISO 18414:2006	ISO 28593:2017	Acceptance sampling procedures by attributes — Accept-zero sampling system based on credit principle for controlling outgoing quality
ISO 21247:2005	ISO 28594:2017	Combined accept-zero sampling systems and process control procedures for product acceptance

ISO 14560:2004	ISO 28597:2017	Acceptance sampling procedures by attributes — Specified quality levels in nonconforming items per million
ISO 13448-1:2005	ISO 28598-1:2017	Acceptance sampling procedures based on the allocation of priorities principle (APP) — Part 1: Guidelines for the APP approach
ISO 13448-2:2004	ISO 28598-2:2017	Acceptance sampling procedures based on the allocation of priorities principle (APP) — Part 2: Coordinated single sampling plans for acceptance sampling by attributes

Cross references between the above listed documents have been corrected in the minor revisions.

A list of all documents in the new ISO 28590 - ISO 28599 series of International Standards can be found on the ISO website.

Introduction

This part of ISO 28598 provides single sampling plans for inspection of lots by attributes. All subjective and objective information of the supplier's capability to provide the desired quality, including any certification of its quality management system to ISO 9001 or an equivalent standard, may be taken into account by the customer or a third party when deciding on his sampling plan, thus allowing smaller sample sizes when the information is favourable.

This part of ISO 28598 is applicable also in the case where successive sample inspections are performed on the same lot by different parties (i.e. producer, customer and/or a third party), allowing each party independence of choice of sampling plan, needing only to coordinate their sampling plans with specific requirements such as customer's or producer's risks. This feature enables each party to organise inspection in accordance with its own resources and significantly reduces the chance of different parties obtaining conflicting results due to sampling variability.

Acceptance sampling procedures based on the allocation of priorities principle (APP) —

Part 2: Coordinated single sampling plans for acceptance sampling by attributes

1 Scope

This part of ISO 28598 provides attributes sampling procedures and single sampling plans for successive independent inspections of the same lot conducted by the supplier, customer and/or a third party.

This part of ISO 28598 addresses:

— supplier inspection (final inspection, product certification upon supplier's request);

— customer inspection (incoming inspection, surveillance, acceptance sampling);

— third party inspection.

This part of ISO 28598 may also be applicable when only one inspection is needed.

A catalogue of single sampling plans is given, indexed by the normative quality limits (NQLs).

This part of ISO 28598 provides sampling procedures for:

— finished product;

— components and discrete items;

— operations;

— discrete items and the processes that produce them;

— data and records.

Attributes sampling procedures are provided for inspection of an isolated lot or a continuing series of lots of a discrete product. These procedures are applicable when a normative quality limit (NQL) is given and expressed in terms of percent nonconforming or nonconformities per 100 items.

This part of ISO 28598 provides a co-ordinated system of supplier, customer and third party acceptance sampling procedures. It is also applicable to the case where a supplier individually, or on agreement with a customer, in a contract, specifies a lot quality criterion expressed in terms of an NQL. In either case, it provides a coherent methodology for designating lots as satisfactory or unsatisfactory for shipment and proposed use.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 2859-2, *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 3534-2, *Statistics — Vocabulary and symbols — Part 2: Applied statistics*

ISO 7870-2:2013, *Control charts — Part 2: Shewhart control charts*

ISO 28591:2017, *Sequential sampling plans for inspection by attributes*

ISO 9000:2015, *Quality management systems — Fundamentals and vocabulary*

ISO 28598-1, *Acceptance sampling procedures based on the allocation of priorities principle (APP) — Part 1: Guidelines for the APP approach*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3534-2, ISO 9000:2015, ISO 28598-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
normative quality limit
NQL
limiting value of the lot quality level specified for the purpose of acceptance as a guaranteed lot quality level

Note 1 to entry: A limiting quality (LQ) may also be considered to be a guaranteed lot quality level although in that case the guarantee is assured only by a sampling plan that has a low probability of acceptance when the lot is of the limiting quality (LQ). Normally it requires large sample sizes. A specified NQL should be considered as a lot quality level guaranteed in part by a sampling plan and in part through supplementary evidence supporting the supplier's capability to satisfy the specified requirements. A sampling plan for LQ is utilized in the case of prior distrust in the lot quality. A sampling plan for a NQL depends on the level of trust in the lot quality and encourages a supplier to submit evidence other than the inspection data in support of the declared quality. In a variety of situations, it allows a considerable decrease in the cost of inspection for both the supplier and the customer.

3.1.2
satisfactory lot
lot for which the actual quality level is no worse than the specified NQL

3.1.3
unsatisfactory lot
lot for which the actual quality level is worse than the specified NQL

3.1.4
customer's risk on supplier inspection
β_0
for an acceptance sampling plan fixed by the supplier, the maximum probability of classifying a lot as satisfactory when the actual lot quality level is worse than the specified NQL

3.1.5
supplier's risk on customer inspection
α_0
for an acceptance sampling plan fixed by the customer, the maximum probability of classifying a lot as unsatisfactory when the actual lot quality level is no worse than the specified NQL

3.1.6
arbitration situation
situation which arises due solely to sampling variation when a customer rejects the lot which was previously accepted by the supplier on supplier inspection with the same quality level

3.1.7
arbitration characteristic curve
probability that a lot with a specific quality level will be classified as satisfactory by the sampling plan used by the supplier and as unsatisfactory by the sampling plan used by the customer

3.1.8
inspecting party
any party which organizes and conducts sampling inspection of the lot for the purpose of acceptance

Note 1 to entry: An inspecting party may be the supplier, the customer, or a third party.

3.1.9
trust level
form of a customer's estimate of the weight of prior, supplementary and indirect evidence of the supplier's capabilities to fulfil the specified quality requirements

3.1.10
supplier
organization or person that provides a product

3.1.11
customer
organization or person that receives a product

3.2 Symbols and abbreviations

Ac	acceptance number
n	sample size
N	lot size
NQL	normative quality limit
p chart	Shewhart control chart for percent nonconforming
Re	rejection number
T1 to T7	trust levels
u chart	Shewhart control chart for number of nonconformities per item
UCL	upper control limit introduced in Shewhart control charting
α_0	supplier's risk on customer inspection
β_0	customer's risk on supplier inspection
γ_0	confidence level on supplier inspection

4 Selection from among sampling systems by attributes

4.1 Relationship between sampling systems

An acceptance sampling system of this part of ISO 28598 is supplementary to ISO 2859-1, ISO 2859-2, ISO 2859-3 and ISO 28591. Refer to the guidelines given in 4.2 to 4.4 for the most suitable selection from these International Standards.

4.2 Suitable environments for applying ISO 28598-2

An ISO 28598-2 sampling system may be applicable when the following conditions are satisfied:

a) an inspection of the same lot is initially conducted by the supplier on final inspection, and then by the customer on incoming inspection (occasionally by a third party);

b) a long-term relationship between the supplier and the customer exists or is anticipated;

c) prior information is available about the supplier's capability to meet, or not to meet, the specified requirements;

d) a supplier's responsibility for a quality guarantee, involving a sampling inspection, has been agreed upon in the contract;

e) both parties are interested in making the inspection procedure more cost-effective.

Under these conditions, the use of ISO 28598-2 may be profitable. As quality improves, the inspection cost may be significantly reduced in one of two ways:

— by reducing the sample size for customer incoming inspection up to the point when an inspection may be abandoned altogether;

— by reducing the sample size for supplier final inspection to the extent that the customer may sanction shipment of the lot without final supplier inspection.

Information on the effectiveness of the quality system, the statistical process control methods being used, the preventative actions being undertaken and any other relevant information may be considered by the customer in determining an appropriate lot quality guarantee and for specifying the degree of severity of supplier lot quality inspection to be performed.

4.3 Suitable environments for applying ISO 2859-1, ISO 2859-3 and ISO 28591

Use of ISO 2859-1, ISO 2859-3 and ISO 28591 sampling systems is beneficial in the following situations:

a) sampling inspection is conducted by a single party only (normally by the customer);

b) a continuing series of lots from a long-run production is considered;

c) lots are inspected in the same sequence as they are produced.

The switching rules outlined in ISO 2859-1, ISO 2859-3 and ISO 28591 may give the supplier an incentive for improving the quality level, while the purchaser may expect tolerable protection.

4.4 Suitable environments for applying ISO 2859-2

Use of an ISO 2859-2 sampling plan is advantageous when

a) acceptance sampling is conducted by a single party only (normally by the supplier);

b) a unique or isolated lot is inspected;

c) there is no relevant prior information on the supplier's capabilities to meet quality requirements in preparing an inspection;

d) there is no long-term partnership between the supplier and the customer;

e) large sample sizes are practicable.

Under these conditions ISO 2859-2 is reasonably supportive for the customer.

5 Lot quality

5.1 Lot quality measures

For the purpose of this part of ISO 28598, a lot quality level is described in terms of either percent nonconforming or nonconformities per 100 items.

5.2 Satisfactory and unsatisfactory lots

For the purpose of this part of ISO 28598, in concluding a contract, the supplier and the customer should agree and specify an associated normative quality limit NQL from among the preferred levels. It is regarded as a guaranteed value for the actual quality level of an isolated lot, or separate lot in a sequence.

This part of ISO 28598 cannot be used prior to the selection of an appropriate NQL.

5.3 Types of requirements

For the purposes of this part of ISO 28598, the normative quality limit NQL should be expressed in terms of either percent nonconforming or number of nonconformities per 100 items.

5.4 Preferred NQLs

The NQLs presented in the tables of this part of ISO 28598 are preferred values. For any other values of NQL, this part of ISO 28598 does not apply. Small values of the NQL are incompatible with small lot sizes. If in any doubt, it is advisable to refer to Table 1 before designating an NQL value for the given lot size.

In cases when Table 1 suggests NQL values that may be far too large and unsuitable for a particular situation, shifting to smaller NQL values may lead to a requirement of zero nonconforming items or nonconformities in a lot, which are equivalent requirements. This corresponds to setting the NQL to zero (see Clause 12).

5.5 Disposition of unsatisfactory lots

A customer is normally concerned with the quality of the lot as an integrated whole. A nonconforming item should be regarded as a loss to the customer to be compensated in some way. However, when a critical number of these items have been found, an additional loss can be imposed on the supplier. This can be illustrated by the common situation where the product supplied is to be used in the customer's production process. The designation of an NQL does not imply that a supplier may knowingly ship nonconforming items. Nevertheless, no lot that is usable for its intended application may be rejected. A customer should not submit a claim for a whole unsatisfactory lot if a supplier is prepared to replace, or repair, nonconforming items and compensate for the customer's inconvenience, unless the proportion of nonconforming items in the lot is so excessive that there is a further consequential loss to the customer.

6 Limits for other party's risk

6.1 Supplier's sampling plans

6.1.1 Assignment of a customer's risk on supplier inspection

For contractual and long-term practical use, a limit for the customer's risk on supplier inspection should be assigned.

NOTE A customer's risk on supplier inspection does not correspond to the actual customer's risk. A customer's risk is a limit for the probability of acceptance on supplier sampling inspection given that an unsatisfactory lot is being supplied. An actual customer's risk denotes the probability both that the lot to be supplied is unsatisfactory and that it is accepted on supplier final inspection.

When a customer's estimate of the probability of an unsatisfactory lot being produced is relatively small, a stringent restriction for the probability of accepting this lot (a customer's risk on supplier inspection β_0) is inappropriate for it leads to unnecessarily large samples and inspection costs on supplier inspection. This in turn leads to increases in production costs and prices. A customer should request the supplier to produce convincing indirect evidence of his capacity to manufacture the required quality. The more convincing this evidence is, the more relaxed the limitation on the customer's risk on supplier inspection that may be set.

Therefore, if the probability of manufacturing an unsatisfactory lot is small, the actual customer's risk will not be great either, even with large values of a customer's risk on supplier inspection (see ISO 28598-1).

In the ISO 28598 sampling system, when estimating the probability of producing an unsatisfactory lot and designating a customer's risk on supplier inspection, all available measures concerning the supplier's capabilities to meet the requirements should be taken into account.

6.1.2 Trust levels

This part of ISO 28598 provides trust levels in accordance with which the customer may qualify his appraisal of the supplier's capabilities and designate a preferred value β_0 of the customer's risk on supplier inspection (see the recommended criteria for assigning an appropriate trust level, provided in Table 2).

The mere fact that a supplier meets the requirements set out in Table 2 does not automatically imply product compliance. Therefore, for the purposes of implementing this part of ISO 28598, the customer should assign an appropriate trust level depending on all prior information available.

Under appropriate conditions, the quality information from previous lots may be used to modify a trust level and, as a result, shift to another sampling inspection plan.

6.1.3 Supplementary trust levels

In some cases, for instance on acceptance sampling for important safety parameters, a sampling plan on supplier inspection for β_0 falling between 0,1 and 0 may be required. Then tables given in other ISO standards apply.

6.2 Customer's sampling plans

The risk α_0 of rejecting a satisfactory lot on customer's inspection and submitting an unjust claim to the supplier, compelling the supplier to provide compensation for an unsatisfactory lot, should be limited. In this part of ISO 28598, the supplier's risk on customer inspection α_0 is fixed at 0,05.