INTERNATIONAL STANDARD

ISO 28598-2

First edition
2017-10

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

Reference number
ISO 28598-2:2017(E)

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

Contents

Page

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.

Table 1 — Relation of lot size to NQL

Lot size	Normative quality limit (NQL) [a] % or number of nonconformities per 100 items													
	0,15	0,25	0,4	0,65	1,0	1,5	2,5	4,0	6,5	10,0	15	25	40	⩾ 65
2														∇
3													∇	∇
4 to 6												∇	∇	∇
7 to 9											∇	∇	∇	∇
10 to 15										∇	∇	∇	∇	∇
16 to 24									∇	∇	∇	∇	∇	∇
25 to 39								∇	∇	∇	∇	∇	∇	∇
40 to 66							∇	∇	∇	∇	∇	∇	∇	∇
67 to 99						∇	∇	∇	∇	∇	∇	∇	∇	∇
100 to 153					∇	∇	∇	∇	∇	∇	∇	∇	∇	∇
154 to 249				∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇
250 to 399			∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇
400 to 666		∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇
> 667	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇	∇

[a] ∇ means that the NQL is available for the given range of lot sizes.

Table 2 — Table for seven levels of trust in prior information about the supplier's capabilities to meet specified requirements

Trust level in supplier's capabilities	Customer's risk and confidence level on supplier inspection
T7 Full (absolute) trust in the supplier's capabilities Corresponds to availability of a supplier's certificate for his quality system in compliance with ISO 9001, national or international quality awards, a tested manufacturing model, unimpeachable reputation of the supplier, presence of "quality history" confirming supplier's ability to ensure the customer's quality requirements, implementation of statistical process control and/or long-term period of lot shipment without claims, supplier's devotion to TQM, etc.	$\beta_0 = 1$; $\gamma_0 = 0$ (shipment of finished product without supplier inspection)
T6 High level of trust in the supplier's capabilities Corresponds to availability of a supplier's certificate for his quality system in compliance with ISO 9001, national or international quality awards, implementation of statistical process control and positive experience obtained from long-term orders, partial supplier's involvement in TQM activities	$\beta_0 = 0{,}9$; $\gamma_0 = 0{,}1$
T5 Average level of trust in the supplier's capabilities Corresponds to the availability of a supplier's certificate for the quality system in compliance with ISO 9001; implementation of statistical process control, long-term shipment of acceptable products	$\beta_0 = 0{,}75$; $\gamma_0 = 0{,}25$
[a] Special level T1 means resorting to 100 % inspection. Its implementation should be stipulated in relevant documents in cases when especially important parameters are inspected and when there is no information or unfavourable information on supplier's capabilities to ensure required quality. Switching to T1 shall not be carried out by the customer unilaterally, but only on the basis of a bilateral agreement. With the permission of the responsible authority. One may move up or down one trust level from the selected trust level to take into account the importance of the items being inspected.	

Table 2 *(continued)*

Trust level in supplier's capabilities	Customer's risk and confidence level on supplier inspection
T4 Neutral (indifferent) attitude to the supplier's capabilities Corresponds to a lack of a certified quality assurance system but the following redeeming factors are taken into consideration: long-term shipment of lots of satisfactory quality, quality system assessment by the customer, partial implementation of statistical process control	$\beta_0 = 0{,}5$; $\gamma_0 = 0{,}5$
T3 Uncertain supplier's capabilities Corresponds to the lack of a certificate for the quality system and customer's experience of orders from the supplier, the absence of statistical quality control, but indirect positive data from other customers or customer communities	$\beta_0 = 0{,}25$; $\gamma_0 = 0{,}75$
T2 Unknown supplier's capabilities Corresponds to the lack of any reliable information about the supplier's capacity to ensure the required quality	$\beta_0 = 0{,}1$; $\gamma_0 = 0{,}9$
T1 Special level [a] Corresponds to especially important safety and ecology parameters of products and the lack of prior information on the supplier ‘s capabilities	$\beta_0 = 0$; $\gamma_0 = 1$ (requiring 100 % inspection prior to shipment)
[a] Special level T1 means resorting to 100 % inspection. Its implementation should be stipulated in relevant documents in cases when especially important parameters are inspected and when there is no information or unfavourable information on supplier's capabilities to ensure required quality. Switching to T1 shall not be carried out by the customer unilaterally, but only on the basis of a bilateral agreement. With the permission of the responsible authority. One may move up or down one trust level from the selected trust level to take into account the importance of the items being inspected.	

6.3 Permissible sampling plans

Any sampling plan with a probability no greater than β_0 (specified by the customer) of accepting a lot with a quality level worse than the NQL should be qualified as permissible on supplier inspection.

Any sampling plan with a probability no greater than α_0 (specified in this part of ISO 28598 as 0,05) of rejecting a lot with a quality level no worse than the NQL should be qualified as permissible on customer inspection.

For the purpose of acceptance, and regarding the provisions set out in this part of ISO 28598, an inspecting party should only adopt permissible plans.

6.4 Coordination of supplier's and customer's sampling plans

The sampling plans, satisfying 6.3 and distinct for both of the parties, should be made consistent with an NQL specified in a contract.

Coordinated plans will greatly reduce the chance of the supplier and the customer reaching different decisions on the acceptability of the same lot as a result of sampling variation (see ISO 28598-1).

6.5 Rule of the third party inspection

A third party should follow a permissible sampling procedure (either supplier or customer in accordance with 6.3) depending on whose interest it represents.

7 Inspecting party's risk

7.1 Supplier's sampling plans

Due to sampling variation, there is a possibility that the supplier will erroneously reject a satisfactory lot (i.e. one having a quality level that is better than the NQL) on supplier's inspection. This part of ISO 28598 enables a supplier to choose from among plans with supplier's risk on supplier inspection lower than 0,05.

7.2 Customer's sampling plans

Due to sampling variation, there is a possibility that the customer will erroneously accept an unsatisfactory lot (i.e. one having a quality level that is worse than the NQL) on customer's inspection.

As this decision is only concerned with customer's interests, the customer is entitled to limit the customer's risk on customer inspection in establishing a relevant plan or customer's risk quality (CRQ) for a fixed customer's risk on customer inspection.

8 Basic data

8.1 Supplier's sampling plans

The following data should be considered in establishing a sampling plan:

a) NQL;

b) trust level;

c) lot size;

d) supplier's estimate of the lot quality level based on the supplier's inspection of an isolated lot, or process quality level from a sequence of lots.

A lot size may be specified by the responsible authority without reference to the constraints imposed by this part of ISO 28598.

8.2 Customer's sampling plans

The following data are to be considered when establishing a sampling plan:

a) NQL;

b) lot size.

Unless otherwise specified, on customer inspection, a submitted lot should be treated as an integrated whole and should not be subdivided into parts for sampling purposes.

9 Catalogue of permissible sampling plans

9.1 Composition of tables

The numbering of the tables of permissible sampling plans is given in Table 3.

Table 3 — Numbering of tables of permissible sampling plans

Type of lot quality level	Lot size	Numbering of supplier's tables associated with the relevant trust levels					Numbering of customer's tables
		T2	T3	T4	T5	T6	
Percent nonconforming	⩽ 25	A.1	A.2	A.17	A.18	A.19	A.25
	26 to 50	A.3	A.4				A.26
	51 to 90	A.5	A.6				A.27
	91 to 150	A.7	A.8				A.28
	151 to 280	A.9	A.10				A.29
	281 to 500	A.11	A.12				A.30
	501 to 1 200	A.13	A.14				A.31
	> 1 200	A.15	A.16				A.32
Nonconformities per 100 items	any lot size	A.20	A.21	A.22	A.23	A.24	A.33

Tables A.1 to A.33 are provided in Annex A.

Examples of using the tables are given in Annex B.

The theoretical basis is presented in Annex C.

9.2 Tables for supplier permissible single sampling plans

9.2.1 Description of supplier single sampling tables

The tables are classified by trust levels T2 to T6 (omitting T1 for $\beta_0 = 0$ and T7 for $\beta_0 = 1$).

The leftmost column in Tables A.1 to A.16 and Tables A.20 to A.24 shows the intervals for the estimate of the incoming quality level. It is expressed in terms of either percent nonconforming or nonconformities per 100 items. It is used in choosing a supplier's preferred plan from among the permissible plans.

The remaining columns are indexed by the NQL expressed in terms of either percent nonconforming or nonconformities per 100 items.

NOTE For the upper limits of the intervals the probability of acceptance is at least 0,95.

Sampling plans with acceptance number zero are given in Tables A.17 to A.19 for trust levels T4 to T6, respectively, and for NQLs expressed in terms of percent nonconforming.

9.2.2 Tables for percent nonconforming

The tables are indexed by the following ranges of lot size:

— up to 25 (⩽ 25);

— 26 to 50;

— 51 to 90;

— 91 to 150;

— 151 to 280;

— 281 to 500;

— 501 to 1 200;

— over 1 200 (> 1 200) items.

9.2.3 Tables for nonconformities per 100 items

Tables indexed by the NQL expressed in terms of nonconformities per 100 items may be used for any lot size.

9.2.4 Table entries

The tables provide the parameters of single sampling plans: the upper figure is the acceptance number and the lower figure is the sample size.

9.3 Tables for customer permissible single sampling plans

Tables A.25 to A.33 provide single sampling plans for supplier's risk on customer inspection, α_0, equal to 0,05, together with the following ranges of lot size:

— up to 25 ($\leqslant$ 25);

— 26 to 50;

— 51 to 90;

— 91 to 150;

— 151 to 280;

— 281 to 500;

— 501 to 1 200;

— over 1 200 (> 1 200) items

for NQLs expressed in terms of percent nonconforming, and any lot sizes for NQLs expressed in terms of nonconformities per 100 items.

The leftmost column displays the rejection numbers. The customer enters these tables with a rejection number, which is regarded as the customer's rejection criterion. Each of the tables provides a range of permissible sample sizes (top entry in each cell) for these combinations of rejection number and NQL. If the bottom line of the cell contains a number in parentheses, and the lot size does not exceed this number, then the lot may be rejected if the number of nonconforming items or nonconformities reaches or exceeds the rejection number for any sample size.

See also the footnotes to Tables A.25 to A.33.

10 Choosing supplier's single sampling plans

10.1 Rules for choosing permissible single sampling plans

The supplier should choose a table taking into consideration the lot size, trust level and type of NQL (as expressed either in terms of percent nonconforming, or nonconformities per 100 items). Permissible plans are provided in the columns displaying specified NQLs.

The tables for trust levels T2 and T3 include a few permissible plans. A supplier may use any of them without agreement between the parties (see 10.2).

It should be noted that all sample sizes greater than those in tabulated plans are permissible for the tabulated acceptance number on supplier inspection.

10.2 Recommendations on selecting a preferred plan from those permissible for T2 and T3 trust levels

10.2.1 Known estimate of a lot quality level

If an estimate of an actual lot quality level is available, the supplier should choose an interval of nonconformity corresponding to this value. The recommended plan will be found at the intersection of the relevant row and column for a specified NQL.

If the actual lot quality level is equal to the upper limit of the interval of nonconformity, the acceptance probability of the lot will be at least 0,95. As the quality level improves towards the lower limit of the interval, this probability increases.

If the prior estimate of the lot quality level changes so that it lies in another interval, the plan should be revised.

10.2.2 Known standard or estimate of a process quality level

If only a standard or estimated stable process quality level is available, the supplier should choose an interval of nonconformity to include the value of the upper control limit (UCL) provided in a Shewhart control chart (*p*- or *u*-chart respectively). If the process is in a state of statistical control then practically all lots under consideration will have a quality level no greater than the UCL. In this case, a preferred sampling plan, selected from the interval of nonconformity that includes the UCL, will provide a probability of acceptance in excess of 0,95 for each lot under consideration.

The plans for calculating the UCL are specified in ISO 7870-2.

11 Choosing customer's single sampling plans

11.1 General recommendations

For the purpose of this part of ISO 28598, the determination of a sample size for customer inspection is not a formal mathematical problem.

A customer may perform an inspection of any number of items in the lot up to 100 % inspection. However, if the customer assigns a trust level from T4 to T7 on supplier inspection, then a customer inspection need not necessarily be required and can be cancelled since quality is assured by other information on the supplier's capabilities to meet specified requirements.

In other circumstances, the customer can determine any sample size on the basis of the time and other resources necessary for an appropriate sampling procedure, the availability of inspection staff or other reasons. If this is the case, an associated rejection number should be found using customer's sampling tables (see 11.2).

11.2 Use of customer's sampling tables for known sample size

If the customer has prior technical or other considerations for fixing a suitable sample size, the corresponding rejection number may be found in the tables in this part of ISO 28598.

For this purpose, from the rightmost column of Table 3, determine the customer sampling table corresponding to the lot size and the lot quality measure. Turning to this table in Annex A, find the column indexed by the NQL. In this column, find the sample size range (given at the top of each cell) that includes the fixed sample size. The appropriate rejection number is given in the leftmost cell in this row of the table.

It should be noted that any sample size that is in the indicated sample size range will also be permissible for the obtained rejection number. For a fixed rejection number, the probability of rejection

of unsatisfactory lots increases as the sample size is increased, i.e. the customer's plans become more stringent.

If the sample size fixed by the customer is not in the table, either a smaller sample size, or 100 % inspection, should be invoked. See also the footnotes to the tables in Annex A.

12 Sampling inspection for NQL = 0

A sampling inspection for NQL = 0 should be performed according to Table 4.

Table 4 — Sampling plans for NQL = 0

Lot size	Supplier inspection		Customer inspection	
	Sample size	Acceptance number	Sample size	Rejection number
N	At least $N(1 - \beta_0)$ items rounded up to the next integer	0	Any sample size	1

Annex A
(normative)

Tables for acceptance single sampling plans by attributes

Table A.1 — Supplier's permissible sampling plans for percent nonconforming: Lot size up to 25 (≤ 25) items and trust level T2

Interval of nonconformity	Normative quality limit (NQL) [a] [b] %	
	4,0; 6,5	**10**
0,0 to 2,5	0 17	0 14
2,5 to 4,0	#	#
4,0 to 6,5	#	#
6,5 to 10		#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

Table A.2 — Supplier's permissible sampling plans for percent nonconforming: Lot size up to 25 (≤ 25) items and trust level T3

Interval of nonconformity	Normative quality limit (NQL) [a] [b] %	
	4,0; 6,5	**10**
0,0 to 2,5	0 13	0 10
2,5 to 4,0	#	#
4,0 to 6,5	#	#
6,5 to 10		#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

Table A.3 — Supplier's permissible sampling plans for percent nonconforming: Lot size 26 to 50 items and trust level T2

Interval of nonconformity	Normative quality limit (NQL) [a] [b] %		
	2,5; 4,0	6,5	10
0,0 to 1,5	#	0 25	0 18
1,5 to 2,5	#	#	#
2,5 to 4,0	#	#	#
4,0 to 6,5		#	#
6,5 to 10			#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

Table A.4 — Supplier's permissible sampling plans for percent nonconforming: Lot size 26 to 50 items and trust level T3

Interval of nonconformity	Normative quality limit (NQL) [a] [b] %			
	2,5	4,0	6,5	10
0,0 to 1,5	#	0 25	0 17	0 12
1,5 to 2,5	#	#	#	1 23
2,5 to 4,0		#	#	#
4,0 to 6,5			#	#
6,5 to 10				#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

Table A.5 — Supplier's permissible sampling plans for percent nonconforming: Lot size 51 to 90 items and trust level T2

Interval of nonconformity	Normative quality limit (NQL) [a] [b] %			
	1,5; 2,5	4,0	6,5	10
0,0 to 1,0	#	0 40	0 28	0 20
1,0 to 1,5	#	#	1 46	1 33
1,5 to 2,5	#	#	#	2 44
2,5 to 4,0		#	#	#
4,0 to 6,5			#	#
6,5 to 10				#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

Table A.6 — Supplier's permissible sampling plans for percent nonconforming: Lot size 51 to 90 items and trust level T3

Interval of nonconformity	Normative quality limit (NQL) [a] [b] %				
	1,5	2,5	4,0	6,5	10
0,0 to 1,0	0 50	0 40	0 28	0 19	0 13
1,0 to 1,5	#	#	1 51	1 35	1 24
1,5 to 2,5		#	#	2 50	2 35
2,5 to 4,0			#	#	3 45
4,0 to 6,5				#	#
6,5 to 10					#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

Table A.7 — Supplier's permissible sampling plans for percent nonconforming: Lot size 91 to 150 items and trust level T2

Interval of nonconformity	Normative quality limit (NQL) [a b c] %					
	1,0	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,0 to 0,65	#	0 91	0 65	0 48	0 31	0 21
0,65 to 1,0	#	#	#	1 76	1 50	1 35
1,0 to 1,5		#	#	#	2 67	↓
1,5 to 2,5			#	#	3 82	2 47
2,5 to 4,0				#	#	5 79
4,0 to 6,5					#	#
6,5 to 10						#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.8 — Supplier's permissible sampling plans for percent nonconforming: Lot size 91 to 150 items and trust level T3

Interval of nonconformity	Normative quality limit (NQL) [a b c] %					
	1,0	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,0 to 0,65	0 75	0 67	0 44	0 31	0 20	0 13
0,65 to 1,0	#	#	1 82	1 58	1 37	↓
1,0 to 1,5		#	#	2 83	↓	1 25
1,5 to 2,5			#	#	2 54	2 36
2,5 to 4,0				#	#	4 58
4,0 to 6,5					#	#
6,5 to 10						#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.9 — Supplier's permissible sampling plans for percent nonconforming: Lot size 151 to 280 items and trust level T2

Interval of nonconformity	Normative quality limit (NQL) [a b c] %						
	0,4; 0,65	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,0 to 0,25	#	0 / 150	0 / 116	0 / 78	0 / 51	0 / 33	0 / 22
0,25 to 0,40	#	#	#	↓	↓		
0,40 to 0,65	#	#	#	1 / 126	1 / 85	↓	↓
0,65 to 1,0		#	#	#	2 / 114	1 / 54	1 / 36
1,0 to 1,5			#	#		3 / 91	2 / 49
1,5 to 2,5				#	#	5 / 125	3 / 61
2,5 to 4,0					#	#	6 / 96
4,0 to 6,5						#	#
6,5 to 10							#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.10 — Supplier's permissible sampling plans for percent nonconforming: Lot size 151 to 280 items and trust level T3

Interval of nonconformity	Normative quality limit (NQL) [a b c] %							
	0,4	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,0 to 0,25	#	0 / 140	0 / 104	0 / 78	0 / 50	0 / 32	0 / 20	↓
0,25 to 0,40	#	#	#	↓	↓	↓	↓	↓
0,40 to 0,65		#	#	1 / 145	1 / 95	↓	↓	0 / 13
0,65 to 1,0			#	#	2 / 136	1 / 62	1 / 39	↓
1,0 to 1,5				#	#	3 / 116	2 / 57	1 / 26
1,5 to 2,5					#	#	4 / 90	3 / 49
2,5 to 4,0						#	#	5 / 71
4,0 to 6,5							#	12 / 142
6,5 to 10								

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.11 — Supplier's permissible sampling plans for percent nonconforming: Lot size 281 to 500 items and trust level T2

Interval of nonconformity	Normative quality limit (NQL) [a b c] %							
	0,25; 0,4	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,0 to 0,15	#	0 247	0 184	0 130	0 83	0 54	0 34	↓
0,15 to 0,25	#	#	#	1 211	1 137	↓	↓	0 22
0,25 to 0,40	#	#	#	2 278	↓	1 90	↓	↓
0,40 to 0,65		#	#	#	2 184	2 122	1 56	↓
0,65 to 1,0			#	#	4 268	3 151	2 77	1 37
1,0 to 1,5				#	#	5 206	3 96	2 50
1,5 to 2,5					#	#	6 149	4 75
2,5 to 4,0						#	#	8 122
4,0 to 6,5							#	20 248
6,5 to 10								#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.12 — Supplier's permissible sampling plans for percent nonconforming: Lot size 281 to 500 items and trust level T3

Interval of nonconformity	Normative quality limit (NQL) [a b c] %								
	0,25	**0,4**	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,0 to 0,15	#	0 250	0 171	0 121	0 84	0 52	0 33	↓	↓
0,15 to 0,25	#	#	#	1 227	1 159	↓	↓	0 21	0 13
0,25 to 0,40		#	#	#	2 227	1 100	↓	↓	↓
0,40 to 0,65			#	#	#	2 144	1 64	1 40	↓
0,65 to 1,0				#	#	4 227	2 93	↓	↓
1,0 to 1,5					#	#	4 148	2 58	1 26
1,5 to 2,5						#	9 275	5 109	3 50
2,5 to 4,0							#	12 221	6 83
4,0 to 6,5								#	16 188
6,5 to 10									#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.13 — Supplier's permissible sampling plans for percent nonconforming: Lot size 501 to 1 200 items and trust level T2

Interval of nonconformity	Normative quality limit (NQL) [a] [b] [c] %							
	0,15; 0,25; 0,4	0,65	1,0	1,5	2,5	4,0	6,5	10
0,0 to 0,15	#	1 487	1 344	1 239	↓	0 56	0 34	0 22
0,15 to 0,25	#	#	#	2 323	1 147	↓	↓	↓
0,25 to 0,40	#	#	#	3 400	2 200	1 94	↓	↓
0,40 to 0,65		#	#	#	3 250	2 127	1 58	1 38
0,65 to 1,0			#	#	7 432	4 190	2 79	↓
1,0 to 1,5				#	#	7 278	4 118	2 51
1,5 to 2,5					#	#	8 192	4 77
2,5 to 4,0						#	22 427	9 137
4,0 to 6,5							#	30 366
6,5 to 10								#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.14 — Supplier's permissible sampling plans for percent nonconforming: Lot size 501 to 1 200 items and trust level T3

Interval of nonconformity	Normative quality limit (NQL) [a b c] %							
	0,15; 0,25; 0,4	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,0 to 0,15	#	1 367	1 251	1 171	0 54	0 34	0 21	↓
0,15 to 0,25	#	#	2 361	↓	↓	↓	↓	0 14
0,25 to 0,40	#	#	3 466	2 247	1 104	1 66	↓	↓
0,40 to 0,65		#	#	4 392	2 152	2 96	1 41	↓
0,65 to 1,0			#	#	5 284	3 124	2 59	1 26
1,0 to 1,5				#	#	5 180	3 77	2 38
1,5 to 2,5					#	15 444	6 129	3 50
2,5 to 4,0						#	17 309	6 84
4,0 to 6,5							#	22 255
6,5 to 10								#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.15 — Supplier's permissible sampling plans for percent nonconforming: Lot size over 1 200 items and trust level T2

Interval of nonconformity	Normative quality limit (NQL) [a b c] %									
	0,15	**0,25**	**0,4**	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,00 to 0,10	53 42 399[d]	10 6 160[d]	5 2 317[d]	2 818	↓	1 258	↓	↓	0 355	↓
0,10 to 0,15	#	33 16 658[d]	9 3 549[d]	4 1 228[d]	2 531	2 354	1 155	↓	↓	0 22
0,15 to 0,25		#	39 12 068[d]	10 2 368[d]	5 926	3 444	2 212	1 96	↓	↓
0,25 to 0,40			#	37 7 086[d]	10 1 538[d]	5 617	3 266	2 132	1 59	↓
0,40 to 0,65				#	47 5 702[d]	12 1 183	5 369	3 166	↓	1 38
0,65 to 1,0					#	52 4 163[d]	10 614	4 198	2 81	↓
1,0 to 1,5						#	33 1 662[d]	9 353	4 121	2 52
1,5 to 2,5							#	38 1 176	9 216	4 78
2,5 to 4,0								#	35 671	10 152
4,0 to 6,5									#	43 522
6,5 to 10										#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

[d] In a few cases, the proposed sample size may exceed the lot size and complete inspection shall then be used.

Table A.16 — Supplier's permissible sampling plans for percent nonconforming: Lot size over 1 200 items and trust level T3

Interval of nonconformity	Normative quality limit (NQL) [a b c] %									
	0,15	**0,25**	**0,4**	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
0,00 to 0,10	34 25 857[d]	7 3 873[d]	3 1 277[d]	2 603	1 269	↓	↓	↓	↓	↓
0,10 to 0,15	#	22 10 410[d]	6 2 139[d]	3 785	2 392	1 179	↓	0 34	0 21	↓
0,15 to 0,25		#	26 7 573[d]	7 1 489[d]	3 510	2 261	1 107	↓	↓	0 14
0,25 to 0,40			#	24 4 332[d]	7 968	3 340	2 156	1 67	↓	↓
0,40 to 0,65				#	30 3 453[d]	8 719	3 204	2 98	1 41	↓
0,65 to 1,0					#	34 2 584[d]	7 387	3 127	2 60	1 27
1,0 to 1,5						#	22 1 040	6 213	3 78	2 39
1,5 to 2,5							#	25 729	6 131	3 51
2,5 to 4,0								#	23 415	7 96
4,0 to 6,5									#	29 333
6,5 to 10										#

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

[d] In a few cases, the proposed sample size may exceed the lot size and complete inspection shall then be used.

Table A.17 — Supplier's permissible sampling plans for percent nonconforming: Ac = 0 and trust level T4

Lot size [a]	Normative quality limit (NQL) %									
	0,15	0,25	0,4	0,65	1,0	1,5	2,5	4,0	6,5	10
⩽ 25								0 13	0 8	0 6
26 to 50							0 20	0 15	0 10	0 7
51 to 90						0 34	0 24	0 16	0 10	0 7
91 to 150					0 51	0 39	0 25	0 17	0 10	0 7
151 to 280			0 125	0 82	0 59	0 43	0 27	0 17	0 11	0 7
281 to 500		0 201	0 147	0 95	0 65	0 44	0 27	0 17	0 11	0 7
501 to 1 200	0 354	0 248	0 159	0 102	0 67	0 45	0 28	0 17	0 11	0 7
> 1 200	0 462	0 277	0 173	0 107	0 69	0 46	0 28	0 17	0 11	0 7

[a] If the sample size equals or exceeds the lot size, then 100 % inspection is required. This will only occur for lot sizes in the class "⩽ 25".

Table A.18 — Supplier's permissible sampling plans for percent nonconforming: Ac = 0 and trust level T5

Lot size [a]	Normative quality limit (NQL) %									
	0,15	0,25	0,4	0,65	1,0	1,5	2,5	4,0	6,5	10
⩽ 25								0 7	0 4	0 3
26 to 50							0 10	0 7	0 5	0 3
51 to 90						0 17	0 11	0 7	0 5	0 3
91 to 150					0 26	0 18	0 11	0 7	0 5	0 3
151 to 280			0 63	0 39	0 27	0 19	0 12	0 7	0 5	0 3
281 to 500		0 101	0 67	0 43	0 28	0 19	0 12	0 8	0 5	0 3
501 to 1 200	0 169	0 108	0 70	0 44	0 29	0 20	0 12	0 8	0 5	0 3
> 1 200	0 192	0 115	0 72	0 45	0 29	0 20	0 12	0 8	0 5	0 3

[a] If the sample size equals or exceeds the lot size, then 100 % inspection is required. This will only occur for lot sizes in the class "⩽ 25".

Table A.19 — Supplier's permissible sampling plans for percent nonconforming: Ac = 0 and trust level T6

Lot size [a]	Normative quality limit (NQL) %									
	0,15	0,25	0,4	0,65	1,0	1,5	2,5	4,0	6,5	10
⩽ 25								0 3	0 2	0 11
26 to 50							0 4	0 3	0 2	0 11
51 to 90						0 7	0 5	0 3	0 2	0 11
91 to 150					0 11	0 7	0 5	0 3	0 2	0 11
151 to 280			0 25	0 16	0 11	0 7	0 5	0 3	0 2	0 11
281 to 500		0 41	0 26	0 16	0 11	0 7	0 5	0 3	0 2	0 11
501 to 1 200	0 67	0 42	0 26	0 17	0 11	0 7	0 5	0 3	0 2	0 11
> 1 200	0 70	0 42	0 27	0 17	0 11	0 7	0 5	0 3	0 2	0 11

[a] If the sample size equals or exceeds the lot size, then 100 % inspection is required. This will only occur for lot sizes in the class "⩽ 25".

Table A.20 — Supplier's permissible sampling plans for nonconformities per 100 items: Any lot size and trust level T2

Interval of nonconformity	Normative quality limit (NQL), nonconformities per 100 items [a] [b] [c] [d]																		
	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000			
0,00 to 0,10	→	1 260	→	→	0 36	→	→	→	→	→	→	→	→	→	→	→			
0,10 to 0,15	2 533	2 355	1 156	→	→	0 24	→	→	→	→	→	→	→	→	→	→			
0,15 to 0,25	5 928	3 446	2 213	1 98	→	→	0 16	→	→	→	→	→	→	→	→	→			
0,25 to 0,40	10 1 541	5 619	3 268	2 134	1 60	→	→	0 10	→	→	→	→	→	→	→	→			
0,40 to 0,65	47 5 707	13 1 264	5 371	3 168	2 82	1 39	→	→	0 6	→	→	→	→	→	→	→			
0,65 to 1,0	#	53 4 241	11 664	5 232	3 103	→	1 26	→	→	0 4	→	→	→	→	→	→			
1,0 to 1,5		#	33 1 667	9 356	4 123	2 54	2 36	1 16	→	→	0 3	→	→	→	→	→			
1,5 to 2,5			#	40 1 235	10 238	5 93	3 45	2 22	1 10	→	→	0 2	→	→	→	→			
2,5 to 4,0				#	37 709	11 166	5 62	3 27	2 14	1 6	→	→	0 1	→	→	→			
4,0 to 6,5					#	47 571	13 127	5 38	3 17	2 9	1 4	→	→	→	→	→			
6,5 to 10,0						#	53 425	11 67	5 24	3 11	2 6	1 3	→	→	→	→			
10 to 15							#	34 172	9 36	4 13	3 7	2 4	1 2	→	→	→			
15 to 25								#	40 124	10 24	5 10	3 5	1	1 1	→	→			
25 to 40									#	37 71	11 17	7 8	3 3	→	→	→			
40 to 65										#	50 61	13 13	5 4	4 2	2 1	→			
65 to 100											#	55 44	13 8	7 3	→	→			
100 to 150												#	36 18	10 4	8 2	→			
150 to 250													#	42 13	13 3	5 1			
250 to 400														#	42 8	13 2			
400 to 650															#	58 7			

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level worse than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] If the tabulated sample size equals or exceeds the lot size, then all items in the lot shall be inspected.

[d] → means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.21 — Supplier's permissible sampling plans for nonconformities per 100 items: Any lot size and trust level T3

Interval of nonconformity	Normative quality limit (NQL), nonconformities per 100 items [a] [b] [c] [d]																		
	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000
0,00 to 0,10	1 270	→		0 35	→	→	→	→	→	→	→	→	→	→	→	
0,10 to 0,15	2 393	1 180	→	→	0 22	→	→	→	→	→	→	→	→	→	→	
0,15 to 0,25	3 511	2 262	1 108	→	→	0 14	→	→	→	→	→	→	→	→	→	
0,25 to 0,40	7 969	3 341	2 157	1 68	→	→	0 10	→	→	→	→	→	→	→	→	
0,40 to 0,65	31 3 562	8 721	3 205	2 99	1 42	→	→	0 6	→	→	→	→	→	→	→	
0,65 to 1,0	#	34 2 586	7 388	3 128	2 61	1 27	→	→	0 4	→	→	→	→	→	→	
1,0 to 1,5		#	22 1 042	6 214	3 79	2 40	1 18	→	→	0 3	→	→	→	→	→	
1,5 to 2,5			#	26 758	7 149	3 52	2 27	1 11	→	→	0 2	→	→	→	→	
2,5 to 4,0				#	24 434	7 97	4 42	2 16	1 7	→	→	0 1	0 1	→	→	
4,0 to 6,5					#	31 357	9 80	3 21	2 10	1 5	→	→	→	→	→	
6,5 to 10,0						#	35 266	7 39	3 13	2 7	1 3	→	→	→	→	
10 to 15							#	23 109	7 25	3 8	2 4	1 2	→	→	→	
15 to 25								#	26 76	7 15	4 7	2 3	→	→	→	
25 to 40									#	25 45	8 11	5 5	2 2	→	→	
40 to 65										#	32 37	9 8	5 3	2 1	→	
65 to 100											#	37 28	9 5	5 2	→	
100 to 150												#	23 11	9 3	4 1	7 1
150 to 250													#	31 9	9 2	7 1
250 to 400														#	28 5	16 2
400 to 650															#	35 4

[a] The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level worse than NQL or where the appropriate cell in the table contains #.

[b] Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

[c] If the tabulated sample size equals or exceeds the lot size then all items in the lot shall be inspected.

[d] → means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.22 — Supplier's permissible sampling plans for nonconformities per 100 items: Any lot size and trust level T4

Interval of nonconformity	Normative quality limit (NQL), nonconformities per 100 items [a] [b] [c] [d]																		
	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000			
0,00 to 0,10	→	0 47	→	→	→	→	→	→	→	→	→	→	→	→	→	→			
0,10 to 0,15	1 168	→	0 28	→	→	→	→	→	→	→	→	→	→	→	→	→			
0,15 to 0,25	2 268	1 112	→	0 18	→	→	→	→	→	→	→	→	→	→	→	→			
0,25 to 0,40	4 468	2 179	1 68	→	0 11	→	→	→	→	→	→	→	→	→	→	→			
0,40 to 0,65	17 1 767	5 379	2 107	1 42	→	0 7	→	→	→	→	→	→	→	→	→	→			
0,65 to 1,0	#	19 1 312	4 187	2 67	1 26	→	0 5	→	→	→	→	→	→	→	→	→			
1,0 to 1,5		#	12 507	4 117	2 42	1 17	→	0 3	→	→	→	→	→	→	→	→			
1,5 to 2,5			#	14 367	4 72	2 27	1 12	→	0 2	→	→	→	→	→	→	→			
2,5 to 4,0				#	13 211	4 47	2 18	1 7	→	→	→	→	→	→	→	→			
4,0 to 6,5					#	17 177	5 38	2 11	1 5	→	→	→	→	→	→	→			
6,5 to 10,0						#	19 132	4 19	2 7	1 3	→	→	→	→	→	→			
10 to 15							#	12 51	4 12	2 5	1 2	→	→	→	→	→			
15 to 25								#	15 40	5 9	2 3	→	1 1	→	→	→			
25 to 40									#	14 23	5 6	2 2	→	→	→	→			
40 to 65										#	18 19	5 4	4 2	→	→	→			
65 to 100											#	20 14	6 3	3 1	→	→			
100 to 150												#	14 6	7 2	→	→			
150 to 250													#	15 4	5 1	→			
250 to 400														#	18 3	9 1			
400 to 650															#	19 2			

a The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.
b Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.
c If the tabulated sample size equals or exceeds the lot size then all items in the lot shall be inspected.
d → means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.23 — Supplier's permissible sampling plans for nonconformities per 100 items: Any lot size and trust level T5

Interval of nonconformity	Normative quality limit (NQL), nonconformities per 100 items [a b c d]																		
	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000
0,00 to 0,10	↓															
0,10 to 0,15	0 29	↓														
0,15 to 0,25	1 97	0 20	↓													
0,25 to 0,40	2 173	1 65	0 12	↓	0 8											
0,40 to 0,65	7 596	2 116	1 39	↓	↓											
0,65 to 1,0	#	7 398	2 70	1 25	0 5	↓										
1,0 to 1,5		#	5 169	2 44	1 15	0 3	↓									
1,5 to 2,5			#	6 128	2 27	1 10	0 2	↓								
2,5 to 4,0				#	5 65	2 18	1 7	↓	0 2	↓						
4,0 to 6,5					#	7 60	2 12	1 4	↓	↓						
6,5 to 10,0						#	8 46	2 7	1 3	↓						
10 to 15							#	5 17	2 5	1 2	↓	↓				
15 to 25								#	6 13	2 3	1 2	1 1	↓			
25 to 40									#	6 8	2 2	↓	↓			
40 to 65										#	7 6	3 2	2 1	↓		
65 to 100											#	10 6	5 2	↓	↓	
100 to 150												#	8 3	4 1	↓	
150 to 250													#	9 2	7 1	↓
250 to 400														#	14 2	↓
400 to 650															#	11 1

a The lot is completely inspected by the supplier for lots submitted with expected or estimated lot quality level greater than NQL or where the appropriate cell in the table contains #.

b Where two integers appear in the appropriate cell, sampling is indicated. The proposed sample size is the integer at the bottom right hand corner and the acceptance number at the top left corner.

c If the tabulated sample size equals or exceeds the lot size then all items in the lot shall be inspected.

d ↓ means the permissible sampling plan is the same as the first sampling plan below the arrow.

Table A.24 — Supplier's permissible sampling plans for nonconformities per 100 items. Any lot size. Trust level T6

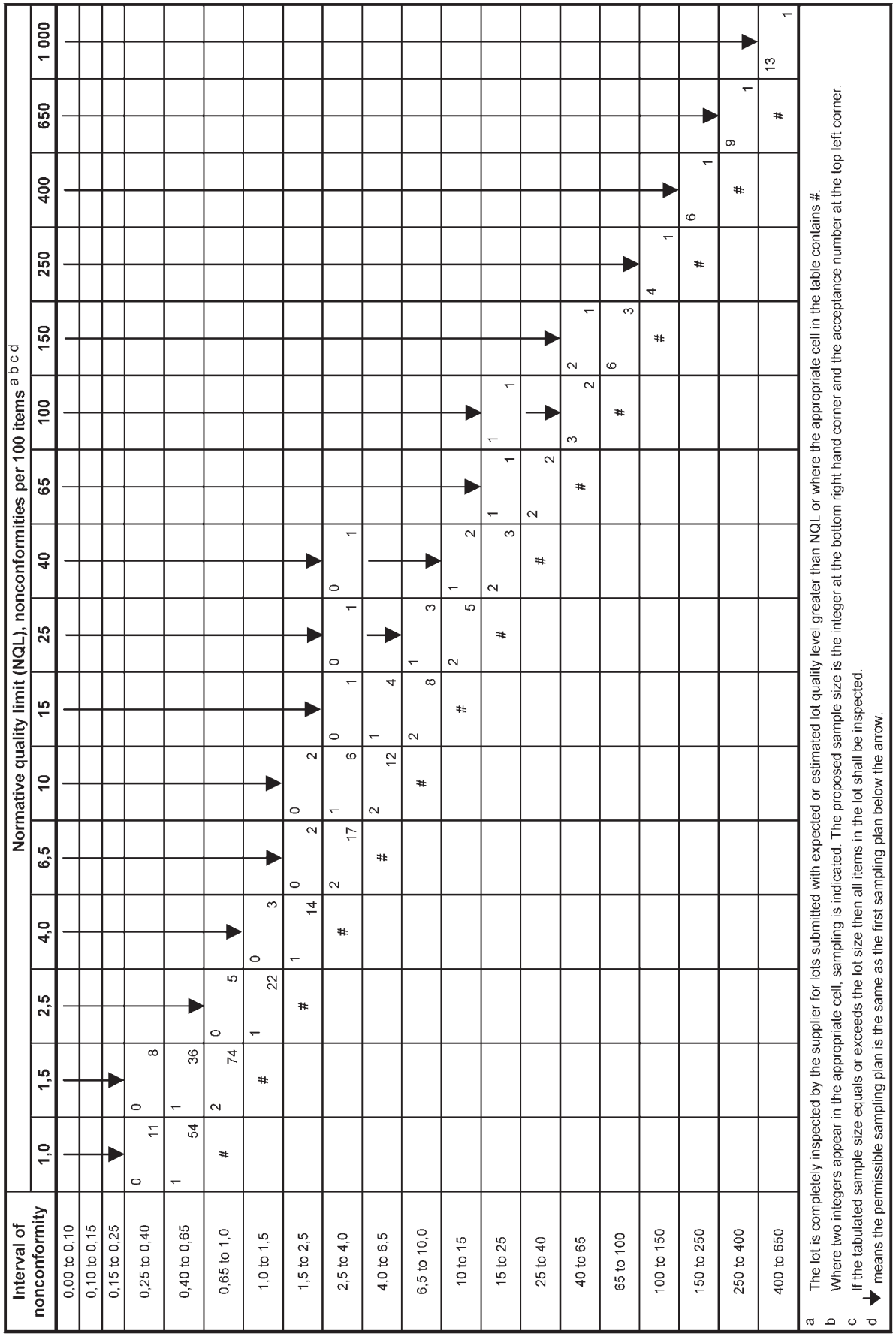


Table A.25 — Customer's permissible sampling plans for percent nonconforming: Lot size up to 25 (≤ 25) items

Rejection number	Normative quality limit (NQL) [a] [b] [c] %		
	4,0	6,5	10
1	1	—	—
2	2 to 25 (25)	2 to 25 (25)	2 to 4 (19)
3			5 to 25 (25)

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.26 — Customer's permissible sampling plans for percent nonconforming: Lot size 26 to 50 items

Rejection number	Normative quality limit (NQL) [a] [b] [c] %			
	2,5	4,0	6,5	10
1	1 to 2	1	—	—
2	3 to 50 (50)	2 to 11 (49)	2 to 6 (30)	2 to 4
3		12 to 50 (50)	7 to 17 (46)	5 to 10 (29)
4			18 to 50 (50)	11 to 17 (39)
5				18 to 28 (49)
6				29 to 50 (50)

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.27 — Customer's permissible sampling plans for percent nonconforming: Lot size 51 to 90 items

Rejection number	Normative quality limit (NQL) [a] [b] [c] %				
	1,5	**2,5**	**4,0**	**6,5**	**10**
1	1 to 3	1 to 2	1	—	—
2	4 to 90 (90)	3 to 18 (79)	2 to 10	2 to 6	2 to 4
3		19 to 90 (90)	11 to 28 (75)	7 to 15	5 to 9
4			29 to 90 (90)	16 to 27 (61)	10 to 16
5				28 to 43 (76)	17 to 23
6				44 to 90 (90)	24 to 32 (59)
7					33 to 41 (69)
8					42 to 52 (79)
9					53 to 65 (89)
10					66 to 90 (90)

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.28 — Customer's permissible sampling plans for percent nonconforming: Lot size 91 to 150 items

Rejection number	Normative quality limit (NQL) [a] [b] [c] %					
	1,0	**1,5**	**2,5**	**4,0**	6,5	10
1	1 to 5	1 to 3	1 to 2	1	—	—
2	6 to 150 (150)	4 to 30 (133)	3 to 16	2 to 9	2 to 6	2 to 4
3		31 to 150 (150)	17 to 44 (119)	10 to 23	7 to 14	5 to 9
4			45 to 150 (150)	24 to 41 (99)	15 to 24	10 to 15

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.28 *(continued)*

Rejection number	Normative quality limit (NQL) [a b c] %					
	1,0	**1,5**	**2,5**	**4,0**	6,5	10
5				42 to 63 (124)	25 to 35	16 to 22
6				64 to 92 (149)	36 to 49 (92)	23 to 29
7				93 to 150 (150)	50 to 63 (107)	30 to 37
8					64 to 80 (123)	38 to 46
9					81 to 108 (138)	47 to 55
10					109 to 150 (150)	56 to 64 (99)
11						65 to 75 (109)
12						76 to 85 (119)
13						86 to 97 (129)

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.29 — Customer's permissible sampling plans for percent nonconforming: Lot size 151 to 280 items

Rejection number	Normative quality limit (NQL) [a b c] %							
	0,4	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
1	1 to 12	1 to 7	1 to 5	1 to 3	1 to 2	1	—	—
2	13 to 280 (280)	8 to 280 (280)	6 to 45 (199)	4 to 26	3 to 15	2 to 9	2 to 5	2 to 3
3			46 to 280 (280)	27 to 67 (199)	16 to 36	10 to 22	6 to 13	4 to 9
4				68 to 127 (266)	37 to 63 (159)	23 to 37	14 to 22	10 to 14
5				128 to 280 (280)	64 to 96 (199)	38 to 55	23 to 33	15 to 21

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval(at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.29 *(continued)*

Rejection number	Normative quality limit (NQL) [a b c] %							
	0,4	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
6					97 to 135 (239)	56 to 75	34 to 44	22 to 28
7					136 to 280 (280)	76 to 97 (174)	45 to 56	29 to 36
8						98 to 121 (199)	57 to 69	37 to 43
9						122 to 147 (224)	70 to 82	44 to 51
10						148 to 280 (280)	83 to 95 (153)	52 to 60
11							96 to 110 (168)	61 to 68
12							111 to 125 (184)	69 to 77
13							126 to 140 (199)	78 to 86

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval(at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.30 — Customer's permissible sampling plans for percent nonconforming: Lot size 281 to 500 items

Rejection number	Normative quality limit (NQL) [a b c] %								
	0,25	**0,4**	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
1	1 to 20	1 to 12	1 to 7	1 to 5	1 to 3	1 to 2	1	—	—
2	21 to 500 (500)	13 to 112 (499)	8 to 62 (307)	6 to 38	4 to 25	3 to 14	2 to 9	2 to 5	2 to 3
3		113 to 500 (500)	63 to 170 (461)	39 to 95 (299)	26 to 60	15 to 35	10 to 21	6 to 13	4 to 8
4			171 to 500 (500)	96 to 172 (399)	61 to 105	36 to 59	22 to 36	14 to 22	9 to 14
5				173 to 275 (499)	106 to 160 (333)	60 to 87	37 to 53	23 to 32	15 to 21

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.30 *(continued)*

Rejection number	Normative quality limit (NQL) [a b c] %								
	0,25	**0,4**	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
6				276 to 500 (500)	161 to 224 (399)	88 to 118	54 to 70	33 to 43	22 to 28
7					225 to 327 (466)	119 to 152	71 to 89	44 to 54	29 to 35
8					328 to 500 (500)	153 to 189 (319)	90 to 109	55 to 66	36 to 42
9						190 to 228 (359)	110 to 130	67 to 78	43 to 50
10						229 to 271 (399)	131 to 152	79 to 90	51 to 58
11						272 to 332 (439)	153 to 175	91 to 103	59 to 66
12						333 to 390 (479)	176 to 198 (299)	104 to 116	67 to 74
13						391 to 500 (500)	199 to 222 (324)	117 to 130	75 to 82

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" implies that for a given rejection number there are no permissible single sampling plans because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.31 — Customer's permissible sampling plans for percent nonconforming: Lot size 501 to 1 200 items

Rejection number	Normative quality limit (NQL) [a b c] %									
	0,15	**0,25**	**0,4**	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
1	1 to 33	1 to 20	1 to 12	1 to 7	1 to 5	1 to 3	1 to 2	1	—	—
2	34 to 1 200 (1 200)	21 to 163 (799)	13 to 97	8 to 57	6 to 36	4 to 24	3 to 14	2 to 9	2 to 5	2 to 3
3		164 to 443 (1 199)	98 to 248 (749)	58 to 139	37 to 86	25 to 57	15 to 33	10 to 21	6 to 13	4 to 8
4		444 to 1 200 (1 200)	249 to 472 (999)	140 to 243 (615)	87 to 148	58 to 96	34 to 56	22 to 35	14 to 22	9 to 14
5			473 to 1 200 (1 200)	244 to 368 (769)	149 to 217	97 to 141	57 to 82	36 to 51	23 to 31	15 to 20
6				369 to 576 (923)	218 to 294 (599)	142 to 189	83 to 110	52 to 68	32 to 42	21 to 27
7				577 to 783 (1 076)	295 to 379 (699)	190 to 239	111 to 139	69 to 85	43 to 52	28 to 34
8				784 to 1 200 (1 200)	380 to 470 (799)	240 to 294 (533)	140 to 169	86 to 104	53 to 63	35 to 41
9					471 to 568 (899)	295 to 351 (599)	170 to 200	105 to 123	64 to 75	42 to 49
10					569 to 675 (999)	352 to 410 (666)	201 to 233	124 to 142	76 to 87	50 to 56
11					676 to 794 (1 099)	411 to 472 (733)	234 to 266	143 to 162	88 to 99	57 to 64
12					795 to 936 (1 199)	473 to 536 (799)	267 to 301	163 to 183	100 to 111	65 to 72
13					937 to 1 200 (1 200)	537 to 604 (866)	302 to 336 (519)	184 to 203	112 to 123	73 to 90

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in the parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" to implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.32 — Customer's permissible sampling plans for percent nonconforming: Lot size over 1 200 items

Rejection number	Normative quality limit (NQL) [a b c] %									
	0,15	**0,25**	**0,4**	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
1	1 to 24	1 to 20	1 to 12	1 to 7	1 to 5	1 to 3	1 to 2	1	—	—
2	25 to 237 (1 332)	21 to 142	13 to 89	8 to 55	6 to 35	4 to 24	3 to 14	2 to 9	2 to 5	2 to 3
3	238 to 545 (1 999)	143 to 327	90 to 205	56 to 126	36 to 82	25 to 55	15 to 33	10 to 21	6 to 13	4 to 8
4	546 to 912 (2 066)	328 to 547 (1 599)	206 to 442	127 to 211	83 to 137	56 to 91	34 to 55	22 to 35	14 to 21	9 to 14
5	913 to 1 314 (3 332)	548 to 789 (1 999)	443 to 493 (1 249)	212 to 304	138 to 198	92 to 132	56 to 79	36 to 50	22 to 31	15 to 20
6	1 315 to 1 743 (3 999)	790 to 1 046 (2 399)	494 to 654 (1 499)	305 to 403	199 to 262	133 to 175	80 to 105	51 to 66	32 to 41	21 to 27
7	1 744 to 2 192 (4 665)	1 047 to 1 315 (2 799)	655 to 822 (1 749)	404 to 506	263 to 329	176 to 220	106 to 132	67 to 83	42 to 51	28 to 34
8	2 193 to 2 655 (5 332)	1 316 to 1 594 (3 199)	823 to 996 (1 999)	507 to 614 (1 229)	330 to 399	221 to 266	133 to 160	84 to 101	52 to 62	35 to 41
9	2 656 to 3 132 (5 999)	1 595 to 1 880 (3 599)	997 to 1 175 (2 249)	615 to 724 (1 384)	400 to 471	267 to 314	161 to 189	102 to 119	63 to 73	42 to 48
10	3 133 to 3 619 (6 665)	1 881 to 2 172 (3 999)	1 176 to 1 358 (2 499)	725 to 836 (1 537)	472 to 544	315 to 363	190 to 218	120 to 137	74 to 85	49 to 56

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" to implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.32 *(continued)*

Rejection number	Normative quality limit (NQL) [a b c] %									
	0,15	**0,25**	**0,4**	**0,65**	**1,0**	**1,5**	**2,5**	**4,0**	**6,5**	**10**
11	3 620 to 4 114 (1 332)	2 173 to 2 469 (4 399)	1 359 to 1 544 (2 749)	837 to 951 (1 691)	545 to 618	364 to 413	219 to 248	138 to 156	86 to 96	57 to 63
12	4 115 to 4 618 (7 999)	2 470 to 2 772 (4 799)	1 545 to 1 733 (2 999)	952 to 1 067 (1 845)	619 to 694	414 to 463	249 to 279	157 to 175	97 to 108	64 to 71
13	4 619 to 5 129 (8 665)	2 773 to 3 078 (5 199)	1 734 to 1 924 (3 249)	1 068 to 1 185 (1 999)	695 to 771 (1 299)	464 to 514	280 to 309	176 to 194	109 to 120	72 to 79

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c "—" to implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

Table A.33 — Customer's permissible sampling plans for nonconformities per 100 items: Any lot size

Rejection number	Normative quality limit (NQL), nonconformities per 100 items [a b c d]																
	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000
1	1 to 5	1 to 3	1 to 2	1	—	—	—	—	—	—	—	—	—	—	—	—
2	6 to 35 (199)	4 to 23 (133)	3 to 14 (79)	2 to 8 (49)	1 to 5 (30)	1 to 3 (19)	1 to 2 (13)	1 (7)	—	—	—	—	—	—	—	—
3	36 to 81 (299)	24 to 54 (199)	15 to 32 (119)	9 to 20 (74)	6 to 12 (46)	4 to 8 (29)	3 to 5 (19)	2 to 3 (11)	1 to 2 (7)	1 (4)	—	—	—	—	—	—
4	82 to 136 (399)	55 to 91 (266)	33 to 54 (159)	21 to 34 (99)	13 to 21 (61)	9 to 13 (39)	6 to 9 (26)	4 to 5 (15)	3 (9)	2 (6)	1 (3)	—	—	—	—	—
5	137 to 197 (499)	92 to 131 (333)	55 to 78 (199)	35 to 49 (124)	22 to 30 (76)	14 to 19 (49)	10 to 13 (33)	6 to 7 (19)	4 (12)	3 (7)	1 (4)	1 (3)	—	—	—	—
6	198 to 261 (599)	132 to 174 (399)	79 to 104 (239)	50 to 65 (149)	31 to 40 (92)	20 to 26 (59)	14 to 17 (39)	8 to 10 (23)	5 to 6 (14)	4 (9)	2 (5)	↓	1 (2)	—	—	—
7	262 to 328 (699)	175 to 219 (466)	105 to 131 (279)	66 to 82 (174)	41 to 50 (107)	27 to 32 (69)	18 to 21 (46)	11 to 13 (27)	7 to 8 (17)	5 (10)	3 (6)	2 (4)	↓	—	—	—
8	329 to 398 (799)	220 to 265 (533)	132 to 159 (319)	83 to 99 (199)	51 to 61 (123)	33 to 39 (79)	22 to 26 (53)	14 to 15 (31)	9 (19)	6 (12)	3 (7)	2 (5)	1 (3)	—	—	—
9	399 to 469 (899)	266 to 313 (599)	160 to 187 (359)	100 to 117 (224)	62 to 72 (138)	40 to 46 989)	27 to 31 (59)	16 to 18 (35)	10 to 11 (22)	7 (13)	4 (8)	3 (5)	↓	1 (2)	—	—
10	470 to 542 (999)	314 to 361 (666)	188 to 217 (399)	118 to 135 (249)	73 to 83 (153)	47 to 54 (99)	32 to 36 (66)	19 to 21 (39)	12 to 13 (24)	8 (15)	5 (9)	3 (6)	2 (3)	1 (2)	—	—
11	543 to 616 (1 099)	362 to 411 (733)	218 to 246 (439)	136 to 154 (274)	84 to 94 (169)	55 to 61 (109)	37 to 41 (73)	22 to 24 (43)	14 to 15 (27)	9 (16)	6 (10)	4 (7)	2 (4)	↓	—	—
12	617 to 692 (1 199)	412 to 461 (799)	247 to 276 (479)	155 to 173 (299)	95 to 106 (184)	62 to 69 (119)	42 to 46 (79)	25 to 27 (47)	16 to 17 (29)	10 (18)	6 (11)	↓	↓		1	—
13	693 to 768 (1 299)	462 to 512 (866)	277 to 307 (519)	174 to 192 (324)	107 to 118 (199)	70 to 76 (129)	47 to 51 (86)	28 to 30 (51)	18 to 19 (32)	11 (19)	7 (12)	5 (8)	3 (5)		↓	—
14	769 to 846 (1 399)	513 to 564 (933)	308 to 338 (559)	193 to 211 (349)	119 to 130 (215)	77 to 84 (139)	52 to 56 (93)	31 to 33 (55)	20 to 21 (34)	12 to 13 (21)	8 (13)	5 (9)	↓	2 (3)	1 (2)	—
15	847 to 924 (1 499)	565 to 616 (999)	339 to 369 (599)	212 to 231 (344)	131 to 142 (230)	85 to 92 (149)	57 to 61 (99)	34 to 36 (59)	22 to 23 (37)	14 (23)	9 (14)	6 (9)		↓	↓	—
16	925 to 1 003 (1 599)	617 to 669 (1 066)	370 to 401 (639)	232 to 250 (399)	143 to 154 (246)	93 to 100 (159)	62 to 66 (106)	37 to 40 (63)	24 to 25 (39)	15 (24)	10 (15)	6 (10)	4 (6)			1

a If the lot size exceeds the bottom value (enclosed in parentheses) or if there is no value at the bottom of the cell, only a sample size from the given interval (at the top of the cell) and the corresponding rejection number indicated in the left column are permissible on customer inspection.

b For lot sizes up to and including the number in parentheses, any sample size for a given combination of NQL and rejection number can be taken.

c Implies that for a given rejection number there are no permissible single sampling plans, because even for a sample size of 1 the limitation for the supplier's risk on customer inspection is not met.

d ↓ means that the permissible sampling plan is the same as the first sampling plan above the arrow.

Annex B
(informative)

Examples of application of catalogued permissible sampling plans

B.1 Example 1 (percent nonconforming)

B.1.1 Requirements specified by the contract

The contract for lot supply of resistors sets up a specified normative quality limit in a lot of 4 % and the customer's risk on supplier inspection complying with the trust level T3 (β_0 = 0,25). The lot size is 10 000.

B.1.2 Choice of a permissible single sampling plan (supplier inspection)

When a lot of resistors is inspected, the supplier is guided to use a single sampling plan. Following Table 3, in this situation, the supplier is directed to use Table A.16. The supplier's permissible sampling plans are given in Table B.1.

Table B.1 — Supplier's permissible sampling plans for Example 1

Sample size	Acceptance number	Rejection number
34	0	1
67	1	2
98	2	3
127	3	4
213	6	7
729	25	26

Any of the above plans may be applied by the supplier, for each plan provides for the probability of acceptance not higher than 0,25, when the actual percent nonconforming in a lot exceeds 4 %.

B.1.3 Choice of a preferred single sampling plan (supplier inspection)

From the permissible sampling plans, the supplier can determine a preferred plan by estimating the actual lot quality level. A preferred plan is one that guarantees a high probability (not less than 0,95) of accepting the lot while minimizing the sample size. For example, if the supplier estimates the actual lot quality level to be in the range 0,7 % to 0,8 %, a plan corresponding to the interval of nonconformity 0,65 % to 1,0 % (sample size of 127 with an acceptance number of 3) could be used. Permissible plans with smaller sample sizes would provide a probability of lot acceptance less than 0,95, whereas plans with larger sample sizes would provide slightly more assurance of lot acceptance but at the expense of greater inspection costs.

B.1.4 Adjustment of a sampling plan to deteriorated quality (supplier inspection)

Following the results of inspection, the supplier estimates that the actual quality level exceeds 1,0 % but is no more than 1,5 %. For the next series of shipments the supplier, without consulting the customer, may shift to the plan corresponding to the related interval of nonconformity 1,0 % to 1,5 % (namely to the plan with the sample size of 213 and acceptance number 6).

B.1.5 Adjustment of a sampling plan to upgraded quality (supplier inspection)

As a result of quality improvement activities, the percent nonconforming decreases to a value less than 0,4 %. In this situation the supplier, unilaterally, decides to shift to a plan conforming to the interval of nonconformity 0,25 % to 0,4 % (sample size is 67 and acceptance number is 1).

B.1.6 Customer inspection

To inspect resistors in a lot of 10 000, the customer uses a single sampling plan. A permissible customer's single sampling plan is found from the plans satisfying the specified normative quality limit NQL = 4 % (Table A.32).

Taking into account the inspection staff resources on incoming inspection, the customer sets a sample of size of 25. Reading Table A.32 for this value, the customer finds a rejection number of 4. Thus, if four or more nonconforming items are found in a random sample of 25 items, a decision may be taken to reject the lot.

In order to cut down the inspection costs under the same rejection number the customer may draw a sample of size equal to the minimal value within the sample size interval for rejection number 4, i.e. a sample size of 22. It will, however, reduce the probability of lot rejection when the actual percent nonconforming is over 4 %.

To increase the probability of rejection for lots that have an actual percent nonconforming in excess of 4 % using an inspection plan with rejection number 4, the customer may determine the size of the sample to be at the upper limit of the interval for this rejection number, i.e. a sample size of 35.

B.1.7 Increasing a trust level

The supplier's quality system is certified in accordance with ISO 9001. The supplier proposes to the customer that the customer raises the trust level to T5 with β_0 = 0,75.

Wherever appropriate, the customer may increase, retain or reduce the level of trust. Unless the customer objects to increasing the trust level, the customer may agree with the supplier to fix a customer's risk on supplier inspection of 0,75. Such an agreement should be provided with a date reference, for example the date of receipt of a certificate from the supplier.

In this case, the supplier is permitted to use a sampling plan conforming to trust level T5, i.e. from Table A.18. Table A.18 shows that the normative quality limit NQL = 4 % corresponds to a sample size of 8 and an acceptance number of 0. As a result of updating a trust level from T3 to T5, the sample size defined by the supplier reduces from 67 to 8 items.

During a half-year term, not a single lot was rejected by a customer on incoming inspection. Thus it may be decided to replace incoming inspection by inspection check-up and adjust the trust level to T6 on a supplier inspection.

In order to conform with β_0 = 0,9 and the trust level T6, the supplier may select a plan from Table A.19 (sample size 3; acceptance number 0). It should be noted that all sample sizes greater than 3 for acceptance number zero are also permissible on supplier inspection.

B.1.8 Shipment of product without inspection

The supplier proposes to the customer that product is shipped without inspection, thereby achieving cuts in the prime cost of resistors. Taking into account the positive experience of a long-term (2 years) of previous shipments from this supplier, a certified supplier quality system and SPC implementation, the customer decides to change the trust level to T7 and agrees to the supplier shipping the product without inspection at lower cost.

Wherever appropriate, a customer may reduce the trust level from T7 each time new evidence of a lower supplier's manufacturing capability becomes available.

B.2 Example 2 (nonconformities per 100 items)

B.2.1 Requirements specified in a contract

The contract for supply of resistors defines the following parameters: the normative quality limit NQL = 4 nonconformities per 100 items and trust level T4 (β_0 = 0,5). A set of coordinated supplier and customer single sampling plans should be selected.

B.2.2 Supplier inspection

Using Table A.22 from the catalogue of supplier single sampling plans for an NQL of 4, permissible sample sizes and acceptance numbers given in Table B.2 are found.

Table B.2 — Permissible sample sizes and acceptance numbers for Example 2

Sample size	Acceptance number	Rejection number
18	0	1
42	1	2
67	2	3
117	4	5
367	14	15

The supplier expects the actual quality level to be no greater than one nonconformity per 100 items. This value falls into the interval of nonconformity up to 1,0 conforming to the sample size of 67 and an acceptance number 2. Thus, the lots should be accepted by the supplier with respect to the indicated nonconformity class if, in a sample of 67 items, no more than two nonconformities of the given class are discovered. This plan provides a probability of at least 0,95 of accepting a lot containing at most one nonconformity per 100 items.

B.2.3 Customer inspection

A customer defines a sample size of 10 for incoming inspection.

From Table A.33 for NQL 4 and sample size 10, the rejection number is found to be 3. Thus the customer has to discover at least three nonconformities in the sample to warrant making a claim against the supplier.

B.3 Example 3 (small lot size)

Consider Example 1 with the lot size reduced to 400. For a lot size of 400, an NQL of 4 % nonconforming and a trust level T3, Table A.12 should be used.

The permissible supplier single sampling plans in this case are given in Table B.3.

Table B.3 — Permissible supplier single sampling plans for Example 3

Sample size	Acceptance number	Rejection number
33	0	1
64	1	2
93	2	3
148	4	5
275	9	10

Thus, for an actual quality level in the range 0,7 % to 0,8 % the plan with a fixed sample size of 93 and an acceptance number of 2 should be used. (Compare with Example 1.)

The customer's plan is derived in a similar way to that of Example 1, but using Table A.30 instead of Table A.32.

B.4 Example 4 (small lot size)

An explanation of the numbers enclosed in parentheses is given in the notes to the customer sampling tables.

Assume the data from Example 2 and on customer's inspection suppose that the lot size is 90, and that the normative quality limit is 4 nonconformities per 100 items.

If a customer decides to use a plan with a sample size of 30, then the rejection number will be equal to 4 (see Table A.33). However because the lot size, 90, is smaller than the number in parentheses, 99, (see Table A.33 for an NQL of 4 and a rejection number of 4) the customer can use any sample size for this rejection number.

Annex C
(informative)

Theoretical justification

C.1 Calculation of a single sampling plan OC curve

C.1.1 Number of nonconformities per 100 items

With a sample size n, acceptance number Ac and nonconformities per item p', the probability of acceptance of a lot is given by the Poisson distribution function in Equation (C.1).

$$P_{n,\mathrm{Ac}}(p') = \sum_{d=0}^{\mathrm{Ac}} \frac{(np')^d \mathrm{e}^{-np'}}{d!} \tag{C.1}$$

Using Equation (C.1), the values of the OC curve for $p = 100p'$ nonconformities per 100 items can be calculated as

$$L(p) = P_{n,\mathrm{Ac}}(p/100)$$

C.1.2 Percent nonconforming items

If N denotes the lot size, D denotes the number of nonconforming items in the lot, n denotes the sample size and Ac denotes the acceptance number, then the acceptance probability for the lot (which has percent nonconforming $p = 100\ D/N$) is given by the hypergeometric distribution function

$$P_{n,\mathrm{Ac}}(D) = \sum_{d=0}^{\mathrm{Ac}} \frac{\binom{n}{d}\binom{N-n}{D-d}}{\binom{N}{D}} \tag{C.2}$$

where

$$\binom{i}{j} = \frac{i!}{j!(i-j)!} \tag{C.3}$$

Using Equation (C.2), the values of the OC curve for $p = 100\ D/N$ percent nonconforming can be calculated as

$$L(p) = P_{n,\mathrm{Ac}}(Np/100)$$

C.2 Conditions for supplier sampling plans to be permissible

C.2.1 Number of nonconformities per 100 items

When the NQL is expressed in terms of nonconformities per 100 items, any single sampling plan (n, Ac) will be a permissible supplier sampling plan for a specified trust level with a customer's risk on supplier inspection β_0 if the OC curve satisfies Inequality (C.4):

$$L_s(p_{NQL}) \leq \beta_0$$

i.e.

$$P_{n,Ac}\left(\frac{p_{NQL}}{100}\right) \leq \beta_0 \tag{C.4}$$

where p_{NQL} is the NQL in terms of nonconformities per 100 items.

C.2.2 Percent nonconforming items

When the NQL is expressed in terms of percent nonconforming, plan for a lot size N will be the supplier permissible plan if OC curve of this plan satisfies Inequality (C.5):

$L_s(p_{NQL}) \leq \beta_0$, i.e.

$$P_{n,Ac}(D*+1) \leq \beta_0 \tag{C.5}$$

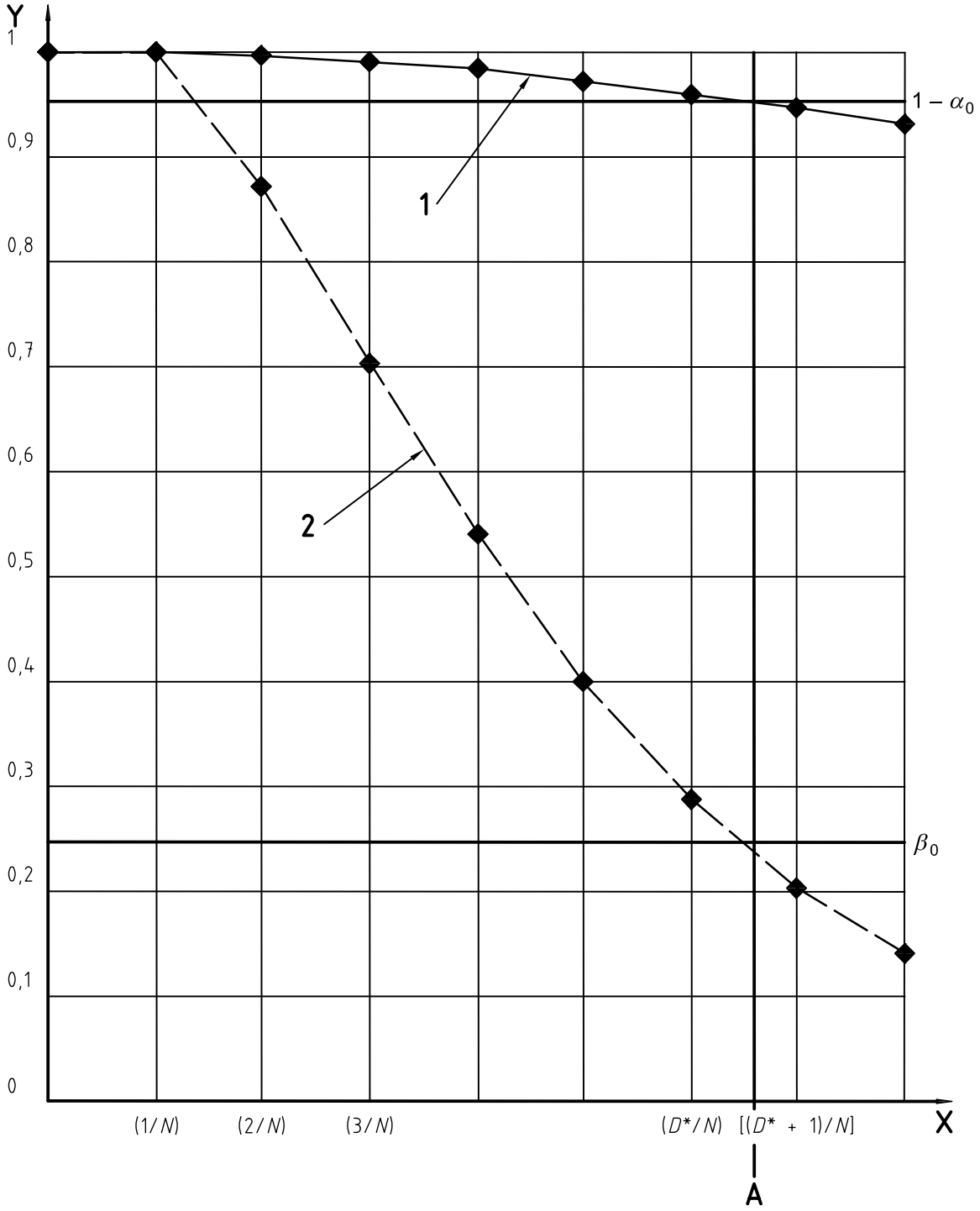
where

$$D* = \left[Np_{NQL}/100\right]$$

where the square brackets denote taking the integer part of the function enclosed in these brackets and p_{NQL} is the NQL in terms of percent nonconforming (see Figure C.1).

If the number of nonconforming items in the lot is no greater than $D*$, then the lot is assumed to be satisfactory, while if the number of nonconforming items exceeds $D*$, then the lot is unsatisfactory.

EXAMPLE Let us assume that N = 102 and that the NQL = 6,5 %. Then $D* = 6$, and any lot with the number of nonconforming items no greater than 6 is assumed to be satisfactory while any lot with the number of nonconforming items 7 or more will be qualified as an unsatisfactory lot. The condition (C.5) shall be met for a lot of size of 102 in which 7 items are nonconforming (see Figure C.1).



Key

X percent nonconforming (× 100), %
Y probability of acceptance
1 customer OC curve for n = 6, Ac = 1
2 supplier OC curve for n = 37, Ac = 1
A NLQ

Figure C.1 — Discrete behaviour of percent nonconforming for a fixed lot size *N*

C.2.3 A supplementary condition

This part of ISO 28598 provides a set of permissible supplier sampling plans which minimize the sample size for each acceptance number subject to conditions of Inequalities (C.4) or (C.5).

C.3 A condition for drawing a permissible customer sampling plan

C.3.1 Number of nonconformities per 100 items

For an NQL expressed in terms of nonconformities per 100 items, a plan (n, Ac) will be treated as a permissible customer plan if the customer's OC curve $L_c(p)$ satisfies:

$$L_c(p_{NQL}) \geq 1-\alpha_0$$

i.e.

$$P_{n,Ac}(p_{NQL}/100) \geq 1-\alpha_0 \tag{C.6}$$

where α_0 is the limit on the supplier's risk on customer inspection (in this part of ISO 28598, $\alpha_0 = 0{,}05$).

C.3.2 Percent nonconforming items

For an NQL expressed in terms of percent nonconforming, a plan (n, Ac) will be treated as a permissible customer plan if the customer's OC curve $L_c(p)$ satisfies:

$$L_c(p_{NQL}) \geq 1-\alpha_0$$

i.e.

$$P_{n,Ac}(D*) \geq 1-\alpha_0 \tag{C.7}$$

where

$$D^* = \left[Np_{NQL}/100 \right]$$

EXAMPLE If the assumed data are similar to the Example in C.2.2, the condition (C.7) should be met for lots with 6 nonconforming items out of 102 items in a lot.

C.3.3 Supplementary condition

This part of ISO 28598 provides, for a range of rejection numbers, customer single sampling plans with largest sample sizes subject to (C.6) or (C.7) (upper values of sample size intervals).

C.4 The lot size used for calculating a permissible plan

In calculating the permissible plans of this part of ISO 28598, account was taken of the fact that, for a fixed sampling plan, the relationship between the acceptance probability and the lot size for a fixed NQL is not a monotonic function. Lot size intervals were therefore calculated for each NQL to be consistent with the worst permissible values of the acceptance probabilities (i.e. the largest value of the probability for the supplier's plan and the smallest value of the probability for the customer's plan).

C.5 A preferred supplier plan

Each pair of values of NQL and β_0 conforms to several permissible plans (e.g. Ac = 0 and n_0, Ac = 1 and n_1, etc.).

At the point of an expected quality level these plans coincide with various values of acceptance probability. This part of ISO 28598 prescribes for each value of the upper limit p_{NQL} of an interval of nonconformity levels a preferred plan out of a set of permissible plans. Preferred plans have a probability of acceptance at this quality level of no less than 0,95 and the smallest possible sample size:

$$L_s\left(p_{NQL}\right) \geq 0{,}95$$

It means that

$$P_{n,Ac}\left(p_{NQL}/100\right) \geq 0{,}95$$

for the number of nonconformities per 100 items, or

$$P_{n,Ac}(D_{UQL}) \geq 0{,}95$$

for percent nonconforming

where p_{NQL} is the upper limit of the interval of nonconformity in the supplier's sampling tables, and

$$D_{UQL} = \left[Np_{NQL}/100\right].$$

The conditions (C.4) or (C.5) are respectively met.

C.6 Calculation of the arbitration characteristic

A formula for calculating the arbitration characteristic curve is (see ISO 28598-1:2017, Annex A)

$$A(p) = L_s(p)\left[1 - L_c(p)\right]$$

where

$A(p)$ is the probability of accepting an arbitration situation for a supplier and customer sampling system;

$L_s(p)$ is the probability of accepting a lot for a sampling plan on supplier inspection for lot quality level p;

$L_c(p)$ is the probability of accepting a lot for a sampling plan on customer inspection for lot quality level p;

p is the lot quality level.

NOTE The formula is based on the assumption that lot quality is the same for the supplier and the customer, i.e. that the lot quality is not affected by the supplier's inspection, by the delivery or by the storage of the lot.

Bibliography

[1] ISO/TR 8550 (all Parts), *Guide for the selection of an acceptance sampling system, scheme or plan for inspection of discrete items in lots*

[2] ISO 9001, *Quality management systems — Requirements*

ICS 03.120.30

Price based on 51 pages