INTERNATIONAL STANDARD

ISO 8422

Second edition
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Sequential sampling plans for inspection by attributes

Plans d'échantillonnage progressif pour le contrôle par attributs

Reference number
ISO 8422:2006(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 8422 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 5, *Acceptance sampling*.

This second edition cancels and replaces the first edition (ISO 8422:1991), of which it constitutes a technical revision. It also incorporates the Technical Corrigendum ISO 8422:1991/Cor.1:1993. The following improvements have been introduced:

— preferred values of producer's risk quality and consumer's risk quality have been changed and their series have been extended,

— values of the parameters h_A, h_R and g have been recalculated in order to provide plans that exactly meet stated requirements,

— consumer's risk quality values in percent nonconforming are separated from those in nonconformities per 100 items both in the master tables and in Table A.1, which contains the average sample sizes for sequential sampling plans.

The revised version of Annex A of ISO 8422:1991 has been published as ISO 2859-5.

Introduction

In contemporary production processes, quality is often expected to reach such high levels that the number of nonconforming items is reported in parts per million (10^{-6}). Under such circumstances, popular acceptance sampling plans, such as those presented in ISO 2859-1, require prohibitively large sample sizes. To overcome this problem, users apply acceptance sampling plans with higher probabilities of wrong decisions or, in extreme situations, abandon the use of acceptance sampling procedures altogether. However, in many situations there is still a need to accept products of high quality using standardized statistical methods. In such cases, there is a need to apply statistical procedures that require the smallest possible sample sizes. Sequential sampling plans are the only statistical procedures that satisfy that need as, among all possible sampling plans having similar statistical properties, the sequential sampling plan has the smallest average sample size.

The principal advantage of sequential sampling plans is the reduction in the average sample size. The average sample size is the weighted average of all the sample sizes that may occur under a sampling plan for a given lot or process quality level. Like double and multiple sampling plans, the use of sequential sampling plans leads to a smaller average sample size than single sampling plans having the equivalent operating characteristic. However, the average savings are even greater when using a sequential sampling plan than when a double or multiple sampling plan is used. For lots of very good quality, the maximum savings for sequential sampling plans may reach 85 %, as compared to 37 % for double sampling plans and 75 % for multiple sampling plans. On the other hand, when using a double, multiple or sequential sampling plan, the actual number of items inspected for a particular lot may exceed the sample size, n_0, of the corresponding single sampling plan. For double and multiple sampling plans, there is an upper limit of 1,25 n_0 to the actual number of items to be inspected. For classical sequential sampling plans, there is no such limit, and the actual number of inspected items may exceed the corresponding single sample size, n_0, or be even as large as the lot size, N. For the sequential sampling plans in this International Standard, a curtailment rule has been introduced involving an upper limit n_t on the actual number of items to be inspected.

Other factors that should be taken into account include:

a) Simplicity

The rules of a sequential sampling plan are more easily misunderstood by inspectors than the simple rules for a single sampling plan.

b) Variability in the amount of inspection

As the actual number of items inspected for a particular lot is not known in advance, the use of sequential sampling plans brings about various organisational difficulties. For example, scheduling of inspection operations may be difficult.

c) Ease of drawing sample items

If drawing sample items at different times is expensive, the reduction in the average sample size by sequential sampling plans may be cancelled out by the increased sampling cost.

d) Duration of test

If the test of a single item is of long duration and a number of items can be tested simultaneously, sequential sampling plans are much more time-consuming than the corresponding single sampling plans.

e) Variability of quality within the lot

If the lot consists of two or more sublots from different sources and if there is likely to be a substantial difference between the qualities of the sublots, drawing of a representative sample under a sequential sampling plan is far more awkward than under the corresponding single sampling plan.

The advantages and disadvantages of double and multiple sampling plans always lie between those of single and sequential sampling plans. The balance between the advantage of a smaller average sample size and the above disadvantages leads to the conclusion that sequential sampling plans are suitable only when inspection of individual items is costly in comparison with inspection overheads.

The choice between single, double, multiple and sequential sampling plans shall be made before the inspection of a lot is started. During inspection of a lot, it is not permitted to switch from one type to another, because the operating characteristics of the plan may be drastically changed if the actual inspection results influence the choice of acceptability criteria.

Although use of sequential sampling plans is on average much more economical than the use of corresponding single sampling plans, acceptance or non-acceptance may occur at a very late stage due to the cumulative count of nonconforming items (or nonconformities) remaining between the acceptance number and the rejection number for a long time. When using the graphical method, this corresponds to the random progress of the step curve remaining in the indecision zone. Such a situation is most likely to occur when the lot or process quality level (in terms of percent nonconforming or in nonconformities per 100 items) is close to ($100g$), where g is the parameter giving the slope of the acceptance and rejection lines.

To improve upon this situation, the sample size curtailment value is set before the inspection of a lot is begins. If the cumulative sample size reaches the curtailment value n_t without determination of lot acceptability, inspection terminates and the acceptance and non-acceptance of the lot is then determined using the curtailment values of the acceptance and rejection numbers.

For sequential sampling plans in common use, curtailment usually represents a deviation from their intended usage, leading to a distortion of their operating characteristics. In this International Standard, however, the operating characteristics of the sequential sampling plans have been determined with curtailment taken into account, so curtailment is an integral component of the provided plans.

Sequential sampling plans for inspection by attributes are also provided in ISO 2859-5. However, the design principle of those plans is fundamentally different from that of this International Standard. The sampling plans in ISO 2859-5 are designed to supplement the ISO 2859-1 acceptance sampling system for inspection by attributes. Thus, they should be used for the inspection of a continuing series of lots, that is, a series long enough to permit the switching rules of the ISO 2859 system to function. The application of the switching rules is the only means of providing enhanced protection to the consumer (by means of tightened sampling inspection criteria or discontinuation of sampling inspection) when the sequential sampling plans from ISO 2859-5 are used. However, in certain circumstances, there is a strong need to have both the producer's and the consumer's risks under strict control. Such circumstances occur, for example, when sampling is performed for regulatory reasons, to demonstrate the quality of the production processes or to test hypotheses. In such cases, individual sampling plans selected from the ISO 2859-5 sampling scheme may be inappropriate. The sampling plans from this International Standard have been designed in order to meet these specific requirements.

Sequential sampling plans for inspection by attributes

1 Scope

This International Standard specifies sequential sampling plans and procedures for inspection by attributes of discrete items.

The plans are indexed in terms of the producer's risk point and the consumer's risk point. Therefore, they can be used not only for the purposes of acceptance sampling, but for a more general purpose of the verification of simple statistical hypotheses for proportions.

The purpose of this International Standard is to provide procedures for sequential assessment of inspection results that may be used to induce the supplier, through the economic and psychological pressure of non-acceptance of lots of inferior quality, to supply lots of a quality having a high probability of acceptance. At the same time, the consumer is protected by a prescribed upper limit to the probability of accepting lots of poor quality.

This International Standard provides sampling plans that are applicable, but not limited, to inspection in different fields, such as:

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

This International Standard contains sampling plans for inspection by attributes of discrete items. The sampling plans may be used when the extent of nonconformity is expressed either in terms of proportion (or percent) nonconforming items or in terms of nonconformities per item (per 100 items).

The sampling plans are based on the assumption that nonconformities occur randomly and with statistical independence. There may be good reasons to suspect that one nonconformity in an item could be caused by a condition also likely to cause others. If so, it would be better to consider the items just as conforming or not, and ignore multiple nonconformities.

The sampling plans from this International Standard should primarily be used for the analysis of samples taken from processes. For example, they may be used for the acceptance sampling of lots taken from a process that is under statistical control. However, they may also be used for the acceptance sampling of an isolated lot when its size is large, and the expected fraction nonconforming is small (significantly smaller than 10 %).

In the case of the acceptance sampling of continuing series of lots, the system of sequential sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection published in ISO 2859-5 should be applied.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3534-1 and the following apply. References are given in square brackets for definitions that have been repeated here for convenience.

3.1
inspection
conformity evaluation by observation and judgement accompanied as appropriate by measurement, testing or gauging

[ISO 3534-2:2006, 4.1.2]

3.2
inspection by attributes
inspection (3.1) by noting the presence, or absence, of one or more particular characteristic(s) in each of the items in the group under consideration, and counting how many items do, or do not, possess the characteristic(s), or how many such events occur in the item, group or opportunity space

NOTE When inspection is performed by simply noting whether the item is nonconforming or not, the inspection is termed inspection for nonconforming items. When inspection is performed by noting the number of nonconformities on each unit, the inspection is termed inspection for number of nonconformities.

[ISO 3534-2:2006, 4.1.3]

3.3
item
entity
anything that can be described and considered separately

EXAMPLE A discrete physical item; a defined amount of bulk material; a service, activity, person, system or some combination thereof.

[ISO 3534-2:2006, 1.2.11]

3.4
nonconformity
non-fulfilment of a requirement

[ISO 3534-2:2006, 3.1.11]

NOTE See notes to 3.5.

3.5
defect
non-fulfilment of a requirement related to an intended or specified use

NOTE 1 The distinction between the concepts defect and **nonconformity** (3.4) is important as it has legal connotations, particularly those associated with product liability issues. Consequently the term "defect" should be used with extreme caution.

NOTE 2 The intended use by the customer can be affected by the nature of information, such as operating or maintenance instructions, provided by the customer.

[ISO 3534-2:2006, 3.1.12]

3.6
nonconforming item
item (3.3) with one or more **nonconformities** (3.4)

[ISO 3534-2:2006, 1.2.12]

3.7
percent nonconforming
⟨in a sample⟩ one hundred times the number of **nonconforming items** (3.6) in the **sample** (3.13) divided by the **sample size** (3.14), viz:

$$100 \times \frac{d}{n}$$

where

d is the number of nonconforming items in the sample;

n is the sample size

[ISO 2859-1:1999, 3.1.8]

3.8
percent nonconforming
⟨in a population or lot⟩ one hundred times the number of **nonconforming items** (3.6) in the population or **lot** (3.11) divided by the population or **lot size** (3.12), viz:

$$100 \times p_{\text{ni}} = 100 \times \frac{D_{\text{ni}}}{N}$$

where

p_{ni} is the proportion of nonconforming items;

D_{ni} is the number of nonconforming items in the population or lot;

N is the population or lot size

NOTE 1 Adapted from ISO 2859-1:1999, 3.1.9.

NOTE 2 In this International Standard, the terms **percent nonconforming** (3.7 and 3.8) or **nonconformities per 100 items** (3.9 and 3.10) are mainly used in place of the theoretical terms "proportion of nonconforming items" and "nonconformities per item" because the former terms are the most widely used.

3.9
nonconformities per 100 items
⟨in a sample⟩ one hundred times the number of **nonconformities** (3.4) in the **sample** (3.13) divided by the **sample size** (3.14), viz:

$$100 \times \frac{d}{n}$$

where

d is the number of nonconformities in the sample;

n is the sample size

[ISO 2859-1:1999, 3.1.10]

3.10
nonconformities per 100 items
⟨in a population or lot⟩ 100 times the number of **nonconformities** (3.4) in the population or **lot** (3.11) divided by the population or **lot size** (3.12), viz:

$$100 \times p_{\mathrm{nt}} = 100 \times \frac{D_{\mathrm{nt}}}{N}$$

where

p_{nt} is the number of nonconformities per item;

D_{nt} is the number of nonconformities in the population or lot;

N is the population or lot size

NOTE 1 Adapted from ISO 2859-1:1999, 3.1.11.

NOTE 2 An item may contain one or more nonconformities.

3.11
lot
definite part of a population constituted under essentially the same conditions as the population with respect to the sampling purpose

NOTE The sampling purpose can, for example, be to determine lot acceptability, or to estimate the mean value of a particular characteristic.

[ISO 3534-2:2006, 1.2.4]

3.12
lot size
number of **items** (3.3) in a **lot** (3.11)

[ISO 2859-1:1999, 3.1.14]

3.13
sample
subset of a population made up of one or more sampling units

[ISO 3534-2:2006, 1.2.17]

3.14
sample size
number of sampling units in a **sample** (3.13)

[ISO 3534-2:2006, 1.2.26]

3.15
acceptance sampling plan
plan which states the **sample size**(s) (3.14) to be used and the associated criteria for lot acceptance

[ISO 3534-2:2006, 4.3.3]

3.16
consumer's risk quality
Q_{CR}
⟨acceptance sampling⟩ quality level of a **lot** (3.11) or process which, in the **acceptance sampling plan** (3.15), corresponds to a specified consumer's risk

[ISO 3534-2:2006, 4.6.9]

NOTE The specified consumer's risk is usually 10 %.

3.17
producer's risk quality
Q_{PR}
⟨acceptance sampling⟩ quality level of a **lot** (3.11) or process which, in the **acceptance sampling plan** (3.15), corresponds to a specified producer's risk

[ISO 3534-2:2006, 4.6.10]

NOTE The specified producer's risk is usually 5 %.

3.18
count
when inspection by attributes is performed, the result of the inspection of each sample item

NOTE In the case of the inspection for nonconforming items, the count is set to 1 if the sample item is nonconforming. In the case of the inspection for nonconformities, the count is set to the number of nonconformities found in the sample item.

3.19
cumulative count
when a sequential sampling plan is used, the sum of the counts during inspection, counting from the start of the inspection of the lot up to, and including, the sample item last inspected

3.20
cumulative sample size
when a sequential sampling plan is used, the total number of sample items during inspection, counting from the start of the inspection of the lot up to, and including, the sample item last inspected

3.21
acceptance value
⟨for sequential sampling⟩ value used in the graphical method for determination of acceptance of the lot, that is derived from the specified parameters of the sampling plan and the cumulative sample size

3.22
acceptance number
⟨for sequential sampling⟩ number used in the numerical method for determination of acceptance of the lot, that is obtained by rounding the acceptance value down to the nearest integer

3.23
rejection value
⟨for sequential sampling⟩ value used in the graphical method for determination of non-acceptance of the lot, that is derived from the specified parameters of the sampling plan and the cumulative sample size

3.24
rejection number
⟨for sequential sampling⟩ number used in the numerical method for determination of non-acceptance of the lot, that is obtained by rounding the rejection value up to the nearest integer

3.25
acceptability table
table used for the lot acceptability determination in the numerical method

3.26
acceptability chart
chart used for the lot acceptability determination in the graphical method, consisting of the following three zones:

— acceptance zone;

— rejection zone;

— indecision zone;

the borders being acceptance, rejection and curtailment lines

4 Symbols and abbreviated terms

The symbols and abbreviations used in this International Standard are as follows:

A acceptance value (for sequential sampling plan)

Ac acceptance number

Ac_0 acceptance number for a corresponding single sampling plan

Ac_t acceptance number at curtailment (curtailment value)

d count

D cumulative count

g parameter giving the slope of the acceptance and rejection lines

h_A parameter giving the intercept of the acceptance line

h_R parameter giving the intercept of the rejection line

n_0 sample size for a corresponding single sampling plan

n_cum cumulative sample size

n_t cumulative sample size at curtailment (curtailment value)

$\overline{P}$ process average

p_x quality level for which the probability of acceptance is x, where x is a fraction

P_a probability of acceptance (in percent)

Q_{CR} consumer's risk quality (in percent nonconforming items or in nonconformities per hundred items)

Q_{PR} producer's risk quality (in percent nonconforming items or in nonconformities per hundred items)

R rejection value (for sequential sampling plan)

Re rejection number

Re_0 rejection number for a corresponding single sampling plan

Re_t rejection number at curtailment (curtailment value)

NOTE $Re_t = Ac_t + 1$

α producer's risk

β consumer's risk

5 Principles of sequential sampling plans for inspection by attributes

Under a sequential sampling plan by attributes, sample items are drawn at random and inspected one by one, and the cumulative count (the total number of nonconforming items or nonconformities) is obtained. After the inspection of each item, the cumulative count is compared with the acceptability criteria in order to assess whether there is sufficient information to decide about the lot at that stage of the inspection.

If, at a given stage, the cumulative count is such that the risk of accepting a lot of unsatisfactory quality level is sufficiently low, the lot is considered acceptable and the inspection is terminated.

If, on the other hand, the cumulative count is such that the risk of non-acceptance of a lot of satisfactory quality level is sufficiently low, the lot is considered not acceptable and the inspection is terminated.

If the cumulative count does not allow either of the above decisions to be taken, then an additional item is sampled and inspected. The process is continued until sufficient sample information has been accumulated to warrant a decision that the lot is acceptable or not acceptable.

6 Selection of a sampling plan

6.1 Producer’s risk point and consumer’s risk point

The general method described in 6.1 and 6.2 is used when the requirements of the sequential sampling plan are specified in terms of two points on the operating characteristic curve of the plan. The point corresponding to the higher probability of acceptance shall be designated the *producer’s risk point*; the other shall be designated the *consumer’s risk point.*

The first step when designing a sequential sampling plan is to choose these two points, if they have not already been dictated by circumstances. For this purpose, the following combination is often used:

— a producer’s risk of $\alpha \leqslant 0{,}05$ and the corresponding producer’s risk quality (Q_{PR}), and

— a consumer's risk of $\beta \leqslant 0{,}10$ and the corresponding consumer's risk quality (Q_{CR}).

When the desired sequential sampling plan is required to have approximately the same operating characteristic curve as an existing single, double or multiple sampling plan, the producer's risk point and the consumer's risk point may be read off from a graph or a table of the operating characteristic of that plan. When no such plan exists, the producer's and the consumer's risk points have to be determined from direct consideration of the conditions under which the sampling plan operates.

6.2 Preferred values of Q_{PR} and Q_{CR}

Tables 1 and 2 give 28 preferred values of Q_{PR} (producer's risk quality) ranging from 0,020 % to 10,0 %, and 23 preferred values of Q_{CR} (consumer's risk quality) ranging from 0,200 % to 31,5 %. This International Standard is applicable only when a combination of the preferred values of Q_{PR} and Q_{CR} is chosen under the constraints $\alpha \leqslant 0{,}05$ and $\beta \leqslant 0{,}10$.

6.3 Pre-operation preparations

6.3.1 Obtaining the parameters h_A, h_R and g

The criteria for acceptance and non-acceptance of a lot that are invoked at each stage of inspection are determined from the parameters h_A, h_R, and g.

Tables 1 and 2 give the values of these parameters corresponding to a combination of preferred values of Q_{PR} and Q_{CR} together with a producer's risk of $\alpha \leqslant 0{,}05$ and a consumer's risk of $\beta \leqslant 0{,}10$. Table 1 is for percent nonconforming inspection, and Table 2 is for nonconformities per 100 items inspection.

6.3.2 Obtaining the curtailment values

The curtailment value, n_t, of the cumulative sample size of the sequential sampling plan is given in Tables 1 and 2 together with the parameters h_A, h_R, and g.

7 Operation of a sequential sampling plan

7.1 Specification of the plan

Before operation of a sequential sampling plan, the inspector shall record on the sampling document the specified values of the parameters, h_A, h_R and g, and the curtailment values, n_t and Ac_t.

7.2 Drawing a sample item

The individual sample items shall be drawn at random from the lot and inspected one by one in the order in which they are drawn.

7.3 Count and cumulative count

7.3.1 Count

For inspection for percent nonconforming, if the sample item is nonconforming, the count, d, for the sample item is 1; otherwise, the count, d, is zero.

For inspection for nonconformities per 100 items, the count, d, for the sample item is the number of nonconformities found in the sample item.

7.3.2 Cumulative count

The cumulative count, D, is the cumulative sum of the count d from the first sample item up to the most recent (i.e. the n_{cum}) sample item inspected so far.

7.4 Choice between numerical and graphical methods

This International Standard provides two methods of operating a sequential sampling plan: a numerical method and a graphical method, either one of which may be chosen.

The numerical method uses an acceptability table for operating, and has the advantage of being accurate, thereby avoiding disputes about acceptance or non-acceptance in marginal cases. An acceptability table can also be used as an inspection record sheet, after inscribing the inspection results.

The graphical method uses an acceptability chart for operating, and has the advantage of displaying the increase in the information on the lot quality as additional items are inspected, information being represented by the step curve within the indecision zone, until the line reaches, or crosses, one of the boundaries of that zone. On the other hand, the method is less accurate, due to the inaccuracy inherent in plotting points and in drawing lines.

The numerical method is the standard method so far as acceptance or non-acceptance is concerned (see the caution in 7.6.2). When the numerical method is applied, it is recommended that the calculation and preparation of an acceptability table be done using appropriate software.

7.5 Numerical method

7.5.1 Preparation of the acceptability table

When the numerical method is used, the following calculations shall be carried out and an acceptability table shall be prepared.

For each value, n_{cum}, of the cumulative sample size that is less than the curtailment value of the sample size, the acceptance value, A, is given by Equation (1):

$$A = \left(g \times n_{cum}\right) - h_A \tag{1}$$

and the acceptance number, Ac, is obtained by rounding the acceptance value, A, down to the nearest integer.

For each value of n_{cum}, the rejection value, R, is given by the Equation (2):

$$R = \left(g \times n_{cum}\right) + h_R \tag{2}$$

and the rejection number, Re, is obtained by rounding the rejection value, R, up to the nearest integer.

Whenever the value of A is negative, the cumulative sample size is too small to permit acceptance of the lot. Conversely, whenever the value of Equation (2) is larger than the cumulative sample size, the cumulative sample size is too small to permit non-acceptance of the lot under inspection for percent nonconforming.

Whenever the rejection number, Re, is larger than the curtailment value, Re_t, the former should be replaced by the latter, because no chance of acceptance remains when the cumulative count, D, exceeds the curtailment value, Re_t.

The values, A and R, given by Equations (1) and (2) shall have the same number of digits after the decimal point as g.

The smallest cumulative sample size permitting acceptance of the lot is obtained by rounding the value, h_A/g, up to the nearest integer. The smallest cumulative sample size permitting non-acceptance of the lot under inspection for percent nonconforming is obtained by rounding the value, $h_R/(1-g)$, up to the nearest integer. Finally, an acceptability table is established by inscribing the necessary data.

7.5.2 Making decisions

Enter the count and the cumulative count into the acceptability table prepared in accordance with 7.5.1, after the inspection of each item.

a) If the cumulative count, D, is less than or equal to the acceptance number, Ac, for the cumulative sample size, n_{cum}, the lot shall be considered acceptable and the inspection shall be terminated.

b) If the cumulative count, D, is greater than or equal to the rejection number, Re, for the cumulative sample size, n_{cum}, the lot shall be considered not acceptable and the inspection shall be terminated.

c) If neither a) nor b) is satisfied, another item shall be sampled and inspected.

When the cumulative sample size reaches the curtailment value n_t, the rules in a) and b) apply with the curtailment values of the acceptance number, Ac_t, and the rejection number, Re_t (= Ac_t + 1).

7.6 Graphical method

7.6.1 Preparation of the acceptability chart

When the graphical method is used, an acceptability chart shall be prepared in accordance with the following procedures. Prepare a graph with the cumulative sample n_{cum} as the horizontal axis, and the cumulative count, D, as the vertical axis. Draw two straight lines with the same slope, g, corresponding to the acceptance and rejection values, A and R, given by Equations (1) and (2). The lower line with the intercept of $-h_A$ is designated the acceptance line, and the upper line with the intercept of h_R is designated the rejection line. Add a vertical line, the curtailment line, at $n_{cum} = n_t$. A horizontal line, the truncation line, should be added at $D = Re_t$.

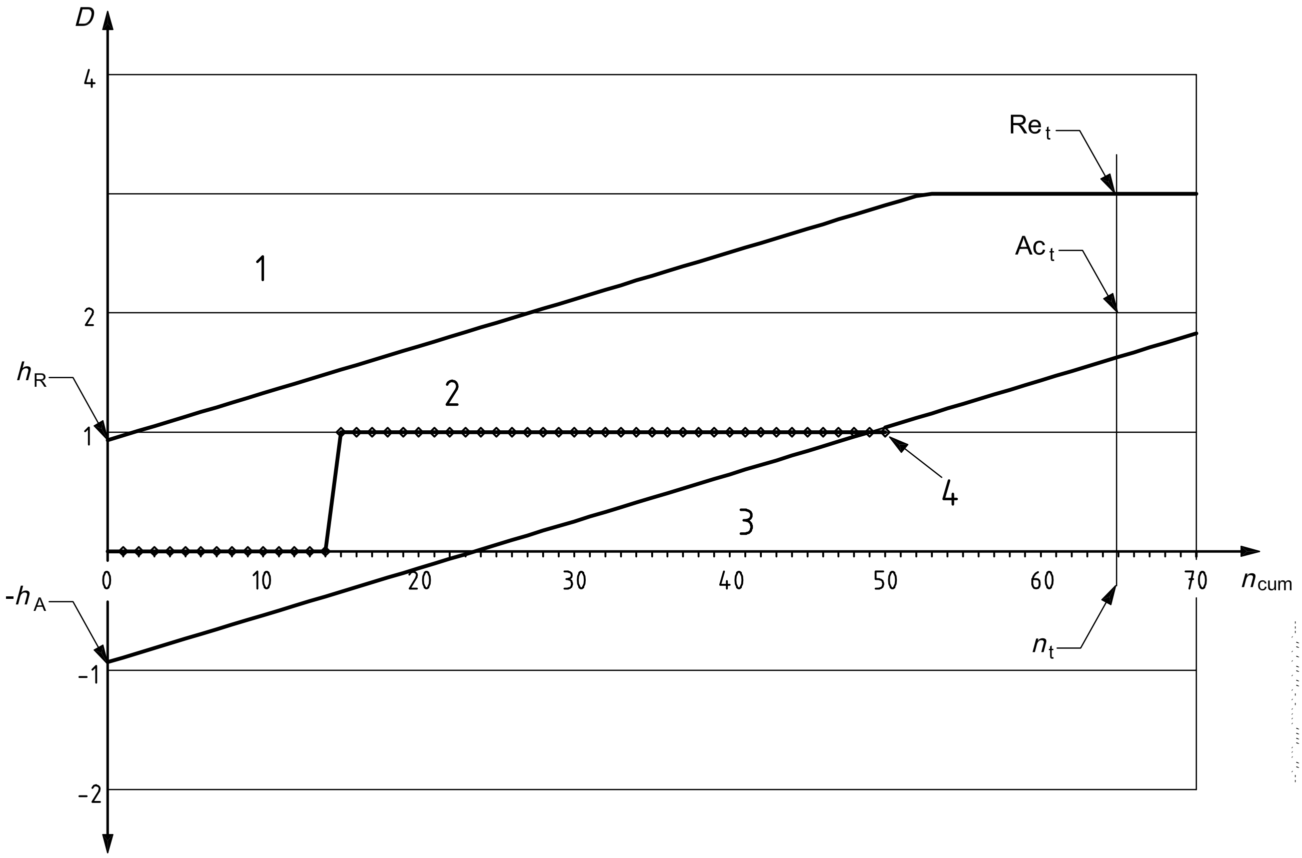
The lines define three zones on the chart.

— The acceptance zone is the zone below (and including) the acceptance line together with that part of the curtailment line that is below and includes the point (n_t, Ac_t).

— The rejection zone is the zone above (and including) the rejection line together with that part of the curtailment line that is above and includes the point (n_t, Re_t).

— The indecision zone is the strip between acceptance and rejection lines that is to the left of the curtailment line.

When the truncation line is added, the triangle at the top of the indecision zone bordered by the rejection line, the curtailment line and the truncation line (including each side) should be considered as a part of the rejection zone. In this International Standard, points on the chart representing the cumulative count will never lie on the acceptance or rejection lines. An example of the prepared graph is given as Figure 1.



Key

1 rejection zone

2 indecision zone

3 acceptance zone

4 inspection terminates

Figure 1 — Acceptability chart

7.6.2 Making decisions

When the graphical method is used, the following procedures shall be followed.

Plot the point (n_{cum},D) on the acceptability chart prepared in accordance with 7.6.1, after the inspection of each item.

a) If the point lies in the acceptance zone, the lot shall be considered acceptable and the inspection of that lot shall be terminated.

b) If the point lies in the rejection zone, the lot shall be considered not acceptable and the inspection of that lot shall be terminated.

c) If the point lies in the indecision zone, another item from that lot shall be sampled and inspected.

The successive points on the acceptability chart shall be connected by a step curve to show up any trend in the inspection results.

CAUTION — If the point is close to the acceptance or rejection lines, the numerical method shall be used to make the decision.

8 Numerical example

The following example illustrates how to use sequential sampling plans in this International Standard.

EXAMPLE

An organization representing consumers is interested in the evaluation of the quality of a certain product. Its producer claims that at least 99 % of its products are free of nonconformities. However, signals from the market have revealed that this claim might not be true. Therefore, it has been decided to verify this claim against the alternative that the real fraction nonconforming is 10 %. In order to minimise the sampling costs, it has been decided to apply a sequential sampling plan with Q_{PR} = 1 %, and Q_{CR} = 10 %.

The parameters of the plan (h_A, h_R and g) and the curtailment values (n_t and Ac_t) of the sequential sampling plan are found in Table 1.

The parameters are as follows: h_A = 0,931, h_R = 0,922 and g = 0,039 4. The curtailment values are as follows; n_t = 65 and Ac_t = 2. Therefore, rejection and acceptance values (R and A) are given by the following equations:

$$R = (g \times n_{cum}) + h_R = (0{,}039\,4 \times n_{cum}) + 0{,}922$$

and

$$A = (g \times n_{cum}) - h_A = (0{,}039\,4 \times n_{cum}) - 0{,}931.$$

When the numerical method is to be used, rejection and acceptance values (R and A) can be calculated for n_{cum} = 1 to $n_t - 1$ (equal to 64), and then rounded to acceptance and rejection numbers (Ac and Re), respectively. When the rejection number (Re) is larger than the curtailment value (Re_t = 3), each Re should be replaced by 3.

Suppose now that consecutive items randomly selected from the products available on the market are submitted for inspection. The results of the inspection are as follows:

n_{cum}	D
1	0
—	—
14	0
15	1
—	—
50	1

For n_{cum} = 50 we have D = 1, and this value is smaller than the calculated acceptance value A = 1,039. Hence, the inspection is terminated, and the producer's claim has not been rejected. The acceptability chart for this example is presented as Figure 1.

9 Tables

Table 1 — Parameters for sequential sampling plans for percent nonconforming. (Master table for $\alpha \leqslant 0{,}05$ and $\beta \leqslant 0{,}10$)

Table 2 — Parameters for sequential sampling plans for nonconformities per 100 items. (Master table for $\alpha \leqslant 0{,}05$ and $\beta \leqslant 0{,}10$)

NOTE The values of h_R steadily decrease along rows and steadily increase down columns except for the values placed along one diagonal. The values along this diagonal are correct.

Table 1 — Parameters for sequential sampling plans for percent nonconforming (Master table for $\alpha \leqslant 0{,}05$ and $\beta \leqslant 0{,}010$)

Q_{PR} (%)	Para-meter	Q_{CR} (in percent nonconforming) 0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,00	1,25	1,60	2,00	2,50	3,15	4,00	5,00
0,0200	h_A	1,014	0,878	0,835	0,788	0,741	0,694	0,616								
	h_R	0,944	0,991	0,856	0,745	0,656	0,564	0,465	*							
	g	0,000775	0,000899	0,00107	0,00126	0,00148	0,00176	0,00210								
	n_t Ac$_t$	3054 2	2079 1	1560 1	1127 1	853 1	630 1	503 1	230 0							
0,0250	h_A	1,085	1,016	0,883	0,831	0,799	0,741	0,680	0,616							
	h_R	1,280	0,943	0,985	0,847	0,741	0,651	0,559	0,464	*						
	g	0,000837	0,000971	0,00114	0,00135	0,00159	0,00187	0,00222	0,00263							
	n_t Ac$_t$	3473 2	2444 2	1649 1	1218 1	892 1	677 1	507 1	401 1	184 0						
0,0315	h_A		1,091	1,014	0,884	0,829	0,783	0,734	0,681	0,616						
	h_R		1,302	0,944	0,980	0,852	0,745	0,649	0,560	0,468	*					
	g		0,00105	0,00122	0,00145	0,00169	0,00198	0,00236	0,00279	0,00329						
	n_t Ac$_t$		2764 2	1936 2	1297 1	984 1	719 1	533 1	408 1	321 1	143 0					
0,0400	h_A		1,244	1,086	1,013	0,888	0,823	0,784	0,737	0,683	0,611					
	h_R		1,410	1,355	0,943	0,990	0,856	0,743	0,653	0,567	0,462	*				
	g		0,00114	0,00132	0,00155	0,00182	0,00212	0,00252	0,00297	0,00350	0,00421					
	n_t Ac$_t$		3282 3	2217 2	1525 2	1038 1	784 1	564 1	429 1	328 1	255 1	114 0				
0,0500	h_A			1,237	1,081	1,013	0,887	0,830	0,785	0,743	0,672	0,611				
	h_R			1,388	1,275	0,942	0,982	0,845	0,742	0,652	0,556	0,464	*			
	g			0,00143	0,00167	0,00195	0,00229	0,00270	0,00315	0,00371	0,00445	0,00526				
	n_t Ac$_t$			2590 3	1730 2	1238 2	819 1	605 1	448 1	336 1	257 1	199 1	91 0			
0,0630	h_A			1,412	1,233	1,081	1,020	0,876	0,835	0,797	0,755	0,700	0,625			
	h_R			1,684	1,365	1,312	0,942	0,980	0,850	0,745	0,645	0,560	0,465	*		
	g			0,00156	0,00181	0,00209	0,00246	0,00289	0,00340	0,00398	0,00477	0,00563	0,00848			
	n_t Ac$_t$			3110 4	2024 3	1390 2	968 2	650 1	392 1	354 1	254 1	192 1	154 1	72 0		
0,0800	h_A				1,410	1,242	1,087	1,010	0,879	0,835	0,795	0,731	0,673	0,609		
	h_R				1,682	1,407	1,346	0,942	0,986	0,855	0,740	0,650	0,567	0,467	*	
	g				0,00198	0,00228	0,00265	0,00310	0,00362	0,00427	0,00509	0,00594	0,00700	0,00834		
	n_t Ac$_t$				2448 4	1640 3	1109 2	762 2	520 1	392 1	275 1	213 1	165 1	126 1	57 0	
0,100	h_A				1,642	1,406	1,246	1,078	1,018	0,885	0,813	0,764	0,721	0,663	0,610	
	h_R				1,879	1,682	1,378	1,270	0,941	0,985	0,844	0,742	0,651	0,559	0,450	*
	g				0,00214	0,00247	0,00288	0,00334	0,00391	0,00456	0,00538	0,00631	0,00743	0,00883	0,0107	
	n_t Ac$_t$				3035 6	1954 4	1293 3	865 2	609 2	411 1	309 1	234 1	174 1	134 1	94 1	45 0

See the notes at the bottom of the table on p. 17.

Table 1 (*continued*)

Q_{PR} (in %)	Parameter	Q_{CR} (in percent nonconforming)																		
		0,500	0,630	0,800	1,00	1,25	1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,5	16,0	20,0	25,0	31,5
0,125	h_A	1,655	1,392	1,239	1,098	1,013	0,880	0,830	0,767	0,711	0,661	0,617								
	h_R	1,869	1,658	1,331	1,250	0,939	0,970	0,840	0,740	0,645	0,553	0,451	*							
	g	0,00269	0,00309	0,00364	0,00425	0,00489	0,00580	0,00679	0,00790	0,00935	0,0112	0,0134								
	n_t Ac_t	2426 6	1541 4	1004 3	692 2	490 2	320 1	238 1	184 1	140 1	102 1	75 1	36 0							
0,160	h_A	1,990	1,653	1,401	1,242	1,095	1,006	0,881	0,830	0,771	0,715	0,690	0,613							
	h_R	2,422	1,935	1,681	1,396	1,355	0,938	0,986	0,850	0,741	0,644	0,550	0,457	*						
	g	0,00296	0,00340	0,00395	0,00458	0,00530	0,00621	0,00729	0,00855	0,0100	0,0119	0,0142	0,0170							
	n_t Ac_t	3256 9	1954 6	1225 4	820 3	554 2	381 2	259 1	192 1	144 1	107 1	77 1	59 1	28 0						
0,200	h_A		1,987	1,650	1,400	1,232	1,078	0,990	0,880	0,840	0,750	0,706	0,663	0,611						
	h_R		2,361	1,865	1,678	1,400	1,243	0,938	0,980	0,840	0,734	0,641	0,553	0,434	*					
	g		0,00372	0,00430	0,00494	0,00569	0,00670	0,00777	0,00915	0,0108	0,0127	0,0150	0,0179	0,0218						
	n_t Ac_t		2555 9	1513 6	977 4	653 3	429 2	313 2	204 1	150 1	118 1	88 1	63 1	46 1	22 0					
0,250	h_A		2,430	1,920	1,648	1,406	1,240	1,090	0,993	0,880	0,797	0,748	0,719	0,662	0,597					
	h_R		3,088	2,355	1,860	1,666	1,320	1,230	0,941	0,970	0,840	0,730	0,641	0,545	0,431	*				
	g		0,00407	0,00469	0,00538	0,00620	0,00731	0,00850	0,00972	0,0115	0,0135	0,0159	0,0189	0,0228	0,0271					
	n_t Ac_t		3595 14	2100 9	1210 6	780 4	499 3	343 2	245 2	160 1	123 1	93 1	65 1	48 1	37 1	18 0				
0,315	h_A			2,405	1,952	1,631	1,385	1,245	1,082	1,020	0,870	0,800	0,780	0,740	0,661	0,587				
	h_R			3,036	2,342	1,916	1,617	1,330	1,248	0,930	0,970	0,831	0,730	0,620	0,541	0,414	*			
	g			0,0051	0,00588	0,00674	0,00785	0,00922	0,0106	0,0124	0,0146	0,0170	0,0202	0,0242	0,0287	0,0345				
	n_t Ac_t			62852 14	1627 9	1002 6	600 4	402 3	273 2	187 2	127 1	97 1	68 1	49 1	38 1	29 1	14 0			
0,400	h_A				2,434	1,981	1,634	1,405	1,225	1,075	1,005	0,870	0,820	0,743	0,695	0,660	0,574			
	h_R				3,180	2,401	1,871	1,646	1,380	1,300	0,930	0,970	0,840	0,719	0,638	0,550	0,427	*		
	g				0,00649	0,00740	0,00866	0,00996	0,0114	0,0133	0,0157	0,0184	0,0217	0,0256	0,0302	0,0363	0,0441			
	n_t Ac_t				2289 14	1297 9	780 6	483 4	323 3	219 2	147 2	100 1	76 1	55 1	41 1	29 1	23 1	11 0		
0,500	h_A				3,197	2,431	1,899	1,647	1,390	1,245	1,065	0,961	0,860	0,820	0,750	0,686	0,601	0,559		
	h_R				4,372	3,166	2,359	1,839	1,645	1,330	1,172	0,923	0,960	0,820	0,730	0,620	0,492	0,441	*	
	g				0,00715	0,00811	0,00938	0,0108	0,0124	0,0146	0,0169	0,0196	0,0232	0,0275	0,0324	0,0381	0,0462	0,0558		
	n_t Ac_t				3636 25	1827 14	1062 9	601 6	387 4	254 3	167 2	127 2	78 1	57 1	43 1	32 1	24 1	18 1	9 0	
0,630	h_A					3,228	2,379	1,939	1,605	1,386	1,221	1,061	0,952	0,853	0,796	0,735	0,638	0,586	0,600	
	h_R					4,476	3,034	2,322	1,934	1,642	1,305	1,174	0,926	0,942	0,828	0,715	0,609	0,533	0,400	*
	g					0,00896	0,0103	0,0118	0,0135	0,0156	0,0183	0,0212	0,0247	0,0294	0,0346	0,0408	0,0490	0,0585	0,0715	
	n_t Ac_t					2892 25	1424 14	818 9	517 6	307 4	198 3	133 2	104 2	63 1	45 1	34 1	27 1	20 1	14 1	7 0

See the notes at the bottom of the table on p. 17.

Table 1 (*continued*)

Q_{PR} (in %)	Para-meter	Q_{CR} (in percent nonconforming)																		
		0,500	0,630	0,800	1,00	1,25	1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,5	16,0	20,0	25,0	31,5
0,800	h_A						3,155	2,465	1,925	1,630	1,375	1,235	1,050	0,947	0,880	0,787	0,678	0,621	0,650	0,550
	h_R						4,349	3,085	2,451	1,917	1,625	1,324	1,200	0,906	0,950	0,826	0,688	0,629	0,500	0,450
	g						0,0114	0,0131	0,0148	0,0172	0,0198	0,0233	0,0269	0,0314	0,0371	0,0437	0,0521	0,0620	0,0751	0,0916
	n_t Ac_t						2265 25	1137 14	674 9	404 6	240 4	158 3	107 2	76 2	46 1	36 1	29 1	21 1	14 1	11 1
1,00	h_A							3,181	2,434	1,871	1,581	1,389	1,181	1,058	0,931	0,850	0,721	0,659	0,700	0,580
	h_R							4,255	3,077	2,430	1,851	1,591	1,309	1,046	0,922	0,940	0,779	0,672	0,650	0,500
	g							0,0143	0,0163	0,0184	0,0215	0,0251	0,0288	0,0341	0,0394	0,0466	0,0554	0,0658	0,0794	0,0965
	n_t Ac_t							1801 25	906 14	536 9	311 6	189 4	127 3	77 2	65 2	37 1	30 1	22 1	15 1	11 1

See the notes at the bottom of the table on p. 17.

Table 1 (*continued*)

Q_{PR} (in %)	Para-meter	Q_{CR} (in percent nonconforming)												
		2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,5	16,0	20,0	25,0	31,5
1,25	h_A		3,177	2,367	1,873	1,578	1,380	1,190	1,025	0,949	0,792	0,700	0,690	0,650
	h_R		4,219	3,023	2,290	1,835	1,550	1,230	1,061	0,901	0,941	0,791	0,690	0,650
	g		0,0179	0,0204	0,0235	0,0271	0,0316	0,0367	0,0427	0,0499	0,0597	0,0699	0,0841	0,1018
	n_t Ac$_t$		1440 25	723 14	419 9	251 6	149 4	96 3	64 2	45 2	31 1	23 1	16 1	11 1
1,60	h_A			3,222	2,383	1,921	1,567	1,350	1,166	1,050	0,892	0,759	0,750	0,700
	h_R			4,506	3,057	2,322	1,880	1,565	1,255	1,050	0,873	0,925	0,800	0,700
	g			0,0227	0,0260	0,0298	0,0342	0,0398	0,0466	0,0540	0,0637	0,0758	0,0899	0,1084
	n_t Ac$_t$			1145 25	567 14	326 9	202 6	117 4	79 3	49 2	36 2	24 1	16 1	12 1
2,00	h_A				3,156	2,363	1,882	1,532	1,346	1,212	1,000	0,900	0,800	0,700
	h_R				4,119	3,018	2,270	1,783	1,504	1,196	1,000	0,900	0,910	0,800
	g				0,0287	0,0325	0,0374	0,0436	0,0499	0,0582	0,0690	0,0810	0,0958	0,1150
	n_t Ac$_t$				897 25	452 14	259 9	160 6	91 4	58 3	40 2	27 2	17 1	13 1
2,50	h_A					3,106	2,305	1,830	1,529	1,330	1,120	0,980	0,930	0,800
	h_R					4,094	2,921	2,175	1,742	1,485	1,150	0,950	0,880	0,880
	g					0,0358	0,0408	0,0471	0,0546	0,0630	0,0743	0,0869	0,1023	0,1223
	n_t Ac$_t$					717 25	358 14	202 9	121 6	71 4	46 3	29 2	20 2	13 1
3,15	h_A						3,060	2,271	1,808	1,521	1,300	1,125	0,980	0,816
	h_R						4,040	2,811	2,186	1,720	1,400	1,065	0,900	0,871
	g						0,0451	0,0517	0,0596	0,0691	0,0805	0,0937	0,1099	0,1294
	n_t Ac$_t$						569 25	280 14	167 9	97 6	53 4	34 3	23 2	17 1
4,00	h_A							3,023	2,289	1,789	1,439	1,230	1,069	0,844
	h_R							3,936	2,826	2,170	1,652	1,800	1,051	0,860
	g							0,0573	0,0655	0,0745	0,0871	0,1018	0,1187	0,1406
	n_t Ac$_t$							445 25	224 14	127 9	75 6	38 3	27 3	18 2
5,00	h_A								2,995	2,221	1,773	1,403	1,160	1,000
	h_R								3,816	2,757	1,978	1,598	1,750	1,600
	g								0,0719	0,0816	0,0962	0,1092	0,1281	0,1509
	n_t Ac$_t$								354 25	177 14	97 9	59 6	31 3	19 2
6,30	h_A									2,947	2,097	1,682	1,380	1,080
	h_R									3,810	2,681	1,920	1,700	1,690
	g									0,0901	0,1040	0,1201	0,1390	0,1599
	n_t Ac$_t$									283 25	132 13	77 9	42 5	25 3

See the notes at the bottom of the table on p. 17.

Table 1 (*continued*)

Q_{PR} (in %)	Parameter	Q_{CR} (in percent nonconforming) 2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,5	16,0	20,0	25,0	31,5
8,00	h_A										2,889	2,088	1,613	1,303
	h_R										3,549	2,630	1,937	1,938
	g										0,1160	0,1310	0,1505	0,1771
	n_t Ac_t										211 24	103 13	62 9	27 4
10,0	h_A											2,675	1,960	1,474
	h_R											3,549	2,521	1,859
	g											0,1438	0,1644	0,1903
	n_t Ac_t											164 23	82 13	46 8

n_t (left hand side of the cell) is the curtailment sample size.

Ac_t (right hand side of the cell) is the acceptance number at curtailment.

A blank cell denotes that there is no recommendable sequential sampling plan. Select another combination of Q_{PR} and Q_{CR}.

* Use the curtailed single sampling plan given below in this cell.

Table 2 — Parameters for sequential sampling plans for nonconformities per 100 items (Master table for $\alpha \leqslant 0,05$ and $\beta \leqslant 0,010$)

Q_{PR} (in non-conformities per 100 items)	Para-meter	Q_{CR} (in nonconformities per 100 items) 0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,00	1,25	1,60	2,00	2,50	3,15	4,00	5,00
0,0200	h_A	1,016	0,883	0,836	0,800	0,762	0,709	0,625								
	h_R	0,944	0,991	0,856	0,743	0,654	0,562	0,464	*							
	g	0,000776	0,000903	0,00107	0,00127	0,00149	0,00177	0,00211								
	n_t Ac_t	3060 2	2083 1	1564 1	1119 1	825 1	616 1	486 1	231 0							
0,0250	h_A	1,082	1,016	0,875	0,832	0,800	0,759	0,702	0,627							
	h_R	1,286	0,944	0,987	0,848	0,743	0,651	0,555	0,463	*						
	g	0,000834	0,000970	0,00113	0,00135	0,00159	0,00187	0,00224	0,00264							
	n_t Ac_t	3474 2	2448 2	1659 1	1222 1	895 1	654 1	487 1	385 1	185 0						
0,0315	h_A		1,091	1,014	0,886	0,832	0,799	0,760	0,705	0,630						
	h_R		1,315	0,944	0,980	0,852	0,743	0,646	0,560	0,465	*					
	g		0,00105	0,00122	0,00145	0,00169	0,00200	0,00238	0,00280	0,00331						
	n_t Ac_t		2783 2	1941 2	1295 1	982 1	711 1	514 1	389 1	307 1	144 0					
0,0400	h_A		1,247	1,088	1,022	0,895	0,835	0,800	0,760	0,714	0,630					
	h_R		1,413	1,358	0,943	0,990	0,855	0,742	0,654	0,564	0,460	*				
	g		0,00114	0,00132	0,00156	0,00183	0,00214	0,00254	0,00298	0,00352	0,00423					
	n_t Ac_t		3287 3	2217 2	1528 2	1036 1	782 1	560 1	413 1	310 1	238 1	116 0				
0,0500	h_A			1,240	1,083	1,022	0,884	0,835	0,796	0,763	0,700	0,625				
	h_R			1,390	1,286	0,942	0,988	0,848	0,745	0,650	0,555	0,465	*			
	g			0,00143	0,00167	0,00195	0,00228	0,00271	0,00317	0,00373	0,00447	0,00529				
	n_t Ac_t			2590 3	1738 2	1222 2	855 1	609 1	448 1	330 1	244 1	194 1	93 0			
0,0630	h_A			1,415	1,236	1,083	1,017	0,885	0,835	0,800	0,757	0,705	0,630			
	h_R			1,687	1,372	1,329	0,943	0,980	0,854	0,747	0,645	0,560	0,465	*		
	g			0,00156	0,00181	0,00209	0,00245	0,00290	0,00339	0,00397	0,00475	0,00560	0,00663			
	n_t Ac_t			3111 4	2032 3	1399 2	972 2	648 1	489 1	358 1	257 1	195 1	151 1	74 0		
0,0800	h_A				1,415	1,239	1,101	1,021	0,890	0,835	0,800	0,760	0,715	0,630		
	h_R				1,688	1,417	1,352	0,941	0,990	0,860	0,745	0,650	0,570	0,470	*	
	g				0,00198	0,00227	0,00267	0,00312	0,00364	0,00426	0,00507	0,00596	0,00703	0,00836		
	n_t Ac_t				2449 4	1644 3	1112 2	764 2	518 1	396 1	279 1	207 1	154 1	123 1	58 0	
0,100	h_A				1,646	1,410	1,245	1,096	1,033	0,891	0,838	0,795	0,765	0,710	0,635	
	h_R				1,884	1,692	1,389	1,280	0,940	0,990	0,847	0,745	0,650	0,560	0,460	*
	g				0,00214	0,0024719	0,00287	0,00338	0,00394	0,00455	0,00541	0,00634	0,00746	0,00884	0,0106	
	n_t Ac_t				3039 6	65 4	1298 3	871 2	611 2	415 1	302 1	224 1	164 1	123 1	95 1	47 0

See the notes at the bottom of the table on p. 24.

Table 2 (*continued*)

Q_{PR} (in non-conformities per 100 items)	Para-meter	Q_{CR} (in nonconformities per 100 items) 0,500	0,630	0,800	1,00	1,25	1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,5	16,0	20,0	25,0	31,5
0,125	h_A	1,659	1,403	1,240	1,091	1,030	0,885	0,835	0,800	0,765	0,700	0,630								
	h_R	1,877	1,663	1,344	1,280	0,940	0,975	0,850	0,740	0,650	0,560	0,465	*							
	g	0,00269	0,00310	0,00363	0,00421	0,00491	0,00582	0,00676	0,00793	0,00937	0,0112	0,0132								
	n_t Ac$_t$	2435 6	1548 4	1010 3	696 2	490 2	332 1	242 1	179 1	129 1	98 1	76 1	37 0							
0,160	h_A	1,995	1,659	1,413	1,235	1,100	1,025	0,898	0,840	0,795	0,755	0,710	0,680							
	h_R	2,438	1,947	1,690	1,415	1,405	0,940	0,990	0,860	0,755	0,650	0,570	0,450	*						
	g	0,00296	0,00340	0,00396	0,00454	0,00530	0,00627	0,00736	0,00851	0,01000	0,0119	0,0141	0,0176							
	n_t Ac$_t$	3270 9	1963 6	1229 4	823 3	563 2	383 2	268 1	196 1	143 1	104 1	78 1	57 1	29 0						
0,200	h_A		1,993	1,656	1,416	1,243	1,100	1,035	0,890	0,840	0,800	0,770	0,720	0,620						
	h_R		2,377	1,876	1,683	1,408	1,260	0,940	1,080	0,850	0,740	0,650	0,570	0,460	*					
	g		0,00372	0,00430	0,00496	0,00570	0,00679	0,00789	0,00911	0,0107	0,0127	0,0149	0,0177	0,0211						
	n_t Ac$_t$		2566 9	1520 6	981 4	656 3	432	304	213	153 1	112 1	81	60 1	48 1	24 0					
0,250	h_A		2,438	1,941	1,648	1,400	1,237	1,090	1,030	0,880	0,830	0,800	0,760	0,700	0,620					
	h_R		3,115	2,579	1,880	1,693	1,345	1,270	0,941	0,980	0,850	0,740	0,660	0,570	0,460	*				
	g		0,00407	0,00469	0,00536	0,00615	0,00726	0,00842	0,00981	0,0114	0,0135	0,0159	0,0187	0,0224	0,0264					
	n_t Ac$_t$		3609 14	1911 8	1217 6	786 4	506 3	347 2	245 2	163 1	121 1	88 1	65 1	48 1	38 1	19 0				
0,315	h_A			2,410	1,959	1,652	1,408	1,245	1,085	1,030	0,875	0,840	0,790	0,750	0,720	0,610				
	h_R			3,280	2,646	1,912	1,629	1,360	1,325	0,945	0,980	0,840	0,750	0,650	0,560	0,450	*			
	g			0,005 5	0,00589	0,00672	0,00790	0,00912	0,0105	0,0124	0,0144	0,0169	0,0200	0,0238	0,0280	0,0331				
	n_t Ac$_t$			2707 13	1528 8	982 6	606 4	405 3	279 2	193 2	131 1	95 1	72 1	52 1	38 1	32 1	15 0			
0,400	h_A				2,447	2,003	1,655	1,419	1,265	1,100	0,950	0,880	0,850	0,800	0,760	0,705	0,610			
	h_R				3,236	2,428	1,873	1,682	1,395	1,340	0,950	0,990	0,860	0,740	0,650	0,550	0,470	*		
	g				0,00649	0,00742	0,00861	0,00994	0,0116	0,0134	0,0147	0,0182	0,0214	0,0254	0,0298	0,0352	0,0423			
	n_t Ac$_t$				2305 14	1308 9	761 6	492 4	329 3	220 2	153 2	104 1	75 1	55 1	41 1	32 1	25 1	12 0		
0,500	h_A				3,214	2,447	1,940	1,640	1,395	1,245	1,080	1,020	0,880	0,830	0,810	0,760	0,690	0,610		
	h_R				4,424	3,235	2,580	1,882	1,694	1,385	1,280	0,940	0,980	0,850	0,740	0,650	0,570	0,450	*	
	g				0,00714	0,00811	0,00939	0,0107	0,0123	0,0144	0,0168	0,0195	0,0229	0,0271	0,0319	0,0373	0,0447	0,0529		
	n_t Ac$_t$				3634 25	1843 14	957 8	609 6	394 4	260 3	175 2	120 2	82 1	61 1	43 1	32 1	25 1	19 1	10 0	

See the notes at the bottom of the table on p. 24.

Table 2 (*continued*)

Q_{PR} (in non-conformities per 100 items)	Para-meter	Q_{CR} (in nonconformities per 100 items) 0,500	0,630	0,800	1,00	1,25	1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,5	16,0	20,0	25,0	31,5
0,630	h_A					3,272	2,430	1,966	1,660	1,435	1,238	1,090	1,010	0,880	0,830	0,810	0,740	0,700	0,630	
	h_R					4,368	3,182	2,617	1,906	1,670	1,350	1,310	0,940	0,980	0,840	0,750	0,640	0,580	0,430	*
	g					0,00897	0,0103	0,0118	0,0135	0,0158	0,0182	0,0211	0,0246	0,0290	0,0339	0,0397	0,0475	0,0560	0,0667	
	n_t Ac_t					2987 26	1329 13	760 8	491 6	312 4	201 3	139 2	96 2	63 1	48 1	34 1	26 1	20 1	15 1	8 0
0,800	h_A						3,233	2,517	1,988	1,684	1,415	1,240	1,100	1,050	0,880	0,830	0,780	0,750	0,704	0,630
	h_R						4,307	3,110	2,432	1,918	1,665	1,400	1,300	0,935	0,970	0,850	0,720	0,670	0,540	0,450
	g						0,0114	0,0131	0,0148	0,0172	0,0199	0,0229	0,0267	0,0324	0,0364	0,0426	0,0507	0,0596	0,0703	0,0836
	n_t Ac_t						2232 25	1129 14	654 9	392 6	243 4	164 3	106 2	77 2	50 1	39 1	28 1	21 1	15 1	12 1
1,00	h_A							3,228	2,473	1,985	1,650	1,417	1,240	1,110	0,955	0,900	0,840	0,790	0,747	0,660
	h_R							4,384	3,186	2,370	2.340	1,680	1,360	1,220	0,930	0,980	0,860	0,720	0,650	0,600
	g							0,0143	0,0163	0,0186	0,0216	0,0249	0,0288	0,0346	0,0368	0,0455	0,0541	0,0634	0,0746	0,0884
	n_t Ac_t							1812 25	917 14	514 9	276 5	197 4	127 3	86 2	62 2	40 1	29 1	22 1	16 1	14 1

See the notes at the bottom of the table on p. 24.

Table 2 (*continued*)

Q_{PR} (in non-conformities per 100 items)	Parameter	Q_{CR} (in nonconformities per 100 items)																		
		0,500	0,630	0,800	1,00	1,25	1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,5	16,0	20,0	25,0	31,5
0,125	h_A	1,659	1,403	1,240	1,091	1,030	0,885	0,835	0,800	0,765	0,700	0,630								
	h_R	1,877	1,663	1,344	1,280	0,940	0,975	0,850	0,740	0,650	0,560	0,465	*							
	g	0,00269	0,00310	0,00363	0,00421	0,00491	0,00582	0,00676	0,00793	0,00937	0,0112	0,0132								
	n_t Ac_t	2435 6	1548 4	1010 3	696 2	490 2	332 1	242 1	179 1	129 1	98 1	76 1	37 0							
0,160	h_A	1,995	1,659	1,413	1,235	1,100	1,025	0,898	0,840	0,795	0,755	0,710	0,680							
	h_R	2,438	1,947	1,690	1,415	1,405	0,940	0,990	0,860	0,755	0,650	0,570	0,450	*						
	g	0,00296	0,00340	0,00396	0,00454	0,00530	0,00627	0,00736	0,00851	0,01000	0,0119	0,0141	0,0176							
	n_t Ac_t	3270 9	1963 6	1229 4	823 3	563 2	383 2	268 1	196 1	143 1	104 1	78 1	57 1	29 0						
0,200	h_A		1,993	1,656	1,416	1,243	1,100	1,035	0,890	0,840	0,800	0,770	0,720	0,620						
	h_R		2,377	1,876	1,683	1,408	1,260	0,940	1,080	0,850	0,740	0,650	0,570	0,460	*					
	g		0,00372	0,00430	0,00496	0,00570	0,00679	0,00789	0,00911	0,0107	0,0127	0,0149	0,0177	0,0211						
	n_t Ac_t		2566 9	1520 6	981 4	656 3	432	304	213	153 1	112 1	81	60 1	48 1	24 0					
0,250	h_A		2,438	1,941	1,648	1,400	1,237	1,090	1,030	0,880	0,830	0,800	0,760	0,700	0,620					
	h_R		3,115	2,579	1,880	1,693	1,345	1,270	0,941	0,980	0,850	0,740	0,660	0,570	0,460	*				
	g		0,00407	0,00469	0,00536	0,00615	0,00726	0,00842	0,00981	0,0114	0,0135	0,0159	0,0187	0,0224	0,0264					
	n_t Ac_t		3609 14	1911 8	1217 6	786 4	506 3	347 2	245 2	163 1	121 1	88 1	65 1	48 1	38 1	19 0				
0,315	h_A			2,410	1,959	1,652	1,408	1,245	1,085	1,030	0,875	0,840	0,790	0,750	0,720	0,610				
	h_R			3,280	2,646	1,912	1,629	1,360	1,325	0,945	0,980	0,840	0,750	0,650	0,560	0,450	*			
	g			0,00515	0,00589	0,00672	0,00790	0,00912	0,0105	0,0124	0,0144	0,0169	0,0200	0,0238	0,0280	0,0331				
	n_t Ac_t			2707 13	1528 8	982 6	606 4	405 3	279 2	193 2	131 1	95 1	72 1	52 1	38 1	32 1	15 0			
0,400	h_A				2,447	2,003	1,655	1,419	1,265	1,100	0,950	0,880	0,850	0,800	0,760	0,705	0,610			
	h_R				3,236	2,428	1,873	1,682	1,395	1,340	0,950	0,990	0,860	0,740	0,650	0,550	0,470	*		
	g				0,00649	0,00742	0,00861	0,00994	0,0116	0,0134	0,0147	0,0182	0,0214	0,0254	0,0298	0,0352	0,0423			
	n_t Ac_t				2305 14	1308 9	761 6	492 4	329 3	220 2	153 2	104 1	75 1	55 1	41 1	32 1	25 1	12 0		
0,500	h_A				3,214	2,447	1,940	1,640	1,395	1,245	1,080	1,020	0,880	0,830	0,810	0,760	0,690	0,610		
	h_R				4,424	3,235	2,580	1,882	1,694	1,385	1,280	0,940	0,980	0,850	0,740	0,650	0,570	0,450	*	
	g				0,00714	0,00811	0,00939	0,0107	0,0123	0,0144	0,0168	0,0195	0,0229	0,0271	0,0319	0,0373	0,0447	0,0529		
	n_t Ac_t				3634 25	1843 14	957 8	609 6	394 4	260 3	175 2	120 2	82 1	61 1	43 1	32 1	25 1	19 1	10 0	
0,630	h_A					3,272	2,430	1,966	1,660	1,435	1,238	1,090	1,010	0,880	0,830	0,810	0,740	0,700	0,630	
	h_R					4,368	3,182	2,617	1,906	1,670	1,350	1,310	0,940	0,980	0,840	0,750	0,640	0,580	0,430	*
	g					0,00897	0,0103	0,0118	0,0135	0,0158	0,0182	0,0211	0,0246	0,0290	0,0339	0,0397	0,0475	0,0560	0,0667	
	n_t Ac_t					2987 26	1329 13	760 8	491 6	312 4	201 3	139 2	96 2	63 1	48 1	34 1	26 1	20 1	15 1	8 0

See the notes at the bottom of the table on p. 24.

Table 2 (*continued*)

Q_{PR} (in nonconformities per 100 items)	Parameter	Q_{CR} (in nonconformities per 100 items) 0,500	0,630	0,800	1,00	1,25	1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,5	16,0	20,0	25,0	31,5
0,800	h_A						3,233	2,517	1,988	1,684	1,415	1,240	1,100	1,050	0,880	0,830	0,780	0,750	0,704	0,630
	h_R						4,307	3,110	2,432	1,918	1,665	1,400	1,300	0,935	0,970	0,850	0,720	0,670	0,540	0,450
	g						0,0114	0,0131	0,0148	0,0172	0,0199	0,0229	0,0267	0,0324	0,0364	0,0426	0,0507	0,0596	0,0703	0,0836
	n_t Ac_t						2232 25	1129 14	654 9	392 6	243 4	164 3	106 2	77 2	50 1	39 1	28 1	21 1	15 1	12 1
1,00	h_A							3,228	2,473	1,985	1,650	1,417	1,240	1,110	0,955	0,900	0,840	0,790	0,747	0,660
	h_R							4,384	3,186	2,370	2.340	1,680	1,360	1,220	0,930	0,980	0,860	0,720	0,650	0,600
	g							0,0143	0,0163	0,0186	0,0216	0,0249	0,0288	0,0346	0,0368	0,0455	0,0541	0,0634	0,0746	0,0884
	A_t							1812 25	917 14	514 9	276 5	197 4	127 3	86 2	62 2	40 1	29 1	22 1	16 1	14 1

See the notes at the bottom of the table on p. 24.

Table 2 (*continued*)

Q_{PR} (in nonconformities per 100 items)	Parameter	Q_{CR} (in nonconformities per 100 items) 2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,50	16,00	20,00	25,00	31,50
1,25	h_A	4,840	3,248	2,447	1,920	1,660	1,410	1,230	1,085	1,020	0,900	0,850	0,794	0,700
	h_R	6,415	4,330	3,105	2,600	1,860	1,625	1,350	1,285	0,920	0,950	0,830	0,700	0,670
	g	0,0159	0,0179	0,0204	0,0234	0,0271	0,0313	0,0362	0,0421	0,0489	0,0579	0,0676	0,0793	0,0937
	n_t Ac_t	3567 56	1442 25	723 14	384 8	244 6	154 4	102 3	70 2	49 2	30 1	23 1	17 1	14 1
1,60	h_A		4,964	3,336	2,447	2,005	1,675	1,407	1,225	1,100	1,070	0,900	0,800	0,750
	h_R		7,036	4,397	3,207	2,405	1,910	1,640	1,410	1,365	0,930	0,930	0,870	0,750
	g		0,0200	0,0227	0,0260	0,0298	0,0343	0,0401	0,0454	0,0530	0,0668	0,0729	0,0851	0,1003
	n_t Ac_t		3144 62	1171 26	575 14	327 9	196 6	123 4	83 3	55 2	38 2	24 1	20 1	15 1
2,00	h_A			4,874	3,257	2,460	2,030	1,630	1,405	1,230	1,150	0,995	0,900	0,800
	h_R			6,894	4,312	3,190	2,325	2,405	1,648	1,370	1,135	0,925	0,910	0,840
	g			0,0251	0,0287	0,0326	0,0377	0,0431	0,0501	0,0573	0,0717	0,0766	0,0908	0,1070
	n_t Ac_t			2426 60	902 25	460 14	257 9	139 5	97 4	66 3	41 2	31 2	20 1	16 1
2,50	h_A				4,682	3,255	2,454	1,945	1,640	1,388	1,210	1,085	1,000	0,900
	h_R				6,695	4,330	3,075	2,510	1,845	1,680	1,340	1,315	0,930	0,885
	g				0,0316	0,0359	0,0410	0,0473	0,0539	0,0627	0,0727	0,0842	0,0971	0,1151
	n_t Ac_t				1801 56	724 25	362 14	190 8	122 6	79 4	51 3	35 2	24 2	16 1
3,15	h_A					4,797	3,250	2,389	2,010	1,630	1,410	1,187	1,115	1,000
	h_R					6,713	4,295	3,244	2,270	1,865	1,600	1,360	1,220	0,890
	g					0,0397	0,0452	0,0515	0,0598	0,0679	0,0791	0,0912	0,1114	0,1231
	n_t Ac_t					1480 58	572 25	270 13	161 9	99 6	59 4	41 3	26 2	18 2
4,00	h_A						4,854	3,225	2,440	2,010	1,640	1,350	1,200	1,145
	h_R						6,914	4,332	3,185	2,370	1,840	1,700	1,350	1,140
	g						0,0502	0,0573	0,0651	0,0751	0,0866	0,0966	0,1146	0,1431
	n_t Ac_t						1215 60	452 25	230 14	131 9	77 6	49 4	33 3	20 2
5,00	h_A							4,670	3,208	2,445	1,900	1,625	1,381	1,155
	h_R							6,792	4,431	3,175	2,565	1,800	1,620	1,350
	g							0,0632	0,0714	0,0815	0,0937	0,1082	0,1255	0,1440
	n_t Ac_t							886 55	364 25	184 14	96 8	59 6	39 4	26 3
6,30	h_A								4,754	3,225	2,390	1,900	1,640	1,350
	h_R								6,721	4,365	2,970	2,295	1,815	1,600
	g								0,0793	0,0897	0,1033	0,1176	0,1365	0,1566
	n_t Ac_t								740 58	300 26	141 14	81 9	47 6	31 4

See the notes at the bottom of the table on p. 24.

Table 2 (*continued*)

Q_{PR} (in nonconformities per 100 items)	Parameter	Q_{CR} (in nonconformities per 100 items) 2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,00	12,50	16,00	20,00	25,00	31,50
8,00	h_A									4,885	3,210	2,400	1,952	1,650
	h_R									7,019	4,300	3,150	2,360	1,800
	g									0,0998	0,1147	0,1301	0,1501	0,1766
	n_t Ac$_t$									628 62	226 25	115 14	66 9	39 6
10,0	h_A										4,664	3,190	2,405	1,878
	h_R										6,607	4,265	3,140	2,300
	g										0,1266	0,1436	0,1630	0,1876
	n_t Ac$_t$										450 56	181 25	92 14	52 9

n_t (left hand side of the cell) is the curtailment sample size.

Ac$_t$ (right hand side of the cell) is the acceptance number at curtailment.

A blank cell denotes that there is no recommendable sequential sampling plan. Select another combination of Q_{PR} and Q_{CR}.

* Use the curtailed single sampling plan given below in this cell.

Annex A
(informative)

Statistical properties of the sequential sampling plan for inspection by attributes

A.1 Values of the average sample size

The principal advantage of sequential sampling plans is the reduction in the average sample size. However, there exist disadvantages of sequential sampling (see Introduction). To evaluate possible profits from having small average sample sizes, we need to know their values for particular sequential sampling plans. Unfortunately, there is no closed mathematical formula for the calculation of the average sample size in the case of sequential sampling. Thus, the average sample size for the given sequential sampling plan and the given quality level (in percent nonconforming or in nonconformities per 100 items) can be only found using numerical procedures. Approximate values of the average sample size (ASSI) for the sequential sampling plans from this International Standard are given in Tables A.1 and A.2 for the following key quality levels:

a) zero (perfect quality level without any nonconforming item);

b) Q_{PR} (of the corresponding single plan with 95 % of probability of acceptance);

c) $100g$ (giving a large average sample number close to the maximum, where g is the parameter of the sequential sampling plan);

d) Q_{CR} (of the corresponding single plan with 10% of probability of acceptance).

Table A.1 gives the values for percent nonconforming inspection, and Table A.2 is for nonconformities per 100 items inspection.

EXAMPLE

An organization representing consumers is interested in the evaluation of the quality of a certain product. Its producer claims that at least 99 % of its products are free of nonconformities. However, signals from the market have revealed that this claim might not be true. Therefore, it has been decided to verify this claim against the alternative that the real fraction nonconforming is 10 %. Hence, the chosen characteristics of the sampling plan are the following: Q_{PR} = 1 %, and Q_{CR}=10 %. While considering different possibilities to verify the producer's claim, quality inspectors analysed expected costs of sampling. For the sequential sampling plan with Q_{PR} = 1 %, and Q_{CR} = 10 % from Table A.1 (for Q_{PR} = 1 %, and Q_{CR}/Q_{PR} = 10) they found that the average sample size when the true fraction nonconforming is Q_{PR} = 1 % equals 29,5. When the true fraction nonconforming is Q_{CR} = 10 % they found that the average sample size equals 18,6. In the worst case, when the true fraction nonconforming is $100g$ = 3,94 %, they found that the average sample size equals 30,7.

For the chosen sequential sampling plan (see 7.2) the curtailment value n_t equals 65. Thus, the sample size of the equivalent single sampling plan (see Note in Table A.1) equals 0,667 n_t = 44 (the equivalent single sampling plan is given by n = 44, and Ac = 1). Therefore, by applying the sequential sampling plan we may decrease average sampling cost by at least 30 %.

Note, however, that in the case of a particular inspection the number of inspected items may randomly be larger than the sample size of the equivalent single sampling plan. Such a situation takes place in the case considered in 7.2, when the inspection has been terminated after the evaluation of 50 items.

Table A.1 — Average sample sizes for sequential sampling plans for percent nonconforming

Q_{PR} (%)	$\overline{P}$ (%)	Nominal value of Q_{CR}/Q_{PR} (for percent nonconforming), and Ac_0 (acceptance number for the equivalent single sampling plan) [a]												
		2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,0	12,5	16,0	20,0	25,0	31,5
		18	10	6	4	3	2	(1,4)	1	(0,7)	(0,5)	(0,3)	(0,2)	(0,1)
0,0200	0								1309	977	781	629	510	399
	Q_{PR}								1537	1127	840	643	507	392
	$100g$								1565	1141	812	584	437	321
	Q_{CR}								921	716	467	316	227	163
0,0250	0							1297	1047	775	616	503	405	313
	Q_{PR}							1640	1229	892	659	514	402	307
	$100g$							1765	1251	900	635	467	345	251
	Q_{CR}							1110	736	563	363	253	179	128
0,0315	0							1040	832	610	492	399	319	251
	Q_{PR}							1317	977	700	528	408	317	246
	$100g$							1419	995	706	509	371	271	202
	Q_{CR}							896	585	441	292	201	141	103
0,0400	0						1092	823	654	488	390	314	255	201
	Q_{PR}						1479	1048	768	563	420	321	254	197
	$100g$						1647	1139	782	569	406	292	218	162
	Q_{CR}						1035	723	460	358	233	158	113	82,7
0,0500	0						866	648	524	387	308	251	204	156
	Q_{PR}						1169	819	614	445	329	256	203	153
	$100g$						1298	881	623	450	317	233	174	125
	Q_{CR}						812	554	368	282	181	126	90,7	63,9
0,0630	0					906	682	518	415	304	246	201	159	125
	Q_{PR}					1343	917	657	487	350	264	205	158	123
	$100g$					1566	1014	711	496	353	254	187	135	101
	Q_{CR}					1023	632	449	292	221	146	101	70,4	51,3
0,0800	0					713	545	411	326	243	196	157	127	100
	Q_{PR}					1057	738	523	383	280	211	160	126	98,2
	$100g$					1232	822	568	390	284	204	145	109	81,0
	Q_{CR}					805	517	361	230	178	118	78,7	56,7	41,4
0,100	0				768	570	433	323	261	195	154	125	102	79
	Q_{PR}				1261	845	583	408	306	224	164	128	101	77,6
	$100g$				1509	985	647	440	311	226	158	116	87,1	63,8
	Q_{CR}				985	643	405	276	184	142	90,8	63,3	45,5	32,7
0,125	0				616	451	341	259	209	152	123	100	80	62
	Q_{PR}				1008	667	456	326	245	173	131	102	79,5	60,9
	$100g$				1205	776	502	350	249	174	126	93,1	68,5	49,8
	Q_{CR}				788	503	312	221	147	109	72,3	50,6	35,8	25,6
0,160	0			673	487	355	272	207	163	121	98	79	63	49
	Q_{PR}			1286	808	527	368	264	191	140	105	80,8	62,6	48,1
	$100g$			1619	974	615	410	286	195	142	101	73,9	54,0	39,7
	Q_{CR}			1100	643	402	258	183	115	89,7	58,7	40,3	28,3	20,5
0,200	0			535	384	284	217	161	130	97	78	62	50	39
	Q_{PR}			1013	629	421	294	203	153	111	83,3	63,3	49,7	38,3
	$100g$			1267	752	491	328	219	156	112	80,0	57,9	43,0	31,6
	Q_{CR}			853	492	321	206	138	92,2	70,6	46,3	31,6	22,6	16,4
0,250	0		598	412	307	227	170	129	104	77	61	50	40	30
	Q_{PR}		1361	781	502	336	227	162	122	87,9	65,1	50,9	39,8	29,5
	$100g$		1785	995	601	392	249	174	124	88,6	62,9	46,2	34,3	24,5
	Q_{CR}		1249	699	393	256	155	110	73,5	55,7	36,4	25,3	18,1	12,8
0,315	0		466	330	244	177	136	103	83	60	49	39	31	24
	Q_{PR}		1058	630	406	260	182	130	96,8	68,5	52,0	39,7	30,7	23,6
	$100g$		1404	806	500	301	200	140	98,1	69,2	50,0	36,2	26,3	19,6
	Q_{CR}		1011	572	359	194	125	88,7	58,1	43,4	29,0	19,8	13,9	10,3
0,400	0		376	268	189	141	108	81	65	48	38	31	25	19
	Q_{PR}		864	512	313	209	146	103	75,8	54,9	40,8	31,5	24,9	18,7
	$100g$		1144	644	387	244	162	112	76,9	55,6	39,6	28,6	21,6	15,4
	Q_{CR}		810	437	277	159	102	71,2	45,6	35,3	23,0	15,7	11,4	8,18

[a] Ac_0 (the acceptance number of the corresponding single sampling plan) is shown for reference.
n_0 (the sample size of the corresponding single sampling plan) is given by 0,667 n_t.
Fractional values of Ac_0 have no corresponding single sampling plans.

Table A.1 (*continued*)

Q_{PR} (%)	$\overline{P}$ (%)	**Nominal value of Q_{CR}/Q_{PR} (for percent nonconforming), and Ac_0 (acceptance number for the equivalent single sampling plan)** [a]													
		1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,0	12,5	16,0	20,0	25,0	31,5
		38	18	10	6	4	3	2	(1,4)	1	(0,7)	(0,5)	(0,3)	(0,2)	(0,1)
0,500	0		448	300	204	150	113	86	64	52	38	30	24	20	15
	Q_{PR}		1315	690	388	250	167	115	80,2	60,7	43,2	31,8	24,5	19,8	14,7
	$100g$		1821	913	495	311	194	127	85,8	61,7	43,8	30,6	22,6	17,0	12,0
	Q_{CR}		1335	646	348	224	127	80,0	54,2	36,7	27,8	17,8	12,5	9,07	6,30
0,630	0		361	232	165	121	89	67	51	40	29	24	19	15	12
	Q_{PR}		1072	526	313	201	132	89,8	63,9	47,3	33,5	25,6	19,5	14,9	11,8
	$100g$		1483	695	398	248	154	99,3	68,6	48,9	34,4	24,9	18,1	13,0	9,77
	Q_{CR}		1097	498	281	178	101	62,2	43,5	29,0	21,6	14,8	10,2	7,03	5,22
0,800	0		277	189	132	96	70	54	40	32	24	19	15	12	9
	Q_{PR}		818	429	254	160	103	72,0	50,4	37,3	26,8	20,3	15,2	12,0	8,85
	$100g$		1131	565	328	198	121	79,5	54,3	37,9	27,0	20,0	13,9	10,6	7,37
	Q_{CR}		827	400	236	144	78,7	50,3	34,6	22,7	17,2	11,9	7,80	5,83	4,04
1,00	0		223	150	104	75	56	42	32	25	19	15	12	9	7
	Q_{PR}		653	342	199	123	82,1	56,5	39,3	29,5	21,2	15,7	12,1	9,01	6,88
	$100g$		898	450	254	150	95,4	62,8	41,2	30,7	21,4	15,0	11,0	8,11	5,69
	Q_{CR}		654	317	181	106	62,4	39,6	26,2	18,6	13,6	8,89	6,22	4,58	3,16
1,25	0	298	178	117	81	60	44	33	25	20	14	12	9	7	
	Q_{PR}	1232	520	267	152	97,8	64,2	43,7	30,9	23,4	16,2	12,6	9,19	7,00	
	$100g$	1765	715	356	194	119	74,4	48,0	32,8	24,1	17,1	12,1	8,63	6,31	
	Q_{CR}	1329	520	258	136	84,0	48,4	30,1	21,0	14,7	11,3	7,37	5,01	3,65	
1,60	0	244	142	92	65	47	34	26	20	15	11	9	7		
	Q_{PR}	1073	425	212	125	78,1	50,4	34,9	24,7	17,5	12,7	9,41	7,17		
	$100g$	1544	588	283	160	96,9	58,8	38,8	26,2	18,1	13,5	9,10	6,88		
	Q_{CR}	1168	430	206	114	69,9	38,3	24,6	16,8	11,1	9,08	5,56	4,14		
2,00	0	189	110	73	51	36	27	21	15	12	9	7			
	Q_{PR}	821	321	168	96,8	59,7	39,8	28,0	18,5	13,9	10,1	7,48			
	$100g$	1188	444	224	124	73,9	46,7	30,9	19,9	14,4	10,6	7,61			
	Q_{CR}	906	328	162	88,4	52,2	30,6	19,7	12,8	8,85	7,31	4,84			
2,50	0	143	87	57	39	29	22	16	12	10	7				
	Q_{PR}	605	255	130	73,9	47,0	31,5	20,9	14,6	11,4	7,83				
	$100g$	875	353	173	94,0	57,4	36,3	23,0	15,5	11,5	8,33				
	Q_{CR}	666	261	124	65,3	40,3	23,6	14,6	10,1	7,01	5,83				
3,15	0	116	68	44	31	23	17	13	9	7					
	Q_{PR}	494	200	99,8	58,6	37,0	24,1	16,8	11,2	8,40					
	$100g$	712	277	132	75,1	45,3	27,6	18,2	12,0	9,26					
	Q_{CR}	538	204	93,6	52,6	31,9	17,9	11,6	7,93	6,12					
4,00	0	92	53	35	25	17	13	10	7						
	Q_{PR}	399	155	80,3	46,8	28,0	18,6	12,7	8,58						
	$100g$	578	214	107	60,2	34,4	22,2	14,0	9,25						
	Q_{CR}	441	156	77,5	42,7	24,1	16,5	9,32	6,26						
5,00	0	70	42	28	19	13	10	7							
	Q_{PR}	292	122	62,9	34,7	21,7	14,3	9,42							
	$100g$	418	169	83,9	43,8	26,9	17,4	11,1							
	Q_{CR}	315	126	60,3	30,2	18,8	13,1	8,40							
6,30	0	55	33	21	15	10	7								
	Q_{PR}	236	97,2	46,6	27,2	16,7	10,7								
	$100g$	342	136	62,5	34,7	20,8	13,3								
	Q_{CR}	262	102	45,6	25,3	14,6	10,0								
8,00	0	45	25	16	11	8									
	Q_{PR}	195	72,1	36,9	21,2	13,0									
	$100g$	284	101	49,8	27,7	16,0									
	Q_{CR}	217	75,4	36,6	20,4	12,0									
10,0	0	32	19	12	9										
	Q_{PR}	135	55,6	28,2	15,9										
	$100g$	196	78,3	38,3	20,0										
	Q_{CR}	151	59,1	28,9	14,4										

[a] Ac_0 (the acceptance number of the corresponding single sampling plan) is shown for reference.
n_0 (the sample size of the corresponding single sampling plan) is given by 0,667 n_t.
Fractional values of Ac_0 have no corresponding single sampling plans.

Table A.2 — Average sample sizes for sequential sampling plans for nonconformities per 100 items

Q_{PR} (in non-confor-mities per 100 items)	$\overline{P}$ (%)	Nominal value of Q_{CR}/Q_{PR} and Ac_0 (for nonconformities per 100 items) [a]												
		2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,0	12,5	16,0	20,0	25,0	31,5
		18	10	6	4	3	2	(1,4)	1	(0,7)	(0,5)	(0,3)	(0,2)	(0,1)
0,0200	0								1310	978	782	630	512	401
	Q_{PR}								1538	1129	842	644	509	394
	100g								1565	1143	813	586	439	323
	Q_{CR}								922	717	467	317	228	164
0,0250	0							1298	1048	775	617	504	406	314
	Q_{PR}							1642	1231	894	661	515	404	308
	100g							1769	1253	905	637	469	347	252
	Q_{CR}							1112	738	565	364	254	180	128
0,0315	0							1040	832	612	493	400	320	252
	Q_{PR}							1319	977	702	529	409	318	247
	100g							1424	995	707	511	372	273	203
	Q_{CR}							900	586	441	293	201	142	103
0,0400	0						1094	825	656	490	391	315	256	203
	Q_{PR}						1483	1051	770	565	421	322	255	199
	100g						1650	1141	783	570	407	293	219	164
	Q_{CR}						1037	725	462	358	234	159	114	83,3
0,0500	0						868	649	525	388	309	252	205	157
	Q_{PR}						1172	821	616	447	331	258	204	154
	100g						1300	885	626	452	318	235	176	126
	Q_{CR}						813	556	369	283	182	127	91,3	64,5
0,0630	0					908	683	519	416	306	247	202	160	126
	Q_{PR}					1346	920	659	488	351	265	207	159	124
	100g					1569	1018	714	497	354	256	189	137	102
	Q_{CR}					1025	635	452	293	221	147	102	71,0	51,9
0,0800	0					715	546	413	328	245	197	158	128	102
	Q_{PR}					1060	741	525	385	282	213	161	127	100
	100g					1236	826	570	391	286	206	147	110	82,3
	Q_{CR}					808	519	363	231	180	119	79,8	57,3	42,0
0,100	0				770	571	434	325	263	196	155	126	103	81
	Q_{PR}				1265	848	586	411	308	226	166	129	102	79,5
	100g				1513	989	650	442	312	228	159	118	88,3	65,3
	Q_{CR}				988	647	408	279	185	144	91,4	63,9	46,1	33,4
0,125	0				617	453	342	260	210	153	124	101	82	63
	Q_{PR}				1011	669	458	328	246	175	133	103	81,4	61,9
	100g				1210	778	505	353	250	176	128	94,2	70,0	51,0
	Q_{CR}				791	506	314	223	148	110	73,5	51,2	36,5	26,2
0,160	0			674	488	357	273	208	164	123	99	80	64	51
	Q_{PR}			1290	811	530	370	266	192	142	107	82,1	63,7	50,1
	100g			1626	979	618	413	290	196	143	103	75,6	55,1	41,5
	Q_{CR}			1106	647	405	260	186	116	90,2	59,9	41,4	28,9	21,4
0,200	0			536	386	286	219	163	132	98	79	63	52	41
	Q_{PR}			1017	632	424	296	205	155	113	84,7	64,4	51,7	40,2
	100g			1273	756	494	330	220	157	115	81,9	58,9	44,4	33,1
	Q_{CR}			859	495	323	208	139	93,2	73,0	47,5	32,2	23,3	17,0
0,250	0		600	414	308	228	171	130	105	78	62	51	41	32
	Q_{PR}		1366	786	506	339	229	164	123	89,5	66,4	52,0	40,8	31,4
	100g		1795	1000	605	396	253	177	125	90,6	64,0	47,3	35,4	26,0
	Q_{CR}		1258	703	396	259	157	111	74,2	57,1	37,0	25,9	18,7	13,5

[a] Ac_0 (the acceptance number of the corresponding single sampling plan) is shown for reference.
n_0 (the sample size of the corresponding single sampling plan) is given approximately by 0,67 n_t.
Fractional values of Ac_0 have no corresponding single sampling plans.

Table A.2 (*continued*)

Q_{PR} (in nonconformities per 100 items)	$\overline{P}$ (%)	Nominal value of Q_{CR}/Q_{PR} and Ac_0 (for nonconformities per 100 items) [a]												
		2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,0	12,5	16,0	20,0	25,0	31,5
		18	10	6	4	3	2	(1,4)	1	(0,7)	(0,5)	(0,3)	(0,2)	(0,1)
0,315	0		468	333	246	179	137	104	84	61	50	40	32	26
	Q_{PR}		1066	635	407	262	184	132	98,6	70,3	53,3	41,1	31,9	25,5
	$100g$		1413	811	489	304	203	143	100	71,3	51,1	38,0	27,9	21,1
	Q_{CR}		1018	576	322	197	127	90,8	59,8	44,8	29,6	20,9	14,8	11,0
0,400	0		378	270	193	143	110	83	65	49	40	32	26	21
	Q_{PR}		870	516	316	212	148	105	77,0	56,7	42,8	32,6	25,9	20,7
	$100g$		1156	650	378	247	165	114	79,3	57,7	41,5	29,7	22,6	17,2
	Q_{CR}		822	443	248	162	104	72,8	46,6	36,7	24,3	16,4	12,1	8,92

[a] Ac_0 (the acceptance number of the corresponding single sampling plan) is shown for reference.
n_0 (the sample size of the corresponding single sampling plan) is given approximately by 0,67 n_t.
Fractional values of Ac_0 have no corresponding single sampling plans.

Table A.2 (*continued*)

Q_{PR} (in nonconformities per 100 items)	$\overline{P}$ (%)	Nominal value of Q_{CR}/Q_{PR} and Ac_0 (for nonconformities per 100 items) [a]													
		1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,0	12,5	16,0	20,0	25,0	31,5
		38	18	10	6	4	3	2	(1,4)	1	(0,7)	(0,5)	(0,3)	(0,2)	(0,1)
0,500	0		451	302	207	154	114	87	65	53	39	31	26	21	16
	Q_{PR}		1327	696	393	253	170	117	82,2	62,0	45,0	33,4	26,4	20,9	15,8
	$100g$		1835	925	501	303	198	130	88,8	63,0	45,8	32,5	23,9	18,0	13,4
	Q_{CR}		1347	658	352	198	130	82,1	56,3	37,3	29,3	19,0	13,2	9,68	7,10
0,630	0		365	236	167	123	91	69	52	42	31	25	21	16	13
	Q_{PR}		1081	535	318	203	135	92,3	66,1	49,3	35,5	26,8	21,4	16,0	12,8
	$100g$		1488	699	405	245	157	102	71,6	50,3	36,1	26,1	19,5	14,0	10,9
	Q_{CR}		1082	498	287	161	103	63,8	45,6	30,0	23,2	15,3	10,9	7,64	5,84
0,800	0		284	193	135	98	72	55	42	33	25	20	16	13	11
	Q_{PR}		833	437	258	162	106	74,2	52,8	38,6	28,6	21,6	16,4	13,1	10,8
	$100g$		1135	572	325	195	123	82,6	56,7	39,4	29,0	21,1	15,1	11,7	8,89
	Q_{CR}		823	404	222	130	80,9	52,3	36,2	23,7	18,6	12,5	8,43	6,44	4,73
1,00	0		226	152	107	77	57	44	33	26	20	16	13	11	8
	Q_{PR}		664	348	203	127	84,8	58,9	41,2	31,0	22,9	17,1	13,3	11,0	8,00
	$100g$		915	461	255	156	99,2	65,0	44,0	32,1	23,2	16,8	12,2	9,63	7,14
	Q_{CR}		671	327	172	112	65,3	40,9	28,1	19,0	15,0	10,1	6,85	5,30	3,99
1,25	0	305	182	120	83	62	46	34	26	21	16	13	11	8	
	Q_{PR}	1256	531	274	157	101	67,2	45,9	33,0	24,8	18,0	13,8	11,2	8,11	
	$100g$	1787	730	360	201	121	78,0	51,2	36,0	25,4	18,3	13,3	10,1	7,50	
	Q_{CR}	1335	533	253	142	79,7	51,0	32,3	23,0	15,3	11,9	7,96	5,73	4,30	
1,60	0	249	147	95	68	49	36	27	21	17	13	10	8		
	Q_{PR}	1096	439	218	129	81,2	53,0	37,1	26,8	19,6	14,6	11,0	8,35		
	$100g$	1581	600	289	163	97,9	61,8	41,8	29,4	19,8	14,8	11,1	8,07		
	Q_{CR}	1197	438	205	111	65,1	40,8	26,6	19,2	12,1	9,60	6,85	4,76		
2,00	0	195	114	76	54	38	29	22	17	13	10	8			
	Q_{PR}	844	332	174	102	63,6	42,6	29,7	20,8	15,8	11,4	8,74			
	$100g$	1215	456	231	127	78,9	49,6	33,2	21,7	16,6	11,7	8,76			
	Q_{CR}	920	333	164	86,4	57,1	32,7	21,3	14,0	10,3	7,73	5,39			
2,50	0	149	91	60	42	31	23	17	13	11	8				
	Q_{PR}	627	265	137	78,7	50,6	34,0	22,9	16,5	13,1	9,16				
	$100g$	902	366	180	99,8	60,7	39,8	25,6	18,1	13,6	9,42				
	Q_{CR}	682	268	127	70,3	40,1	26,4	16,2	11,7	8,46	6,24				
3,15	0	121	72	47	34	25	18	14	11	9					
	Q_{PR}	517	211	107	63,6	40,7	26,6	18,5	13,4	10,6					
	$100g$	741	290	141	79,4	49,0	30,8	20,7	14,2	10,9					
	Q_{CR}	558	212	102	53,7	32,7	20,0	13,3	9,35	6,79					
4,00	0	97	57	38	27	19	14	11	9						
	Q_{PR}	422	166	87,1	51,6	31,6	21,3	15,0	10,8						
	$100g$	609	229	116	65,2	38,2	25,3	16,8	11,2						
	Q_{CR}	462	168	82,5	44,7	25,4	16,7	10,9	7,42						
5,00	0	74	45	30	21	16	12	9							
	Q_{PR}	314	133	69,7	39,4	25,7	17,2	11,8							
	$100g$	453	184	92,6	50,5	30,4	20,1	13,3							
	Q_{CR}	346	136	66,1	35,9	20,1	13,4	8,72							

[a] Ac_0 (the acceptance number of the corresponding single sampling plan) is shown for reference.
n_0 (the sample size of the corresponding single sampling plan) is given approximately by $0,67n_t$.
Fractional values of Ac_0 have no corresponding single sampling plans.

Table A.2 (*continued*)

Q_{PR} (in nonconformities per 100 items)	$\overline{P}$ (%)	**Nominal value of Q_{CR}/Q_{PR} and Ac_0 (for nonconformities per 100 items)** [a]													
		1,60	2,00	2,50	3,15	4,00	5,00	6,30	8,00	10,0	12,5	16,0	20,0	25,0	31,5
		38	18	10	6	4	3	2	(1,4)	1	(0,7)	(0,5)	(0,3)	(0,2)	(0,1)
6,30	0	60	36	24	17	13	9								
	Q_{PR}	258	108	53,3	31,8	20,8	13,6								
	$100g$	371	149	69,6	39,8	24,6	16,1								
	Q_{CR}	279	109	48,7	27,1	16,5	10,8								
8,00	0	49	28	19	14	10									
	Q_{PR}	220	83,0	43,6	25,9	16,3									
	$100g$	316	115	57,9	32,9	19,6									
	Q_{CR}	239	84,1	41,4	22,9	13,4									
10,0	0	37	23	15	11										
	Q_{PR}	157	66,4	34,9	20,3										
	$100g$	226	91,6	46,5	25,6										
	Q_{CR}	171	67,5	33,4	17,7										

[a] Ac_0 (the acceptance number of the corresponding single sampling plan) is shown for reference.
n_0 (the sample size of the corresponding single sampling plan) is given approximately by $0{,}67n_t$.
Fractional values of Ac_0 have no corresponding single sampling plans.

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