

INTERNATIONAL STANDARD

Quality assessment systems –
Part 2: Selection and use of sampling plans for inspection of electronic
components and packages

IT'S A STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/4dfcc2a7-e9da-4a07-8388-029219ef0a5a/iec-61193-2-2007>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2007 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

PRESTANDARD PREVIEW
(standards.iteh.ai)
IEC 61193-2:2007
<https://standards.iteh.ai/catalog/standards/sist/4dfcc2a7-e9da-4a07-8388-229190300>



IEC 61193-2

Edition 1.0 2007-08

INTERNATIONAL STANDARD

Quality assessment systems –
Part 2: Selection and use of sampling plans for inspection of electronic components and packages

STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/4dfcc2a7-e9da-4a07-8388-029219ef0a5a/iec-61193-2-2007>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

R

ICS 31.190

ISBN 2-8318-9297-X

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions.....	6
4 Sampling system.....	7
4.1 Formation and identification of lots.....	7
4.2 Drawing of samples.....	7
4.2.1 Selection of sample items.....	7
4.2.2 Process of sampling.....	7
4.3 Sampling plans.....	7
4.3.1 Inspection level.....	7
4.3.2 Sampling plan for normal inspection.....	8
4.3.3 Acceptance number.....	8
4.3.4 Tightened or reduced inspection.....	8
5 Acceptance and rejection.....	9
5.1 Acceptability criteria.....	9
5.2 Disposition of rejected lots.....	9
6 Statistical verified quality limit (SVQL).....	9
6.1 General.....	9
6.2 Calculation of the SVQL.....	10
Annex A (informative) Estimation of the statistical verified quality limit (SVQL) in nonconforming items per million ($\times 10^{-6}$) at a confidence limit 60 %.....	11
Annex B (informative) Relationship between this standard and ISO 2859-1.....	15
Annex C (informative) Example of application of this standard (lot-by-lot inspection of assessment level EZ in IEC/TC 40).....	17
Bibliography.....	18
Table 1 – Sample size.....	8
Table 2 – Sample size code letters.....	9
Table 3 – Coefficients for confidence level 60 % (see also A.5).....	10
Table A.1 – Statistical verified quality limits in nonconforming items per million ($\times 10^{-6}$).....	12
Table A.2 – np with confidence limit of 60 % for accumulated number of nonconforming items and coefficient C_L	14
Table B.1 – Sampling plans corresponding to Table 2-A of ISO 2859-1.....	15
Table B.2 – Tabulated values for operating characteristic curves (p : per cent nonconforming).....	16
Table C.1 – Lot-by-lot inspection of assessment level EZ – IEC/TC 40.....	17

IEC STANDARD PREVIEW
 (standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/4dccc2a7-e9da-4a07-8388-029219ef0a5a/iec-61193-2-2007>
 IEC 61193-2:2007

INTERNATIONAL ELECTROTECHNICAL COMMISSION

QUALITY ASSESSMENT SYSTEMS –

**Part 2: Selection and use of sampling plans
for inspection of electronic components and packages**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61193-2 has been prepared by IEC technical committee 91: Electronics assembly technology.

The text of this standard is based on the following documents:

FDIS	Report on voting
91/690/FDIS	91/723/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 61193 series, under the general title *Quality assessment systems*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 61193-2:2007](#)

<https://standards.iteh.ai/catalog/standards/sist/4dfcc2a7-e9da-4a07-8388-029219ef0a5a/iec-61193-2-2007>

INTRODUCTION

To obtain a high quality level of products, process controls like 100 % testing of significant characteristics and statistical methods are needed to stabilize, monitor, and improve processes.

Sampling inspection is one of the methods to verify

- whether the process control is effective, and
- the quality level of a supplier's product by a customer or third party.

Today the quality level of products for use in electric and electronic equipment is expected to be equal or close to zero defects. But, the assessment of a quality level close to zero defects by sampling only would lead to an unreasonable increase of cost for inspection. A combination of process control and zero acceptance number sampling plans is indispensable.

This standard provides a sampling system and plans for the inspection of electronic components, packages and modules, manufactured under suitable process control, which prevents the outflow of nonconforming products.

NOTE The sampling system provided by this standard is extracted from ISO 2859-1, and is intended to be used for the inspection of final products, either by the manufacturer, a customer, or a third party.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[IEC 61193-2:2007](https://standards.iteh.ai/catalog/standards/sist/4dfcc2a7-e9da-4a07-8388-029219ef0a5a/iec-61193-2-2007)

<https://standards.iteh.ai/catalog/standards/sist/4dfcc2a7-e9da-4a07-8388-029219ef0a5a/iec-61193-2-2007>

QUALITY ASSESSMENT SYSTEMS –

Part 2: Selection and use of sampling plans for inspection of electronic components and packages

1 Scope

This part of IEC 61193 applies to the inspection of electronic components, packages, and also modules (referred to as “products” in this standard) for use in electronic and electric equipment. It specifies sampling plans for inspection by attributes on the assumption that the acceptance number is zero ($A_c = 0$), including criteria for sample selection and procedures.

The zero acceptance number sampling plans provided by this standard apply to the inspection of products, that are manufactured under suitable process control with the target of a “zero-defect” quality level before sampling inspection.

In addition, this standard provides a method for the calculation of the expected value of the statistical verified quality limit (SVQL) at a confidence level of 60 %. Amongst other things, this method can be used to verify the effectiveness of the supplier’s process control.

NOTE In this standard the term “module” is used for products which are modules according to the definition in IEC 60194.

ITeH STANDARD PREVIEW
(standards.iteh.ai)

2 Normative references

[IEC 61193-2:2007](https://standards.iteh.ai/catalog/standards/sist/4dfcc2a7-e9da-4a07-8388-1272739045a4/iec-61193-2-2007)

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.

IEC 60194: *Printed board design, manufacture and assembly – Terms and definitions*

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

ISO 3534-2:2006, *Statistics – Vocabulary and symbols – Part 2: Applied statistics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60194, ISO 2859-1 and ISO 3534-2, as well as the following, apply.

3.1

electronic component

individual component which includes electronic, optoelectronic and/or micro-electro-mechanical systems (MEMS) element

3.2

electronic package

individual electronic element or elements in a container which protects the contents to assure the reliability and provides terminals to interconnect the container to an outer circuit

3.3

electronic module

functional block which contains individual electronic elements and /or electronic packages, to be used in a next level assembly

3.4

inspection level

IL

level to define sample size for lot size

NOTE Sample size of lots depends on the severity of inspection level.

3.5

nonconforming item

item with one or more nonconformities

NOTE A nonconforming item is a product which cannot satisfy the requirement (visual examination or electrical performance, etc.) in the lot-by-lot inspection or periodic test, etc.

3.6

structurally similar products

products manufactured by the same manufacturer with the same materials, manufacturing processes and methods

NOTE Products are structurally similar, even when there are differences e.g. in case size and rated values. Results from designated tests conducted on items of one lot of these products can be accumulated with results of other lots in the same group of structural similarity.

4 Sampling system

The procedure and sampling plans described in this clause are based on an acceptance number zero ($A_c = 0$).

4.1 Formation and identification of lots

The products shall be assembled into identifiable lots or sub-lots. Each lot shall, as far as practicable, consist of items of a single type, grade, class, size and composition, manufactured under uniform conditions at essentially the same time.

4.2 Drawing of samples

4.2.1 Selection of sample items

The items selected for the sample shall be drawn from the lot by simple random sampling (see 3.1.3.4 in ISO 3534-2). However, when the lot consists of sub-lots or strata, identified by some rational criterion, stratified sampling shall be used in such a way that the size of the subsample from each subplot or stratum is proportional to the size of that subplot or stratum.

4.2.2 Process of sampling

Samples may be drawn after the lot has been produced, or during production of the lot.

4.3 Sampling plans

4.3.1 Inspection level

The inspection level designates the relative severity of inspection. Three inspection levels, I, II and III, are given for general use. Unless otherwise specified, level II shall be used. Level I may be used when less discrimination is needed or level III when greater discrimination is required. Four additional special levels, S-1, S-2, S-3 and S-4 may be used where relatively

small sizes are necessary and larger sampling risks can be tolerated, such as destructive inspection or valuable products.

The inspection level shall be specified in accordance with the detail specification or an agreement with a supplier and a user.

4.3.2 Sampling plan for normal inspection

Unless otherwise specified in the detail specification, single sampling plans for normal inspection according to Table 1 of this standard shall be applied (see also Annex B).

NOTE Table 1 is adapted from ISO 2859-1.

Table 1 – Sample size

Lot size	Special inspection levels				General inspection levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	2	2	2	2	2	2	3
9 to 15	2	2	2	2	2	3	5
16 to 25	2	2	3	3	3	5	8
26 to 50	2	3	3	5	5	8	13
51 to 90	3	3	5	5	5	13	20
91 to 150	3	3	5	8	8	20	32
151 to 280	3	5	8	13	13	32	50
281 to 500	3	5	8	13	20	50	80
501 to 1 200	5	5	13	20	32	80	125
1 201 to 3 200	5	8	13	32	50	125	200
3 201 to 10 000	5	8	20	32	80	200	315
10 001 to 35 000	5	8	20	50	125	315	500
35 001 to 150 000	8	13	32	80	200	500	800
150 001 to 500 000	8	13	32	80	315	800	1 250
≥ 500 001	8	13	50	125	500	1 250	2 000

4.3.3 Acceptance number

The acceptance number (Ac) shall be zero and the rejection number (Re) shall be 1.

4.3.4 Tightened or reduced inspection

When tightened inspection or reduced inspection is applied, Table 2 shall be used to select the applicable code letter for the particular lot size and the prescribed inspection level (see ISO 2859-1, Table 1). Then, sample size shall be determined from ISO 2859-1, Table 2-B (tightened inspection) or Table 2–C (reduced inspection) by the corresponding sample size code letter.

Table 2 – Sample size code letters

Lot size	Special inspection levels				General inspection levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	A	A	A	A	A	A	B
9 to 15	A	A	A	A	A	B	C
16 to 25	A	A	B	B	B	C	D
26 to 50	A	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	E	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1 200	C	C	E	F	G	J	K
1 201 to 3 200	C	D	E	G	H	K	L
3 201 to 10 000	C	D	F	G	J	L	M
10 001 to 35 000	C	D	F	H	K	M	N
35 001 to 150 000	D	E	G	J	L	N	P
150 001 to 500 000	D	E	G	J	M	P	Q
≥ 500 001	D	E	H	K	N	Q	R

5 Acceptance and rejection

ITh STANDARD PREVIEW

5.1 Acceptability criteria

(standards.iteh.ai)

The lot shall be accepted only if no nonconforming items are found upon inspection according to Clause 4.

<https://standards.iteh.ai/catalog/standards/sist/4dfcc2a7-e9da-4a07-8388-029219ef0a5a/iec-61193-2-2007>

5.2 Disposition of rejected lots

The responsible authority of the manufacturer shall decide how the rejected lots should be disposed. Such lots may be scrapped, sorted (with or without nonconforming items being replaced), reworked, re-evaluated against more specific usability criteria, or held for additional information, etc.

When the inspection results are used to calculate the statistical verified quality limit (SVQL) according to Clause 6, the complete sample shall be inspected to obtain correct statistical data.

NOTE Nonconforming lots indicate weak points in process control. The cause of nonconformities should be determined and appropriate corrective action implemented.

6 Statistical verified quality limit (SVQL)

6.1 General

The observation of zero nonconformities in a sample does not imply that the population has no nonconformities. The following method describes how to estimate the average production quality with a certain statistical probability (confidence level).

NOTE Though SVQL is calculated by accumulating the inspection results, including rejected lots, these rejected lots including nonconforming items in sample are not shipped. Thus the defect rate perceived by a customer is far below the values calculated as statistical verified quality limit.

Verification of the outgoing quality in nonconforming items per million ($\times 10^{-6}$) to customers is hard to be obtained by sampling inspection of single lots. For that reason the quality level