

Quality assessment systems —

Part 1: Registration and analysis of defects on printed board assemblies

The European Standard EN 61193-1:2002 has the status of a
British Standard

ICS 31.180

National foreword

This British Standard is the official English language version of EN 61193-1:2002. It is identical with IEC 61193-1:2001.

The UK participation in its preparation was entrusted to Technical Committee EPL/501, Electronic assembly technology, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Quality assessment systems
Part 1: Registration and analysis of defects
on printed board assemblies
(IEC 61193-1:2001)

Système d'assurance de la qualité
Partie 1: Enregistrement et analyse
des défauts sur les cartes
imprimées équipées
(CEI 61193-1:2001)

Qualitätsbewertungssysteme
Teil 1: Protokollierung und Analyse
von Fehlern auf bestückten Leiterplatten
(IEC 61193-1:2001)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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Foreword

The text of document 91/265/FDIS, future edition 1 of IEC 61193-1, prepared by IEC TC 91, Electronics assembly technology, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61193-1 on 2002-02-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
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- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2005-02-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A and ZA are normative and annexes B, C and D are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61193-1:2001 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

This part of IEC 61193 enables the counting of defects on soldered printed board assemblies in the manufacture of electronic circuits and the associated calculation of ppm (parts per million) data to be carried out in a standard manner.

The number of defects occurring during the production process is usually expressed at lower defect levels in parts per million, commonly indicated as ppm. On the face of it, the meaning of the ppm value of a soldering process is self-evident: a part is, in this context, a soldered joint that is defective, the million refers to a million soldered joints.

For a uniform registration of defects it is emphasized that in this standard the soldering defects are counted immediately after the actual soldering operation (on emergence of the soldered assembly from the soldering machine). By the Pareto analysis method it can be assessed whether the defect should be attributed to the soldering process proper or to another cause.

In order to manage the ppm values to be calculated, there is a need to understand the mathematical significance of the number of defects found in a batch of a particular size (i.e. smaller than the size of the entire lot of products) and its consequences for the entire lot.

Mentioning the ppm value of a certain soldering process, without reference to the number of soldered joints and without giving the level of confidence is of little use.

For making ppm calculations, several methods are described by which the maximum ppm level to be expected can be determined, for example:

- by using the formula that describes the binomial distribution to construct this distribution;
- by using graphs or tables from the literature.

QUALITY ASSESSMENT SYSTEMS –

Part 1: Registration and analysis of defects on printed board assemblies

1 Scope

This part of IEC 61193 defines methods of registration and analysis of defects on soldered printed board assemblies. Methods are described to allow effective comparison of performance between products, processes and production locations and can serve as a basis for general quality improvement.

The standard specifies defect data collection in two categories.

Category 1 ppm data: this category provides data for registration purposes intended to enable overall performance comparison of assembly operations.

Category 2 ppm data: this category provides data intended for individual subprocess assessment, analysis and control purposes.

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.

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

IEC 61191-1, *Printed board assemblies – Part 1: Generic specification – Requirements for soldered electrical and electronic assemblies using surface mount and related assembly technologies*

IEC 61191-2, *Printed board assemblies – Part 2: Sectional specification – Requirements for surface mount soldered assemblies*

IEC 61191-3, *Printed board assemblies – Part 3: Sectional specification – Requirements for through-hole mount soldered assemblies*

IEC 61191-4, *Printed board assemblies – Part 4: Sectional specification – Requirements for terminal soldered assemblies*

IEC 61192-1, *Product performance requirements – Part 1: Generic standard – Workmanship requirements and guidelines for soldered electronic assemblies*¹

IEC 61192-2, *Product performance requirements – Part 2: Sectional standard – Workmanship requirements and guidelines for soldered surface mount electronic assemblies*¹

¹ To be published.

IEC 61192-3, *Product performance requirements – Part 3: Sectional standard – Workmanship requirements for through-hole mount soldered assemblies*²

IEC 61192-4, *Product performance requirements – Part 4: Sectional standard – Workmanship requirements for terminal soldered connections*²

3 Terms and definitions

For the purposes of this part of IEC 61193 the definitions in IEC 60194³ and the following apply. Where appropriate, an alpha-numerical code has been assigned to the term in order to assist the registration and disposition of defects or process deviation indicators.

3.1

general characterizations

conditions or attributes of the final electronic assembly that may be compared to the requirements of the appropriate documentation or performance specification

3.1.1

defect registration

uniform registration system for collecting information on electronic assembly attributes that can be accredited to a subprocess or a final product configuration, made before any touch-up or repair process

3.1.2

subprocesses

major manufacturing functions used to produce electronic assemblies that are an integral part of the manufacturing process to which process deviation indicators or defects defining non-conforming attributes may be assigned

3.1.3

printed board solder joint

electrical/mechanical connection to a printed board or other interconnecting structure that employs solder for the joining of two or more metal surfaces

NOTE See also the definitions of cold soldered connection, disturbed soldered connection, excess soldered connection, insufficient soldered connection, overheated soldered connection, preferred soldered connection and rosin soldered connection in IEC 60194.

3.2

solder paste application (P0)

subprocess used to apply solder paste to a land pattern on a printed board or interconnecting structure for the purpose of attaching components using solder reflow techniques

3.2.1

paste misalignment (P1)

image of solder paste geometric profiles positioned so that they are not registered to the land pattern on the printed board/interconnecting structure used to mount components

² To be published.

³ Certain definitions of IEC 60194 have been translated into French.