SVENSK STANDARD SS-EN 61709

Fastställd	Utgåva	Sida	Ansvarig kommitté
2017-09-06	3	1 (1+123)	SEK TK 56

Funktionssäkerhet hos elektronikkomponenter – Referensbetingelser för felbenägenhet och stressmodeller för omräkning

Electronic components –
Reliability –
Reference conditions for failure rates and stress models for conversion

Som svensk standard gäller europastandarden EN 61709:2017. Den svenska standarden innehåller den officiella engelska språkversionen av EN 61709:2017.

Nationellt förord

Europastandarden EN 61709:2017

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
– **IEC 61709, Third edition, 2017 - Electronic components - Reliability - Reference conditions for failure rates and stress models for conversion**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 61709, utgåva 2, 2012, gäller ej fr o m 2020-03-24.

ICS 31.020.00

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Stora delar av arbetet sker internationellt

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Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

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Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61709

May 2017

ICS 31.020

Supersedes EN 61709:2011

English Version

Electric components - Reliability - Reference conditions for failure rates and stress models for conversion (IEC 61709:2017)

Composants électriques - Fiabilité - Conditions de référence pour les taux de défaillance et modèles de contraintes pour la conversion
(IEC 61709:2017)

Bauelemente der Elektronik - Zuverlässigkeit - Referenzbedingungen für Ausfallraten und Beanspruchungsmodelle zur Umrechnung
(IEC 61709:2017)

This European Standard was approved by CENELEC on 2017-03-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 61709:2017 E

SEK Svensk Elstandard

European foreword

The text of document 56/1714/FDIS, future edition 3 of IEC 61709, prepared by IEC/TC 56 "Dependability" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61709:2017.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-12-24
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2020-03-24

This document supersedes EN 61709:2011.

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

Endorsement notice

The text of the International Standard IEC 61709:2017 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60300-3-2:2004	NOTE	Harmonized as EN 60300-3-2:2005.
IEC 60300-3-3	NOTE	Harmonized as EN 60300-3-3.
IEC 60721 (series)	NOTE	Harmonized as EN 60721 (series).
IEC 60721-3-3	NOTE	Harmonized as EN 60721-3-3.
IEC 60721-3-4	NOTE	Harmonized as EN 60721-3-4.
IEC 60721-3-5	NOTE	Harmonized as EN 60721-3-5.
IEC 60721-3-7	NOTE	Harmonized as EN 60721-3-7.
IEC 61014:2003	NOTE	Harmonized as EN 61014:2003.
IEC 61360 (series)	NOTE	Harmonized as EN 61360 (series).
IEC 61360-1:2009	NOTE	Harmonized as EN 61360-1:2010.
IEC 61360-4:2005	NOTE	Harmonized as EN 61360-4:2005.
IEC 61508 (series)	NOTE	Harmonized as EN 61508 (series).
IEC 61649:2008	NOTE	Harmonized as EN 61649:2008.
IEC 61703:2002	NOTE	Harmonized as EN 61703:2002.
IEC 61710	NOTE	Harmonized as EN 61710.

IEC 61810-2:2011	NOTE	Harmonized as EN 61810-2:2011.
IEC 61810-2-1:2011	NOTE	Harmonized as EN 61810-2-1:2011.
IEC 62007 (series)	NOTE	Harmonized as EN 62007 (series).
IEC 62741	NOTE	Harmonized as EN 62741.
IEC 62308:2006	NOTE	Harmonized as EN 62308:2006.

Annex ZA
(normative)
Normative references to international publications with their corresponding European publications

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

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60050-192	2015	International electrotechnical vocabulary - Part 192: Dependability	-	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRIC COMPONENTS – RELIABILITY – REFERENCE CONDITIONS FOR FAILURE RATES AND STRESS MODELS FOR CONVERSION

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.
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International Standard IEC 61709 has been prepared by IEC technical committee 56: Dependability.

This third edition cancels and replaces the second edition, published in 2011. This edition constitutes a technical revision. This third edition is a merger of IEC 61709:2011 and IEC TR 62380:2004.

This edition includes the following significant technical changes with respect to the previous edition:

a) addition of 4.5 Components choice, 4.6 Reliability growth during the deployment phase of new equipment, 4.7 How to use this document, and of Clause 19 Printed circuit boards (PCB) and Clause 20 Hybrid circuits with respect to IEC TR 62380;
b) addition of failure modes of components in Annex A;

c) modification of Annex B, Thermal model for semiconductors, adopted and revised from IEC TR 62380;

d) modification of Annex D, Considerations on mission profile;

e) modification of Annex E, Useful life models, adopted and revised from IEC TR 62380;

f) revision of Annex F (former B.2.6.4), Physics of failure;

g) addition of Annex G (former Annex C), Considerations for the design of a data base on failure rates, complemented with parts of IEC 60319;

h) addition of Annex H, Potential sources of failure rate data and methods of selection;

i) addition of Annex J, Presentation of component reliability data, based on IEC 60319.

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

FDIS	Report on voting
56/1714/FDIS	56/1721/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.

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This document is intended for the reliability prediction of electric components as used in equipment and is aimed at organizations that have their own data and describes how to state and use that data in order to perform reliability predictions.

It can also be used to allow an organization to set up a failure rate database and describes the reference conditions for which field failure rates should be stated. The reference conditions adopted in this document are typical of the majority of applications of components in equipment however when components operate under other conditions the users may consider stating these conditions as their reference conditions.

Using the presented stress models allows extrapolation of failure rates from reference conditions to other operating conditions which in turn permits the prediction of failure rates at assembly level. This allows estimation of the effect of design changes or changes in the environmental conditions on component reliability. Reliability prediction is most useful in the early design phase of equipment. It can be used, for example, to identify potential reliability problems, the planning of logistic support strategies and the evaluation of designs.

The stress models contained herein are generic and are as simple as possible while still being comparable with more complex equations contained in other models. The predictions generated using this document have a wide range of prediction accuracy.

This document does not contain failure rates, but it describes how they can be stated and used. This approach allows a user to select the most relevant and up to date failure rates for the prediction from a source that they select. This document also contains information on how to select the data that can be used in the presented models.

The failure rates considered in this document are assumed to be constant, either for an unlimited period of operation (general case) or for limited periods. The limitation of life is called useful life and applies only for some few component families, reaching the wear-out failure period (during which the failure rate is increasing) within the normal period of use. It is hence assumed that during useful life, the failure rate can be considered constant for any practical use.

For the purposes of this document the term electric component includes the commonly used terms “electronic component”, “electrical component” and “electro-mechanical component”.

ELECTRIC COMPONENTS – RELIABILITY – REFERENCE CONDITIONS FOR FAILURE RATES AND STRESS MODELS FOR CONVERSION

1 Scope

This document gives guidance on the use of failure rate data for reliability prediction of electric components used in equipment.

The method presented in this document uses the concept of reference conditions which are the typical values of stresses that are observed by components in the majority of applications.

Reference conditions are useful since they provide a known standard basis from which failure rates can be modified to account for differences in environment from the environments taken as reference conditions. Each user can use the reference conditions defined in this document or use their own. When failure rates stated at reference conditions are used it allows realistic reliability predictions to be made in the early design phase.

The stress models described herein are generic and can be used as a basis for conversion of failure rate data given at these reference conditions to actual operating conditions when needed and this simplifies the prediction approach. Conversion of failure rate data is only possible within the specified functional limits of the components.

This document also gives guidance on how a database of component failure data can be constructed to provide failure rates that can be used with the included stress models. Reference conditions for failure rate data are specified, so that data from different sources can be compared on a uniform basis. If failure rate data are given in accordance with this document then additional information on the specified conditions can be dispensed with.

This document does not provide base failure rates for components – rather it provides models that allow failure rates obtained by other means to be converted from one operating condition to another operating condition.

The prediction methodology described in this document assumes that the parts are being used within its useful life. The methods in this document have a general application but are specifically applied to a selection of component types as defined in Clauses 6 to 20 and I.2.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-192:2015*, International electrotechnical vocabulary – Part 192: Dependability*