SLOVENSKI STANDARD
SIST EN 62308:2007

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Zanesljivost opreme - Metode ocenjevanja zanesljivosti (IEC 62308:2006)

Equipment reliability - Reliability assessment methods

Zuverlässigkeit von Geräten - Verfahren zur Zuverlässigkeitsbewertung

Fiabilité de l'équipement - Méthodes d'évaluation de la fiabilité

Ta slovenski standard je istoveten z: **EN 62308:2006**

ICS:

03.120.01	Kakovost na splošno	Quality in general
21.020	Značilnosti in načrtovanje strojev, aparatov, opreme	Characteristics and design of machines, apparatus, equipment

SIST EN 62308:2007 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 62308

December 2006

ICS 03.120.01; 03.120.99

English version

Equipment reliability - Reliability assessment methods (IEC 62308:2006)

Fiabilité de l'équipement -
Méthodes d'évaluation de la fiabilité
(CEI 62308:2006)

Zuverlässigkeit von Geräten -
Verfahren zur Zuverlässigkeitsbewertung
(IEC 62308:2006)

This European Standard was approved by CENELEC on 2006-11-01. 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 Central Secretariat or to any CENELEC member.

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

The text of document 56/1110/FDIS, future edition 1 of IEC 62308, prepared by IEC TC 56, Dependability, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62308 on 2006-11-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2007-08-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2009-11-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62308:2006 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61751	NOTE Harmonized as EN 61751:1998 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

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

Publication	Year	Title	EN/HD	Year
IEC 60050-191	1990	International Electrotechnical Vocabulary (IEV) Chapter 191: Dependability and quality of service	-	-
IEC 60300-1	-[1)]	Dependability management Part 1: Dependability management systems	EN 60300-1	2003[2)]
IEC 60300-3-1	2003	Dependability management Part 3-1: Application guide - Analysis techniques for dependability - Guide on methodology	EN 60300-3-1	2004
IEC 60300-3-2	-[1)]	Dependability management Part 3-2: Application guide - Collection of dependability data from the field	EN 60300-3-2	2005[2)]
IEC 60300-3-3	-[1)]	Dependability management Part 3-3: Application guide - Life cycle costing	EN 60300-3-3	2004[2)]
IEC 60300-3-4	1996	Dependability management Part 3: Application guide - Section 4: Guide to the specification of dependability requirements	-	-
IEC 60300-3-5	2001	Dependability management Part 3-5: Application guide - Reliability test conditions and statistical test principles	-	-
IEC 60300-3-9	-[1)]	Dependability management Part 3: Application guide - Section 9: Risk analysis of technological systems	-	-
IEC 60300-3-11	-[1)]	Dependability management Part 3-11: Application guide - Reliability centred maintenance	-	-
IEC 60300-3-12	-[1)]	Dependability management Part 3-12: Application guide - Integrated logistic support	EN 60300-3-12	2004[2)]
IEC 60812	-[1)]	Analysis techniques for system reliability - Procedure for failure mode and effects analysis (FMEA)	EN 60812	2006[2)]

[1)] Undated reference.

[2)] Valid edition at date of issue.

Publication	Year	Title	EN/HD	Year
IEC 61025	-[1)]	Fault tree analysis (FTA)	HD 617 S1	1992[2)]
IEC 61078	-[1)]	Analysis techniques for dependability - Reliability block diagram and Boolean methods	EN 61078	2006[2)]
IEC 61160	-[1)]	Design review	EN 61160	2005[2)]
IEC 61165	-[1)]	Application of Markov techniques	EN 61165	2006[2)]
IEC 61508	Series	Functional safety of electrical/electronic/programmable electronic safety-related systems	EN 61508	Series
IEC 61649	-[1)]	Goodness-of-fit tests, confidence intervals and lower confidence limits for Weibull distributed data	-	-
IEC 61709	-[1)]	Electronic components - Reliability - Reference conditions for failure rates and stress models for conversion	EN 61709	1998[2)]
IEC 61710	-[1)]	Power law model - Goodness-of-fit tests and estimation methods	-	-
IEC 61713	-[1)]	Software dependability through the software life-cycle processes - Application guide	-	-
IEC 61882	-[1)]	Hazard and operability studies (HAZOP studies) - Application guide	-	-
IEC/TR 62380	-[1)]	Reliability data handbook - Universal model for reliability prediction of electronics components, PCBs and equipment	-	-

NORME INTERNATIONALE

INTERNATIONAL STANDARD

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Fiabilité de l'équipement – Méthodes d'évaluation de la fiabilité

Equipment reliability – Reliability assessment methods

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For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EQUIPMENT RELIABILITY – RELIABILITY ASSESSMENT METHODS

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 62308 has been prepared by IEC technical committee 56: Dependability.

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

FDIS	Report on voting
56/1110/FDIS	56/1122/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 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.

INTRODUCTION

This International Standard describes procedures that are intended for use in assessing the reliability of items based on data from: the market of similar items; and field data and test data from suppliers of components and modules. The results of such assessments are intended for use as inputs to early equipment design decisions such as system architecture selection as well as business decisions such as estimating the cost of warranties or maintenance cost guarantees. Furthermore the results can be used as the initial estimate for input to safety analysis, for example FTA analysis. Modern electronic components and items are so reliable that estimating or verifying their reliability by testing is very difficult, therefore data from the field for previous similar items are often the only way to get an initial estimate of the reliability. Component manufacturers have used this method for years under the name of the “similarity principle”. By emphasising the use of data from previously marketed similar products, and requiring similarity to be documented, the method is a modern alternative to the classical but now obsolete handbook prediction.

Reliability assessment results should be viewed as an early estimate of the probability that the product reliability targets and goals can be satisfied using the chosen architecture, modules, components and maintenance policy. As such, they may be used, for example, to authorize advancement to the next step in product development, or to authorize progress payments, or to proceed with delivery and acceptance of products. Reliability assessment results should never be used to support a claim that the reliability targets, goals, or expectations have been satisfied. The only certain measure of reliability requirement having been met is from service/field performance. This standard describes the uses for reliability assessment results as well as providing a list of IEC standards that require such results as input.

The approach to reliability assessment in this International Standard

– encourages the equipment manufacturer to consider all relevant information regarding equipment reliability which may include the effects of design and manufacturing processes as well as component selection issues. This is in contrast to more traditional methods that focus on component reliability as the most significant contributor to the equipment reliability;

– encourages the equipment manufacturer to define and use the processes that are most effective for the manufacturer’s own equipment;

– describes a continuous procedure in which a reliability assessment can be updated as more information becomes available during the life cycle of the equipment. This information may be used to improve both the reliability of the equipment and the effectiveness of the assessment process.

This International Standard describes the application of three approaches to reliability assessment, namely: similarity analysis, durability analysis, and handbook predictions. This standard does not, however, provide information on assessing the reliability of software systems but can be used for assessing the reliability of hardware systems containing embedded software.

EQUIPMENT RELIABILITY – RELIABILITY ASSESSMENT METHODS

1 Scope

This International Standard describes early reliability assessment methods for items based on field data and test data for components and modules. It is applicable to mission, safety and business critical, high integrity and complex items. It contains information on why early reliability estimates are required and how and where the assessment would be used. Finally, it details methods for reliability assessment and the data required to support the assessment. To estimate durability (life time or wear-out), the physics-of-failure method is used.

Three types of assessment are discussed in detail:

– the similarity approach;
– models for durability analysis;
– handbook methods.

Clause 6 provides an introduction to reliability assessment and Clause 7 the management of the process. Clause 8 describes the data needs, sources and types for assessments and Clause 9 provides details of the assessment methods.

Annexes A and B provide additional information to aid understanding of the similarity analysis and durability analysis.

This standard is applicable to making reliability estimates for specifications, design, design modification and support engineering.

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 60050-191:1990, *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 60300-1, *Dependability management – Part 1: Dependability management systems*

IEC 60300-3-1:2003, *Dependability management – Part 3-1: Application guide – Analysis techniques for dependability – Guide on methodology*

IEC 60300-3-2, *Dependability management – Part 3-2: Application guide – Collection of dependability data from the field*

IEC 60300-3-3, *Dependability management – Part 3-3: Application guide – Life cycle costing*

IEC 60300-3-4:1996, *Dependability management – Part 3: Application guide – Section 4: Guide to the specification of dependability requirements*

IEC 60300-3-5:2001, *Dependability management – Part 3-5: Application guide – Reliability test conditions and statistical test principles*

IEC 60300-3-9, *Dependability management – Part 3: Application guide – Section 9: Risk analysis of technological systems*

IEC 60300-3-11, *Dependability management – Part 3-11: Application guide – Reliability centred maintenance*

IEC 60300-3-12, *Dependability management – Part 3-12: Application guide – Integrated logistic support*

IEC 60812, *Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)*

IEC 61025, *Fault tree analysis (FTA)*

IEC 61078, *Analysis techniques for dependability – Reliability block diagram and boolean methods*

IEC 61160, *Design review*

IEC 61165, *Application of Markov techniques*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61649, *Goodness-of-fit tests, confidence intervals and lower confidence limits for Weibull distributed data*

IEC 61709, *Electronic components – Reliability – Reference conditions for failure rates and stress models for conversion*

IECI 61710, *Power law model – Goodness-of-fit tests and estimation methods*

IEC 61713, *Software dependability through the software life-cycle processes – Application guide*

IEC 61882, *Hazard and operability studies (HAZOP studies) – Application guide*

IEC 62380, *Reliability data handbook – Universal model for reliability prediction of electronics components, PCBs and equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-191, together with the following, apply.

3.1
durability analysis
analysis of the equipment's responses to the stresses imposed by operational use, maintenance, shipping, storage and other activities throughout its specified life-cycle in order to estimate its predicted reliability and expected life

3.2
life-cycle
time interval between a product's conception and its disposal

3.3
similarity analysis
structured comparison of the elements of the equipment being assessed with those of predecessor equipment for which in-service reliability data are available

4 Abbreviations

ASIC	Application specific integrated circuit
BITE	Built in test equipment
COTS	Commercial off the shelf
FEA	Finite element analysis
FFOP	Failure free operating period
FITS	Failure per thousand million hours
FMEA	Failure mode and effects analysis
FMECA	Failure mode, effects and criticality analysis
FRACAS	Failure reporting, analysis and corrective action system
FTA	Fault tree analysis
HALT	Highly accelerated life test
IC	Integrated circuit
LCC	Life cycle costs
LRU	Line replaceable unit
MCTF	Mean cycles to failure
MTBF	Mean time between failures
MTBUR	Mean time between unit repair
MTTF	Mean time to failure
MTTR	Mean time to restoration/recovery/repair
MTTSC	Mean time to service call
MTTSI	Mean time to service interruption
MTTWC	Mean time to warranty claim
RBD	Reliability block diagram
RCM	Reliability centred maintenance
RET	Reliability enhancement test
SRU	Shop replaceable unit

5 Symbols

λ	Constant failure rate of the exponential distribution
t	Time period of interest
$f(t)$	Probability density function
$F(t)$	Cumulative distribution function
$R(t)$	Reliability function
T^*	Accumulated exposure time