

Reliability growth - Statistical test and estimation methods

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61164:2008 sisaldab Euroopa standardi EN 61164:2004 ingliskeelset teksti.

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Aru 10 Tallinn 10317 Eesti; www.evs.ee; Telefon: 605 5050; E-post: info@evs.ee

English version

**Reliability growth -
Statistical test and estimation methods
(IEC 61164:2004)**

Croissance de la fiabilité -
Tests et méthodes
d'estimation statistiques
(CEI 61164:2004)

Zuverlässigkeitswachstum -
Statistische Prüf- und Schätzverfahren
(IEC 61164:2004)

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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

Foreword

The text of document 56/920/FDIS, future edition 2 of IEC 61164, prepared by IEC TC 56, Dependability, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61164 on 2004-04-01.

This European Standard should be used in conjunction with EN 61014:2003.

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) 2005-01-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2007-04-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61164:2004 was approved by CENELEC as a European Standard without any modification.

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-191	1990	International Electrotechnical Vocabulary (IEV) Chapter 191: Dependability and quality of service	-	-
IEC 60300-3-5	2001	Dependability management Part 3-5: Application guide - Reliability test conditions and statistical test principles	-	-
IEC 60605-4	- ¹⁾	Equipment reliability testing Part 4: Statistical procedures for exponential distribution - Point estimates, confidence intervals, prediction intervals and tolerance intervals	-	-
IEC 60605-6	- ¹⁾	Part 6: Tests for the validity of the constant failure rate or constant failure intensity assumptions	-	-
IEC 61014	2003	Programmes for reliability growth	EN 61014	2003

¹⁾ Undated reference.

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INTRODUCTION

This International Standard describes the power law reliability growth model and related projection model and gives step-by-step directions for their use. There are several reliability growth models available, the power law model being one of the most widely used. This standard provides procedures to estimate some or all of the quantities listed in Clauses 4, 6 and 7 of IEC 61014.

Two types of input are required. The first one is for reliability growth planning through analysis and design improvements in the design phase in terms of the design phase duration, initial reliability, reliability goal, and planned design improvements, along with their expected magnitude. The second input, for reliability growth in the project validation phase, is for a data set of accumulated test times at which relevant failures occurred, or were observed, for a single system, and the time of termination of the test, if different from the time of the final failure. It is assumed that the collection of data as input for the model begins after the completion of any preliminary tests, such as environmental stress screening, intended to stabilize the product's initial failure intensity.

Model parameters estimated from previous test results may be used to plan and predict the course of future reliability growth programmes, provided the conditions are similar.

Some of the procedures may require computer programs, but these are not unduly complex. This standard presents algorithms for which computer programs should be easy to construct.

RELIABILITY GROWTH – STATISTICAL TEST AND ESTIMATION METHODS

1 Scope

This International Standard gives models and numerical methods for reliability growth assessments based on failure data, which were generated in a reliability improvement programme. These procedures deal with growth, estimation, confidence intervals for product reliability and goodness-of-fit tests.

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 (IEV) – Chapter 191: Dependability and quality of service*

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

IEC 60605-4, *Equipment reliability testing – Part 4: Statistical procedures for exponential distribution – Point estimates, confidence intervals, prediction intervals and tolerance intervals*

IEC 60605-6, *Equipment reliability testing – Part 6: Tests for the validity of the constant failure rate or constant failure intensity assumptions*

IEC 61014:2003, *Programmes for reliability growth*

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050(191) and IEC 61014, together with the following terms and definitions, apply.

3.1

reliability goal

desired level of reliability that the product should have at the end of the reliability growth programme

3.2

initial reliability

reliability that is estimated for the product in earlier design stages before any potential failure modes or their causes have been mitigated by the design improvement

3.3

reliability growth model for the design phase

mathematical model that takes into consideration potential design improvements, and their magnitude to express mathematically reliability growth from start to finish during the design period