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Reliability growth - Statistical test and estimation methods

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

The translation method used in this standard is equivalent to the IEC 61164.2004 "Reliability Growth Statistical Test and Evaluation Method".

The Chinese documents that have a consistent correspondence relationship with the normatively cited international documents in this standard are as follows.

---GB/T 5080.4-1985 equipment reliability test reliability determination test point estimation and interval estimation method (index score

Cloth) (neq IEC 60605-4.1978)

---GB/T 5080.6-1996 equipment reliability test validity test of the assumption of constant failure rate (idt IEC 60605-6.

1989)

This standard was proposed by the Ministry of Industry and Information Technology of the People's Republic of China.

This standard is under the jurisdiction of the National Standardization Technical Committee on Reliability and Maintainability of Electrical and Electronic Products (SAC/TC24).

Drafting organizations of this standard. The Fifth Institute of Electronics, Ministry of Industry and Information Technology, Beijing Aeronautical Engineering Technology Research Center.

Introduction

This standard describes the power law reliability growth model and the corresponding deduction model, and gives the detailed steps of their application methods. in

Among the existing reliability growth models, the power law model is the most widely used. GB/T 15174-2017 Chapter 4, Chapter 6 and

Chapter 7 gives some numerical calculation procedures.

The model requires two forms of input. The first type of input is used for reliability growth planning through analysis and design improvement in the design phase.

Plan, that is, input the duration of the design phase, initial reliability, reliability target, planned design improvement and expected reliability level. First

The second type of input is used for reliability growth in the engineering development stage. Failure is the cumulative test when each associated failure of a system occurs or during observation.

In addition, if the test cut-off time is not the time of the last failure, it also includes the test cut-off time. In order to make the product early

The efficiency is stable, and it is assumed that the data collected as input to the model starts after all pre-tests such as environmental stress screening.

When the test conditions are similar, the parameters estimated with the previous test results can be used to predict or plan the reliability growth in the future.

Some calculation processes require computer programming, but it is not complicated. The algorithms in this standard can be easily programmed by computer.

achieve.

Reliability growth statistical test and evaluation method

1 Scope

This standard provides models and numerical methods for reliability growth assessment based on failure data in reliability improvement work. These models

And numerical methods involve growth, evaluation, product reliability confidence intervals, and product goodness-of-fit tests.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this article

Pieces. For undated reference documents, the latest version (including all amendments) is applicable to this document.

GB/T 2900.13-2008 Electrical engineering terminology credibility and service quality [IEC 60050(191).1990,IDT]

GB/T 5080.1-2012 Reliability Test Part 1.Test Conditions and Principles of Statistical Inspection (IEC 60300-3-5.2001, IDT)

GB/T 15174-2017 Reliability Growth Outline (IEC 61014.2003, IDT)

IEC 60605-4 Equipment Reliability Test Part 4.Point Estimation and Interval Estimation Method for Reliability Test under Exponential Distribution

(Equipmentreliabilitytesting-Part 4.Statisticalproceduresforexponentialdistribution-Pointestimates,confidenceintervals,predictionintervalsandtoleranceintervals)

IEC 60605-6 Equipment Reliability Test Part 6.Validity Test of the Constant Failure Rate Hypothesis of Equipment Reliability Test

(Equipmentreliabilitytesting-Part 6.Testsforthevalidityoftheconstantfailurerateorconstant failureintensityassumptions)

3 Terms and definitions

The following terms and definitions defined in GB/T 2900.13-2008 and GB/T 15174-2017 apply to this document.

3.1

Reliability goal

The expected reliability level of the product after the reliability increase program is over.

3.2

Initial reliability

The reliability level in the early stage of product design, that is, the reliability level before any potential failure modes and causes are designed and improved.

3.3

Reliability growth model for the design phase

According to potential design improvements, use mathematical language to describe the increase in reliability from the beginning of the design phase to the end of the design phase

Variety.

3.4

Average product failure rate

Calculated from the estimated reliability in a given time period.

Note. The modification of product design results in a change in the failure rate function with time as a variable.