

Programme zum Zuverlässigkeitswachstum

(IEC 56/743/CD:2001, Text Englisch)

DIN

IEC 61014

Einsprüche bis 2001-11-30

ICS 29.020; 31.020; 35.020

Programmes for reliability growth
(IEC 56/743/CD:2001, text in English)

Programmes de croissance de fiabilité
(CEI 56/743/CD:2001), texte en anglais

Anwendungswarnvermerk

Dieser Norm-Entwurf wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE, Stresemannallee 15, 60596 Frankfurt am Main.

Das internationale Schriftstück IEC 56/743/CD:2001-06 „IEC 61014, Ed. 2: Programmes for reliability growth“ ist unverändert in diesen deutschen Norm-Entwurf übernommen worden.

Fortsetzung Seite 2 und 3
und 42 Seiten IEC-Original

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Nationales Vorwort

Dieser Norm-Entwurf enthält die englische Originalfassung des Internationalen Norm-Entwurfs [Committee Draft (CD)] IEC 56/743/CD:2001-06 "IEC 61014, Ed. 2: Programmes for reliability growth".

Auf eine Übersetzung wird im derzeitigen Entwurfsstadium zugunsten einer schnelleren Verfügbarkeit, Kommentierung und Einflussnahme der deutschen Fachöffentlichkeit verzichtet. Eine deutsche Übersetzung wird bei den weiteren Bearbeitungsstufen des Normvorhabens angefertigt.

Der Internationale Norm-Entwurf wurde vom TC 56 „Dependability“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen, haben IEC und das Europäische Komitee für Elektrotechnische Normung (CENELEC) vereinbart, dass ein auf IEC-Ebene entstandener Internationaler Norm-Entwurf zeitgleich (parallel) bei IEC und CENELEC im CDV-Stadium zur Umfrage und im FDIS-Stadium zur Abstimmung gestellt wird.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidung möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Europäische Norm-Entwürfe, die die erforderliche Zustimmung in CENELEC erhalten haben und als Europäische Norm ratifiziert wurden, sind unverändert als Deutsche Normen zu übernehmen.

Für den vorliegenden Norm-Entwurf ist das nationale Arbeitsgremium K 132 „Zuverlässigkeit“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE zuständig.

Nationaler Anhang NA (informativ) Zusammenhang mit Europäischen und Internationalen Normen

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ist nachstehend wiedergegeben. Zum Zeitpunkt der Veröffentlichung dieser Norm waren die angegebenen Ausgaben gültig.

IEC hat 1997 die Benummerung der IEC-Publikationen geändert. Zu den bisher verwendeten Normnummern wird jeweils 60000 addiert. So ist zum Beispiel aus IEC 68 nun IEC 60068 geworden.

Tabelle NA.1

Europäische Norm	Internationale Norm	Deutsche Norm	Klassifikation im VDE-Vorschriftenwerk
-	IEC 60050-191:1990	IEV Kapitel 191:1995	-
EN 60300-1:1993	IEC 60300-1:1993	DIN ISO 9000-4:1994-06	-
EN 60300-2:1996	IEC 60300-2:1995	DIN EN 60300-2:1996-10	-
-	IEC 60300-3-1:1991	DIN IEC 60300-3-1:1994-02	-
-	IEC 60300-3-5:2001	E DIN IEC 56/442/CD:1995-11	-

Europäische Norm	Internationale Norm	Deutsche Norm	Klassifikation im VDE-Vorschriftenwerk
-	IEC 60319:1978	DIN IEC 60319:1981-12	-
-	IEC 60605-2:1994	-	-
-	IEC 60605-4:1986	DIN IEC 60605-4:1988-05	-
-	IEC 60812:1985	DIN 25448:1990-05	-
-	IEC 61025:1990	DIN IEC 61025:1993-12	-
-	IEC 61160	-	-
EN ISO 9001:2000	ISO 9001:2000	DIN EN ISO 9001:2000-12	-

Nationaler Anhang NB (informativ) Literaturhinweise

IEV Kapitel 191, *Internationales Elektrotechnisches Wörterbuch – Kapitel 191: Zuverlässigkeit und Dienstgüte*; Identisch mit IEC 60050-191:1990

DIN ISO 9000-4, *Normen zu Qualitätsmanagement und zur Darlegung von Qualitätsmanagementsystemen; Leitfaden zum Management von Zuverlässigkeitsprogrammen* (Identisch mit ISO 9000-4:1993 bzw. IEC 60300-1:1993); Deutsche Fassung EN 60300-1:1993

DIN EN 60300-2, *Zuverlässigkeitsmanagement – Teil 2: Zuverlässigkeitsprogrammelemente und –aufgaben* (IEC 60300-2:1995); Deutsche Fassung EN 60300-2:1996

DIN IEC 60300-3-1, *Zuverlässigkeitsmanagement – Anwendungsleitfaden; Techniken für die Analyse der Zuverlässigkeit*; Identisch mit IEC 60300-3-1:1991

E DIN IEC 56/442/CD, *Zuverlässigkeitsmanagement – Teil 3: Anwendungsleitfaden; Hauptabschnitt 5: Zuverlässigkeitsprüfungen und Grundsätze für die statistische Prüfung* (IEC 56/442/CD:1995)

DIN IEC 60319, *Darstellung von Zuverlässigkeitsangaben von Bauelementen der Elektronik*

DIN IEC 60605-4, *Elektrotechnik – Prüfung der Zuverlässigkeit von Geräten; Teil 4: Schätzwerte und Vertrauensgrenzen*; Identisch mit IEC 60605-4:1996

DIN 25448, *Ausfalleffektanalyse (Fehler-Möglichkeits- und Einfluss-Analyse)*

DIN IEC 61025, *Störungsbaumanalyse*, Identisch mit IEC 61025:1990

DIN EN ISO 9001, *Qualitätsmanagementsysteme – Anforderungen* (ISO 9001:2000); Dreisprachige Fassung EN ISO 9001:2000

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PROGRAMMES FOR RELIABILITY GROWTH

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61014 has been prepared by IEC technical committee 56: Dependability.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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 3.

The committee has decided that the contents of this publication will remain unchanged until _____. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

Reliability improvement by a growth programme should be part of an overall reliability activity in the development of a product. This is especially true for a design which uses novel or unproven techniques or component parts or a substantial content of software. In such a case the programme may expose, over a period of time, many types of weaknesses having design-related causes. It is essential to reduce the probability of failure due to these weaknesses to the greatest extent possible to prevent their later appearance in formal tests or in the field. At that late stage, design correction is often highly inconvenient, costly and time-consuming.

Life cycle costs will be minimized if the necessary design changes are made at the earliest possible stage.

60300-3-5, clause 1, refers to a "reliability growth (or improvement) programme" employing equipment reliability design analysis and reliability testing, with the principal object of upgrading the reliability. Reliability design analysis applies analytical methods and techniques described in IEC 60300-3-1. Reliability design analysis is of a particular value, as it allows early identification of potential design weakness, well before design completion. This allows introduction of design modifications that are inexpensive and relatively easy to implement without consequences such as major design changes, program delays, modification of tooling and manufacturing processes. The reliability growth testing and environmental arrangements for the test part of this programme are essentially the same as those covered by IEC 60300-3-5, IEC 60605-2 and IEC 60605-3.

The importance of the reliability growth programme integrated into the design or product development process and known as Integrated Reliability Engineering is driven by limited time to market, program costs, and striving for product cost reduction.

Although effective for disclosure of potential field problems, a reliability growth testing program alone is typically expensive, requiring extensive test time and resources, and the corrective actions are considerably more costly than if they were found and corrected in early design. Additionally, the duration of these tests sometimes lasting for a very long time, would seriously affect the marketing or deployment schedule of the system.

The cost-effective solution to these challenges is a reliability growth program fully integrated in both, the design and evaluation phase, and the reliability growth testing phase, enabled by strong Project Management, Design Engineering, and often Customer participation and involvement. Over the past few years leading industry organizations have developed and applied state-of-the-art integrated reliability growth analytical and test methods and processes for increasing the reliability during the design phase, thus requiring less reliance on formal reliability growth testing. This technology is the basis for the integrated reliability growth strategy in this handbook and will be further discussed in this section. Some definitions and concepts are first given in order to lay the groundwork for discussing the integrated reliability growth concepts and methodologies.

PROGRAMMES FOR RELIABILITY GROWTH

1 Scope

This international standard specifies requirements and gives guidelines for the exposure and removal of weaknesses in hardware and software items for the purpose of reliability growth. It applies when the specification calls for a reliability growth programme of equipment (electronic, electromechanical and mechanical hardware as well as software) or when it is known that the design is unlikely to meet the requirements without improvement. A statement of the basic concepts is followed by descriptions of the management, planning, testing (laboratory or field), failure analysis and corrective techniques required. Mathematical modelling, to estimate the level of reliability achieved, is outlined briefly.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(191):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 191: Dependability and quality of service*

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

IEC 60300-2, *Dependability management – Part 2: Dependability programme elements and tasks*

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

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

IEC 60319, *Presentation and specification of reliability data for electronic components*

IEC 60605-2, *Equipment reliability testing – Part 2: Design of test cycles*

IEC 60605-3 series, *Equipment reliability testing – Part 3: Preferred test conditions*

IEC 60605-4, *Equipment reliability testing – Part 4: Procedures for determining point estimates and confidence limits for equipment reliability determination tests*

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

IEC 61025, *Fault tree analysis (FTA)*

IEC 61160, *Formal design review*

ISO 9001, *Quality management systems – Requirements*

3 Definitions

For the purposes of this International Standard, the terms and definitions given in IEC 60050(191) apply.

NOTE For analysis of the reliability growth test data, it is important to distinguish between the terms "failure intensity" (for repaired items) and "failure rate" or "hazard rate" (for non-repaired or one-shot items) defined in IEC 60050(191).

3.1

item; entity

any part, component, device, subsystem, functional unit, equipment or system that can be individually considered

NOTE 1 An item may consist of hardware, software or both, and may also in particular cases, include people.

[IEC 60050(191-01-01)]

3.2

reliability improvement

process undertaken with the deliberate intention of improving the reliability performance by eliminating causes of systematic failures and/or by reducing the probability of occurrence of other failures

[IEV 191-17-05]

NOTE 1 The method described in this standard is to make corrective modifications aimed at reducing systematic weaknesses or reducing their likelihood of occurrence.

NOTE 2 For any item there are limits to practicable and economic improvement and to achievable growth.

3.3

reliability growth

condition characterized by a progressive improvement of a reliability performance measure of an item with time

[IEV 191-17-04]

NOTE Modelling (projection) and analysis of reliability improvement during the design phase is based on the standard estimation of the expected product reliability within a given time period.

3.4

weakness failure

failure due to a weakness in the item itself when subjected to stresses within the stated capabilities of the item

NOTE 1 A weakness may be either inherent or induced.

[IEV 191-04-06]

NOTE 2 A weakness is any imperfection (known or unknown) in an item, capable of causing one or more weakness failures.

NOTE 2 Each type of weakness is assumed to be statistically independent of all other such types.

3.5

integrated reliability engineering

engineering tool, consisting of multitude of reliability/dependability methods integrated into all engineering stages and activities regarding a product from the conceptual phase through its use in the field by a combination of contribution from all relevant stakeholders

3.6

product reliability goal

setting a reliability goal for each new product based on certain corporate targets, market requirements or desired mission success probability that is reasonably achievable according to the past history and technical evaluation

NOTE For some projects, the reliability goal is set by the customer. The product specific goal is the target value of the reliability growth process.

3.7

systematic weakness

weakness, which can be eliminated, or its effects reduced, only by a modification of the design or manufacturing process, operational procedures, documentation or other relevant factors, or by substitution of substandard components or parts by components or parts of proven superior reliability

NOTE 1 A systematic weakness will often result in a failure that is related to a weakness in the design or a weakness of the manufacturing process or documentation.

NOTE 2 Repair or replacement (or re-run in case of software) without modification is likely to lead to recurrent failures of a similar kind.

NOTE 3 Software weaknesses are always systematic.

3.8

residual weakness

weakness, which is not systematic

NOTE 1 In this case, risk of recurrent failure of a similar kind is negligible, within the expected test time scale.

NOTE 2 Software weaknesses cannot be residual.

3.9

failure definition

termination of the specified performance due to the loss of the system capability to perform as it was designed and had demonstrated to perform under specified operational and/or environmental stresses

NOTE The term "termination" implies that the product had the ability to perform a required function and then had lost it. Once the system design is capable of meeting the specified performance requirement, then reliability failure is the termination of this capability.

3.10

failure mode

failure mode of a system, component, or part is the manner in which any of them ceases to perform its respective designed operation. A failure mode may be related to its frequency of occurrence ("equivalent failure rate") or to a probability of its occurrence to express the system's or part's reliability.

NOTE To address the reliability of a system, fundamentally one must address its corresponding failure modes, causes of these failure modes, and frequency or probability of occurrence of these modes under the system's intended use environment.

3.11

relevant failure

failure that should be included in interpreting test or operational results or in calculating the value of a reliability performance measure

NOTE 1 The criteria for inclusion should be stated.

[IEV 191-04-13]

NOTE 2 The criteria for inclusion are stated in 6.4.10.

3.12

non-relevant failure

failure that should be excluded in interpreting test or operational results or in calculating the value of a reliability performance measure

NOTE 1 The criteria for exclusion should be stated.

[IEV 191-04-14]

NOTE 2 The criteria for inclusion are stated in 6.4.9.

3.13

systematic failure

failure related in a deterministic way to a certain cause, which can only be eliminated by a modification of the design or of the manufacturing process, operational procedures, documentation or other relevant factors

NOTE 1 Corrective maintenance without modification will usually not eliminate the failure cause.

NOTE 2 A systematic failure can be induced at will by simulating the failure cause.

[IEV 191-04-19]

NOTE 3 In this standard, a systematic failure is interpreted as a failure resulting from a systematic weakness.

3.14

residual failure

failure resulting from a residual weakness

3.15

Categories of failures observed in a reliability growth test programme

Not all failures that may be experienced during a planned reliability growth test programme are addressed for correction. Failure correction, even if desired, at times may not be possible due to a variety of reasons such as time, complexity of changes that may be required to accommodate improvement or magnitude of cost that may be incurred. In that case, a primarily management decision is made whether or not to introduce necessary improvements. To reflect decisions on whether a failure will be addressed or not, failures that occur in reliability growth tests, and at times even in the field are categorized.

Failure categorization is not applicable for reliability growth in the product design phase as the view on potential failure modes is entirely different. Here, all components could potentially fail in one mode or another, but the likelihood and consequence of such an event may be very different. Failure modes and their potential causes that may be highly likely to occur are addressed first, and, if resources and schedules allow, other failure modes, less likely to occur are addressed. A product with a high number of components where each of those might have multiple failure modes, and each of the failure modes might have multiple causes might require a great amount of effort to classify and then re-classify each of the failure modes or causes, too cumbersome and costly to justify the classification. As in this effort, a classification does not add any value, it is not applied during design reliability and failure mode analysis.

- Failure category A

A systematic failure experienced in test for which management decides not to attempt corrective modification, due to cost, time, technological constraints or other reasons.

- Failure category B

A systematic failure experienced in test for which management decides to attempt corrective modification.

3.16

instantaneous reliability measure

reliability measure for an item at a given point (past or present) in a reliability growth programme

NOTE 1 The reliability measure used in design analysis is the expected product reliability in a predetermined time, or its equivalent failure intensity calculated from the assessed product reliability associated with a time period of interest.

NOTE 2 Occasionally, the reliability measure can be expressed in terms of equivalent MTBF or MTTF also calculated from the assessed product reliability associated with a time period of interest.

Whenever time is used in this standard it can be substituted by other counts as for example cycles, miles, kilometer, or copies

Further that in this standard the term failure intensity will be used for a reliability measure of a repairable system, but terms like failure rate, hazard rate, MTBF, or MTTF can be substituted as appropriate. Further the system is assumed repairable unless specifically stated otherwise.

The reliability measures for a system commonly used in test are the (instantaneous) failure intensity (IEV 191-12-04) or the mean operating time between failures (MTBF) (IEV 191-12-09); as well as the (instantaneous) failure rate (IEV 191-12-02) or the mean time to failure (MTTF) (IEV 191-12-07).

The values of reliability measures are estimated by reliability growth models determined for product improvement in the design and the test phase separately.

3.17

extrapolated reliability measure

reliability measure for an item, predicted for a given future point in a reliability growth test programme, where the corrective modifications are promptly introduced throughout the programme

NOTE 1 The definition of the modifier "extrapolated ..." in IEV Chapter 191, 191-18-03 applies here, but is restricted to time.

NOTE 2 The previous test conditions and corrective modification procedures are assumed to continue unchanged.

NOTE 3 The value of the reliability measure is estimated by a reliability growth model applied to the previous data and the same trend is assumed to apply also to the future period of the programme.

NOTE 4 The reliability measures commonly used are the (instantaneous) failure intensity (IEV 191-12-04) or the mean operating time between failures (MTBF) (IEV 191-12-09); as well as the (instantaneous) failure rate (IEV 191-12-02) or the mean time to failure (MTTF) (IEV 191-12-07).

NOTE 5 Extrapolated reliability measure is not applicable for use in reliability growth programme during the design phase.

3.18

projected reliability measure

reliability measure predicted for an item as a consequence of the simultaneous introduction of a number of corrective modifications

NOTE 1 The modifications are often introduced between two successive phases in the programme.

NOTE 2 The reliability measures commonly used in the formal reliability growth test are the (instantaneous) failure intensity (IEV 191-12-04) or the mean operating time between failures (MTBF) (IEV 191-12-09); as well as the (instantaneous) failure rate (IEV 191-12-02) or the mean time to failure (MTTF) (IEV 191-12-07).

NOTE 3 Reliability measure during reliability growth in the design phase is the product reliability projected for the time period of interest such as warranty period or mission duration.

NOTE 4 The values of these measures are estimated by a reliability growth model.

3.19

integrated reliability engineering

engineering tool integrating inputs from all relevant stakeholders into all engineering stages and activities regarding a product from the conceptual phase through its use in the field

3.20

product reliability goal

setting a reliability goal for each new product based on certain corporate targets and what is reasonably achievable according to the past history

NOTE For some projects, the reliability goal is set by the customer. The product specific goal is the target value of the reliability growth process.

3.21**usage profile**

detailed information on environmental, mechanical, and electrical stresses, their levels and content, duration, and sequence, expected to be encountered on a new product

3.22**field performance report**

summary and analysis of the field data pertinent to the product to be designed

3.23**product specification for reliability**

description of expected product performance for the specified time period under the expected usage profile

3.24**reliability requirements, key parts**

reliability requirements as determined for the key parts (assemblies or components) in a product

3.25**reliability and life test**

test (environmental or other stress) designed to prove or estimate probability of occurrence of failure modes or their respective causes in cases where it is difficult to determine solely by analysis

NOTE Operational test (life testing) is done on a product to demonstrate reliability.

3.26**reliability growth planning**

plan of reliability activities such as analyses, components and materials selection, and testing, that would assure increase in product reliability

NOTE The same term can also refer to planning of the magnitude and the quantity of design improvements necessary to attain product reliability goal. This planning consists of an analytical representation of the course of reliability growth in design and gives and estimate of the number and magnitude of design changes (improvements) necessary to attain reliability goal.

3.27**preliminary reliability estimates and allocation**

preliminary estimates are done for new product based on inherited design; allocation is apportioned reliability to the parts of design where, because of the lack of information, preliminary estimates cannot be made

3.28**design guidelines**

document with design rules that point out known design criteria for reliability enhancement

3.29**continuous design reliability assessment**

updating reliability assessment of the new product concurrently with the design evolution and testing of parts and subsystems

3.30**FMEA and failure mode mitigation**

identification of critical and/or safety-related failure modes and estimation of likelihood of their occurrence regarding product usage profile, expected stresses, and life

NOTE Mitigation addresses those with high severity and probability of occurrence. A very useful tool in failure mode analysis of a design is found to be Fault Tree Analysis, which is a logical representation of hardware and associated failure modes.

3.31**key parts selection**

selection of those parts, which are determined to be product key parts such to have available and satisfactory reliability and environmental information

3.32**reliability testing, parts, subsystems, and system**

testing of parts, subsystems, and systems to obtain information on parts and subsystems reliability regarding specific failure modes and to verify system reliability

3.33**final reliability report**

compilation of methods, analyses, tests, results, lessons learned, mitigated failure modes, critical parts and finding on their reliability, achieved reliability growth, and the final reliability estimate and evaluation of the confidence in the reliability and integrity of the product

NOTE The report will archive the information to be used as a source of information, references, reports, and a starting point for the next version or similar product.

3.34**reliability assessment of product changes**

evaluation of reliability impact of part, design, or process changes resulting from corrective actions, cost reductions on products, or other changes done in production

3.35**continuing reliability testing**

reliability testing on ongoing lot of production to verify that the product reliability has not been compromised by the manufacturing processes or a lot of components of inferior quality

3.36**FRACAS**

closed loop system for tracking and bringing design issues to closure

NOTE As a database, it is a source of information on experienced failure modes on products related to the new design.

3.37**system**

To be defined by WG 1.

discrete, distinguishable entity with a physical existence and a defined purpose, completely composed of integrated and interacting components, each of which does not individually comply with the overall purpose

[IEC 60300-1]

Note Item on the highest level considered in the analysis.

3.38**component**

item on the lowest level considered in the analysis

3.39**apportionment**

procedure applied during the design of an item intended to apportion the requirements for performance measures for an item to its sub-items according to given criteria

3.40**failure**

termination of the ability of an item to perform a required function

[IEC 60050(191-04-01)]