

INTERNATIONAL STANDARD

**Dependability management –
Part 1: Guidance for management and application**

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INTERNATIONAL STANDARD

**Dependability management –
Part 1: Guidance for management and application**

INTERNATIONAL
ELECTROTECHNICAL
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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviations	7
3.1 Terms and definitions.....	7
3.2 Abbreviations.....	10
4 Dependability management	10
4.1 Understanding dependability.....	10
4.2 Benefits of dependability management.....	12
4.3 Challenges of managing dependability.....	12
5 System for managing dependability	12
5.1 Overview.....	12
5.2 Organizational arrangements	13
5.3 Management actions.....	14
5.4 Performance evaluation	14
6 Application of dependability management.....	15
6.1 Tailoring a dependability programme	15
6.2 Analysis of objectives and requirements	16
6.3 Risk management	17
6.4 Implementation of dependability activities through the life cycle.....	17
6.5 Selection of dependability tools and technical activities	17
6.6 Resources	18
6.7 Measurement and assessment.....	18
6.8 Assurance of dependability	19
6.9 Reviewing dependability outcomes and activities	20
Annex A (informative) Organizational arrangements of a dependability management system.....	22
A.1 Organizational structures	22
A.2 Organization of dependability activities	22
Annex B (informative) Activities of a dependability management system.....	24
B.1 Dependability activities within the life cycle.....	24
B.2 Dependability life cycle activities.....	27
Annex C (informative) Defining requirements of an item.....	32
C.1 Requirements from an application perspective	32
C.2 Examples of performance requirements that include dependability.....	33
C.2.1 Requirements determined by both provider and user	33
C.2.2 Requirements determined by provider only	34
Annex D (informative) Structure of dependability standards	37
D.1 Structure.....	37
D.2 Core standards	37
D.3 Process standards	37
D.4 Support standards.....	38
D.5 Associated standards.....	38

Annex E (informative) Checklist for review of dependability	39
E.1 Introductory remark.....	39
E.2 Concept	39
E.2.1 Requirements definition	39
E.2.2 Requirements analysis.....	39
E.2.3 High-level architectural design.....	39
E.3 Development.....	40
E.3.1 Item design.....	40
E.3.2 Full-scale system development.....	40
E.4 Realization.....	41
E.4.1 Item realization	41
E.4.2 Item implementation	41
E.5 Utilization.....	41
E.6 Enhancement.....	41
E.7 Retirement.....	42
Bibliography.....	43

Figure 1 – Relationship of dependability to the needs and requirements of an item (product, system, process or service).....	11
--	----

Figure 2 – Dependability management systems	13
---	----

Figure B.1 – Dependability activities and the life cycle.....	26
---	----

Figure C.1 – Example showing the relationship between the functional, non-functional and dependability requirements for a motor-driven pipeline pump	34
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Figure C.2 – Example showing the relationship between the functional, non-functional and dependability requirements for a family car	36
--	----

Figure D.1 – Framework for dependability standards	37
--	----

Table B.1 – Activities during the concept stage	27
---	----

Table B.2 – Activities during development stage	29
---	----

Table B.3 – Activities during the realization stage	30
---	----

Table B.4 – Activities during the utilization stage	31
---	----

Table B.5 – Activities during the enhancement stage	31
---	----

Table B.6 – Activities during the retirement stage	31
--	----

INTERNATIONAL ELECTROTECHNICAL COMMISSION

DEPENDABILITY MANAGEMENT –

Part 1: Guidance for management and application

FOREWORD

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International Standard IEC 60300-1 has been prepared by IEC technical committee 56: Dependability.

This third edition cancels and replaces the second edition published in 2003 and constitutes a technical revision.

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

- a) an updating of definitions to reflect IEC 60050-191:2014;
- b) an enhanced description of dependability and its attributes;
- c) a more generic approach to dependability management;
- d) revised guidelines for application of dependability management;
- e) a more generic approach to the life cycle;

f) a framework for dependability standards.

In addition, this third edition cancels and replaces the second edition of document IEC 60300-2 published in 2004.

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

FDIS	Report on voting
56/1550/FDIS	56/1556/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.

A list of all parts in the IEC 60300 series, published under the general title *Dependability management*, can be found on the IEC website.

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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This part of IEC 60300 describes the processes involved in managing dependability within an organization and establishes a framework for managing dependability activities for the purpose of achieving dependability performance.

Dependability is the ability of an item to perform as and when required. Dependability is a term used to describe the time-dependent characteristics associated with the performance of an item. Dependability includes characteristics such as availability, reliability, maintainability and supportability under given conditions of use and maintenance support requirements. Dependability describes the extent to which something can be trusted to behave as expected.

Dependability creates trust and confidence and affects the ability of an organization to meet its objectives. It is achieved by effective planning and implementation of dependability activities throughout the life cycle of items.

Dependability has a strong impact on the user's perception of the value of an item developed or provided by an organization. Poor dependability will affect an organization's capability to deliver its objectives and reduce its reputation.

Dependability management provides a systematic approach for addressing dependability and related issues from an organizational and business perspective. Dependability is often driven by technology and requires the integration of innovation with legacy products. Achieving dependability throughout the life cycle process can be influenced by market dynamics, global economics and resource distributions, changing customer needs, and a competitive environment. Strategies need to adapt to anticipated changes to sustain viability in business operations. Dependability management focuses on the needs of stakeholders in optimizing dependability to enhance organizational objectives and return-on-investments.

This standard is written specifically for application to technological products, systems, processes and services, which are referred to in this standard by the general term "item". However, much of the guidance provided is generic and can be adapted for application in various non-technological applications. In addition, the potential side effects on safety, environment and other factors should be identified, analysed and managed when optimizing dependability.

The intended audience for this standard ranges from users, owners and customers to organizations involved in and responsible for ensuring dependability requirements are being met. Organizations include all types and sizes of corporations, public and private institutions such as in government agencies, business enterprises, and non-profit associations.

DEPENDABILITY MANAGEMENT –

Part 1: Guidance for management and application

1 Scope

This part of IEC 60300 establishes a framework for dependability management. It provides guidance on dependability management of products, systems, processes or services involving hardware, software and human aspects or any integrated combinations of these elements. It presents guidance on planning and implementation of dependability activities and technical processes throughout the life cycle taking into account other requirements such as those relating to safety and the environment.

This standard gives guidelines for management and their technical personnel to assist them to optimize dependability.

This standard is not intended for the purpose of certification.

2 Normative references

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.

None.

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms and definitions apply.

3.1 Terms and definitions

3.1.1

availability <of an item>
ability to be in a state to perform as required

Note 1 to entry: Availability depends upon the combined characteristics of the reliability, recoverability and maintainability of the item, and in some cases, on the maintenance support performance.

Note 2 to entry: Availability may be quantified using appropriate performance measures.

[SOURCE: IEC 60050-191:2014 [1]¹, 191-41-23]

3.1.2

dependability <of an item>
ability to perform as and when required

Note 1 to entry: Dependability includes availability, reliability, recoverability, maintainability, and maintenance support performance, and, in some cases, other characteristics such as durability, safety and security.

¹ Numbers in brackets refer to the bibliography.

Note 2 to entry: Dependability is used as a collective term for the time-related quality characteristics of an item.

[SOURCE: IEC 60050-191:2014, 191-41-22]

3.1.3

dependability case

evidence-based, reasoned, traceable argument created to support the contention that a defined system will satisfy the dependability requirements

3.1.4

dependability management

coordinated activities to direct and control an organization with regard to dependability

Note 1 to entry: Dependability management is part of an organization's overall management.

3.1.5

dependability management system

set of interrelated or interacting elements of an organization to establish dependability-related policies and objectives and the processes to achieve those dependability objectives

Note 1 to entry: Systems for managing dependability are part of the overall management system and not usually a separate management system.

Note 2 to entry: The system elements include the organization's structure, roles and responsibilities, planning, procedures and processes.

3.1.6

dependability plan

set of scheduled activities to achieve dependability objectives and targets for an item

3.1.7

dependability programme

coordinated set of plans that describe the activities that lead to cost-effective achievement of dependability objectives and targets and the way they are resourced

3.1.8

item

subject being considered

Note 1 to entry: The item may be an individual part, component, device, functional unit, equipment, subsystem, or system.

Note 2 to entry: The item may consist of hardware, software, people or any combination thereof.

Note 3 to entry: The item is often comprised of elements that may each be individually considered.

[SOURCE: IEC 60050-191:2014, 191-41-01]

3.1.9

life cycle

series of identifiable stages through which an item goes, from its conception to disposal

EXAMPLE A typical system lifecycle consists of: concept and definition; design and development; construction, installation and commissioning; operation and maintenance; mid-life upgrading, or life extension; and decommissioning and disposal.

Note 1 to entry: The stages identified will vary with application.

[SOURCE: IEC 60050-191:2014, 191-41-09]

3.1.10**maintainability** <of an item>

ability to be retained in, or restored to a state to perform as required, under given conditions of use and maintenance

Note 1 to entry: Given conditions would include aspects that affect maintainability, such as: location for maintenance, accessibility, maintenance procedures and maintenance resources.

Note 2 to entry: Maintainability may be quantified using appropriate measures.

[SOURCE: IEC 60050-191:2014, 191-41-27]

3.1.11**maintenance support**

provision of resources to maintain an item

Note 1 to entry: Resources include human resources, support equipment, materials and spare parts, maintenance facilities, documentation and information, and maintenance information systems.

[SOURCE: IEC 60050-191:2014, 191-41-28]

3.1.12**organization**

person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives

Note 1 to entry: The concept of organization includes, but is not limited, to sole-trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private.

Note 2 to entry: For organizations with more than one operating unit, a single unit may be defined as an organization.

3.1.13**reliability** <of an item>

ability to perform as required, without failure, for a given time interval, under given conditions

Note 1 to entry: The time interval duration may be expressed in units appropriate to the item concerned, e.g. calendar time, operating cycles, distance run, etc., and the units should always be clearly stated.

Note 2 to entry: Given conditions include aspects that affect reliability, such as: mode of operation, stress levels, environmental conditions and maintenance.

Note 3 to entry: Reliability may be quantified using appropriate measures.

[SOURCE: IEC 60050-191:2014, 191-41-24]

3.1.14**requirement**

need or expectation that is stated, generally implied or obligatory

[SOURCE: ISO 9000:2005, 3.1.2]

3.1.15**stakeholder**

person or organization that can affect, be affected by, or perceive themselves to be affected by a decision or activity

3.1.16**supportability** <of an item>

ability to be supported to sustain the required availability with a defined operational profile and logistic and maintenance resources

Note 1 to entry: Supportability complements the inherent reliability and maintainability of the item, combined with factors external to the item that affect the relative ease of providing the required maintenance and logistic support.

[SOURCE: IEC 60050-191:2014, 191-41-31, note 1 has been modified]

3.1.17

system <in dependability>

set of interrelated items that collectively fulfil a requirement

Note 1 to entry: A system is considered to have a defined real or abstract boundary.

Note 2 to entry: External resources (from outside the system boundary) may be required for the system to operate.

Note 3 to entry: A system structure may be hierarchical, e.g. system, subsystem, component, etc.

Note 4 to entry: Conditions of use and maintenance should be expressed or implied within the requirement.

[SOURCE: IEC 60050-191:2014, 191-41-03]

3.1.18

tailoring <process>

process to adapt, adjust or alter an organization's set of established processes and activities to fulfil, satisfy or meet requirements as they apply to dependability

3.2 Abbreviations

COTS	Commercial-off-the-shelf
FMEA	Failure modes and effects analysis
FRACAS	Failure recording, analysis and corrective action system
FTA	Fault tree analysis
HSE	Health, safety and environment
MTBF	Mean time between failure
HAZOP	Hazard and operability studies
RCM	Reliability centred maintenance

4 Dependability management

4.1 Understanding dependability

Dependability is the ability of an item to perform as and when required. Dependability is thus the ability to fulfil the requirements and expectations of an item consistently over time. Dependability creates value in that the item retains its performance characteristics, operates as desired, and satisfies customer needs and expectations.

Management of dependability is a key element of an organization's wider management systems in particular those for assets, finance and quality. Dependability management encompasses the planning and application of organizational arrangements, processes and associated methods and techniques to achieve the organization's performance and product objectives.

Dependability is improved by systematically reducing the frequency of outages, product failures, service downtimes, and other undesired events and minimizing their effects. This is achieved by actions such as improving design, eliminating root causes of failure, simplifying complex processes, mitigating anomalies, promoting fault tolerance in design and fitness for use, advocating fault avoidance and error prevention, managing maintenance activities and making commitments to build trust and integrity to ensure user confidence throughout the life cycle. Early consideration of dependability in the life cycle is crucial since rectifying a design