
Vodenje zagotovljivosti - 1. del: Upravljanje zagotovljivosti

Dependability management - Part 1: Managing dependability

Gestion de la sûreté de fonctionnement - Partie 1: Gestion de la sûreté de fonctionnement

Ta slovenski standard je istoveten z: prEN IEC 60300-1:2022

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

oSIST prEN IEC 60300-1:2022**en**



56/1954/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: IEC 60300-1 ED4	
DATE OF CIRCULATION: 2022-06-10	CLOSING DATE FOR VOTING: 2022-09-02
SUPERSEDES DOCUMENTS: 56/1931/CD, 56/1948/CC	

IEC TC 56 : DEPENDABILITY	
SECRETARIAT: United Kingdom	SECRETARY: Ms Stephanie Lavy
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Dependability management - Part 1: Managing dependability

PROPOSED STABILITY DATE: 2025

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DEPENDABILITY MANAGEMENT**Part 1: Managing Dependability****FOREWORD**

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International Standard IEC 60300-1 has been prepared by IEC technical committee TC56.
Dependability

This fourth edition cancels and replaces the third edition published in 2014 and constitutes a technical revision.

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

- a) more guidance on integration of dependability activities into an existing management system;
- b) greater detail on the activities required to establish and implement a programme of dependability activities
- c) changes to provide consistency with revision of IEC 60300-3-4, IEC 60300-3-1, IEC 60300-3-10 and IEC 60300-3-14

The text of this International Standard is based on the following documents:

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

191

192 Full information on the voting for the approval of this International Standard can be found in the
193 report on voting indicated in the above table.

194 This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

195 The committee has decided that the contents of this document will remain unchanged until the
196 stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to
197 the specific document. At this date, the document will be:

- 198 • reconfirmed,
- 199 • withdrawn,
- 200 • replaced by a revised edition, or
- 201 • amended.

202 The National Committees are requested to note that for this document the stability date is **20XX**.

203 This text is included for the information of the national committees and will be deleted at the
204 publication stage.

ITEH STANDARD PREVIEW
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[oSIST prEN IEC 60300-1:2022](https://standards.iteh.ai/catalog/standards/sist/3500355d-1ac9-41b5-af2f-8766e645c6b7/osist-pren-iec-60300-1-2022)

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205

INTRODUCTION

206 Dependability is the ability to perform as and when required. A dependable item is one where
207 there is justified confidence that it operates as desired and satisfies agreed stakeholder needs
208 and expectations. Dependability has many attributes but is usually characterised in terms of
209 reliability, maintainability and supportability, and the derived characteristic of availability. In
210 some cases, attributes such as resilience, recoverability, durability, integrity, safety, security,
211 and trustworthiness are included in, or overlap with, dependability.

212 The specification and verification of dependability attributes provides stakeholders with
213 assurance that requirements will be met into the future and quality will be maintained over time.
214 Dependability is an important attribute of a system, product or service which influences the
215 business strategies associated with its design, acquisition and use, and its life time costs. The
216 dependability of an organization's systems, products and services has a strong impact on the
217 perception of the value and trustworthiness of the organization.

218 Dependability is managed as a key element of an organization's wider management system,
219 particularly aspects relating to assets, quality and finance. There should not be a separate
220 management system for dependability.

221 This document highlights the importance and benefits of managing dependability. It gives
222 guidance on dependability activities and how to integrate them into an existing management
223 system and life cycle processes. It provides information on different life cycle models and how
224 dependability activities can be incorporated into them so that an efficient, effective and
225 economical approach is achieved.

226 Dependability activities bring benefits whenever they are performed but greater benefit is
227 achieved the sooner in the life cycle they are implemented.

228 This document is applicable to a broad range of industry sectors and organizations of any size.
229 It applies to systems of systems, large unique systems, mass produced industrial and consumer
230 products, software applications, components and services. These categories are not mutually
231 exclusive. For example, many products and components are in themselves complex systems.

232 The document will be useful for:

- 233 • managers and technical personnel;
- 234 • those involved in deciding how their systems, products and services can be made
235 dependable;
- 236 • organizations such as regulators who evaluate the dependability of systems, products and
237 services;
- 238 • those (e.g. users or the public) who need justified confidence in systems, product and
239 services that might affect them;
- 240 • developers of other dependability related standards.

241 This document is one of a suite of "top level" interrelated IEC dependability standards that
242 provide managers and technical personnel, with guidance on how to effectively plan and
243 implement dependability activities. As such this document should be used in conjunction with:

- 244 • IEC 60300-3-4 which provides guidance on writing dependability requirements in
245 specifications, and on the means of assuring the achievement of those requirements;
- 246 • , IEC 60300-3-10 and IEC 60300-3-14 which provide guidance on how to identify and apply
247 appropriate analysis and assurance techniques for maintainability (and maintenance) and
248 supportability (and support) respectively. Standards to cover reliability and availability are
249 planned.

DEPENDABILITY MANAGEMENT

Part 1: Managing Dependability

1 Scope

This document provides guidance on:

- the meaning and significance of dependability from a business, technical and financial perspective;
- achieving dependability through suitable adaptation of organizational management systems such as those described in the ISO 9000 series (Quality management), ISO 26000 (Guidance on social responsibility) and the ISO 55000 series (Asset management);
- the activities that need to be integrated into management systems and life cycle processes in order to achieve dependable systems, products and services;
- planning and implementing dependability activities throughout the life cycle to achieve and assure required outcomes, taking into account factors such as costs, safety, the environment, customer goodwill, brand and reputation.

This document is applicable to any type of system, both new and existing, to mass produced industrial or consumer products, to components and to services. This document addresses all elements of systems, products and services including hardware, software, data, processes, procedures, facilities, materials, and personnel required for operations and support.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60050-192:2015 International Electrotechnical Vocabulary (IEV) – Part 192: Dependability

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

accountability

state of being answerable for decisions and activities to the organization's governing bodies, legal authorities and, more broadly, its stakeholders

Note 1 to entry: Accountability includes answerability to society in general.

Note 2 to entry: Description in ISO 26000:2010: Accountability involves an obligation on management to be answerable to the controlling interests of the organization and on the organization to be answerable to legal authorities with regard to laws and regulations. Accountability for the overall impact of its decisions and activities on society and the environment also implies that the organization's answerability to those affected by its decisions and activities, as well as to society in general, varies according to the nature of the impact and the circumstances.

292 Note 3 to entry: Accountability implies that individuals, organizations and the community are responsible for their
293 actions and may be required to justify them to others.

294 [SOURCE: ISO 26000, 2.1, modified — notes to entry have been added]

295 **3.1.2**

296 **adaptability**

297 ability to be modified to make suitable for a particular purpose or for a changed environment

298 **3.1.3**

299 **assurance**

300 grounds for justified confidence that a claim has been or will be achieved

301 [SOURCE: ISO/IEC/IEEE 15026-1:2019, 3.1.1]

302 **3.1.4**

303 **availability, <of an item>**

304 ability to be in a state to perform as required under given conditions

305 Note 1 to entry: Availability depends upon the combined characteristics of the reliability, maintainability,
306 supportability and on the maintenance and support provided.

307 Note 2 to entry: Given conditions include aspects that affect availability such as mode of operation, stress levels,
308 environmental conditions and maintenance defined in the life profile.

309 Note 3 to entry: Availability may be quantified using measures defined in IEC 60050-192, Section 192-08.

310 [SOURCE: IEC 60050-192:2015, 192-01-23, as currently proposed for modification by WG1.]

311 **3.1.5**

312 **business process**

313 partially ordered set of inter-related enterprise activities that can be executed to achieve some
314 desired end-result in pursuit of a given objective of an organization

315 Note 1 to entry: Business is interpreted broadly to mean those activities that are core to the purposes of the
316 organization's existence whether the organization is public, private, for profit or not for profit.

317 [SOURCE: ISO/IEC/IEEE 24765:2017, 3.445, modified — Note from ISO 9001:2015, 5.1.1
318 added.]

319 **3.1.6**

320 **dependability**

321 ability to perform as and when required

322 Note 1 to entry: A dependable item or service is one where there is justified confidence that it operates as desired
323 and satisfies agreed stakeholder expectations.

324 Note 2 to entry: In most cases, the term dependability is used as an umbrella term to express its core attributes of
325 reliability, maintainability, and supportability and the attribute of availability derived therefrom. In some cases, other
326 attributes are also included in or overlap with dependability. These include resilience, recoverability, durability,
327 integrity, safety, security, etc.

328 Note 3 to entry: In order to express the ability to perform, requirements in terms of functions to be performed, when
329 the performance is to be achieved, and the life profile conditions are specified by the customers/ users/ stakeholders.

330 Note 4 to entry: The attributes of dependability can be expressed qualitatively or quantitatively.

331 Note 5 to entry: It is also a common practice to use the term dependability in the context of a subject of study or
332 discipline.

333 [SOURCE: <http://www.electropedia.org>, 192-01-xx, 192-01-22, as currently proposed for
334 modification by WG1.]

3.1.7**dependability activity**

set of cohesive tasks carried out to achieve a dependability related purpose

Note 1 to entry: A dependability activity can be any of a life cycle process, activity or task or process view in the terminology of ISO/IEC/IEEE15288.

3.1.8**dependability case**

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

Note 1 to entry: A dependability case is an assurance case for dependability-related claims see ISO/IEC/IEEE 15026-2.

[SOURCE: IEC 62741 modified — Note 1 to entry added]

3.1.9**dependability plan**

information item that presents a systematic course of action for achieving a declared purpose related to dependability including when, how and by whom specific tasks are to be performed

3.1.10**durability**

ability to perform as required, over time resisting, wear, deterioration, etc. under given conditions,

3.1.11**integrity, <in dependability>**

ability to prevent or withstand unauthorised modification

3.1.12**life profile**

stresses, their levels, content, duration and sequence encountered during the life cycle

Note 1 to entry: Stresses may be internal (such as operating cycles) or external (such as environmental, power level inputs maximum number of key strokes per second).

Note 2 to entry: Life profile can be actual, expected or predicted.

3.1.13**maintainability, <of an item>**

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

Note 1 to entry: Given conditions include location for maintenance, accessibility, maintenance procedures and maintenance resources as well as those defined in the life profile.

Note 2 to entry: Maintainability can be quantified using appropriate measures. See IEC 60050-192 section 192-07—Maintainability and maintenance support measures.

[SOURCE: <http://www.electropedia.org>, 192-01-xx, 192-01-27 modified — Note 3 to entry added]

3.1.14**measurement**

process of experimentally obtaining one or more values that can reasonably be attributed to a quantity

Note 1 to entry: Measurement does not apply to nominal properties.

Note 2 to entry: Measurement implies comparison of quantities, including counting of entities.

379 [SOURCE: ISO/IEC GUIDE 99:2007, 2.1]

380 **3.1.15**

381 **need**

382 prerequisite identified as necessary, to achieve an intended outcome, implied or stated, within
383 a specific context of use

384 **3.1.16**

385 **recoverability**, <of an item>

386 ability to recover from a failure without corrective maintenance

387 Note 1 to entry: Recoverability may be quantified using measures such as the probability of recovery within a
388 specified time interval.

389 [SOURCE: IEC 60050-192:2015, 192-01-25, modified — Note 1 to entry omitted.]

390 **3.1.17**

391 **reliability**, <of an item>

392 ability to perform as required, without failure, for a given period under given conditions

393 Note 1 to entry: The period can be expressed in units appropriate to the item concerned, e.g. calendar time,
394 operating cycles, distance run, etc., and the units should be clearly stated.

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

397 Note 3 to entry: Reliability can be quantified using measures defined in Section 192-05, Reliability related concepts:
398 measures.

399 [SOURCE: IEC 60050-192:2015, 192-01-24, modified — time interval replaced by period.]

400 **3.1.18**

401 **requirement**

402 statement which translates or expresses a need and its associated constraints and conditions

403 Note 1 to entry: Requirements exist at different levels in the system structure.

404 Note 2 to entry: A requirement is an expression of one or more particular needs in a very specific, precise and
405 unambiguous manner.

406 Note 3 to entry: A requirement always relates to a system, software or service, or other item of interest.

407 Note 4 to entry: A requirement is a statement where evidence or assurance of compliance can be provided.

408 [SOURCE: ISO/IEC/IEEE 29148:2018, 3.1.19, modified — Note 4 added]

409 **3.1.19**

410 **safety**

411 freedom from unacceptable risk of physical injury or damage to the health of people or damage
412 to property or the environment

413 [SOURCE: IEC 80001-1:2010, 2.30]

414 **3.1.20**

415 **security**

416 protection against intentional subversion or forced failure

417 **3.1.21**

418 **specification**

419 information item that identifies the requirements and goals of a system, service or product
420 together with any supporting information

Note 1 to entry: Supporting information can include details of use, operating and environmental conditions, failure criteria and methods intended to be applied for assurance of compliance with requirements, including accept/reject criteria.

Note 2 to entry: ISO/IEC/IEEE 15289 defines specification as an information item that identifies in a complete, precise and verifiable manner the requirements, design, behaviour or other expected characteristics of the system, service or process. The specification of dependability has a greater scope than that used in ISO/IEC/IEEE 15289.

3.1.22

stakeholder

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

EXAMPLE: End users, end user organizations, supporters, developers, producers, trainers, maintainers, disposers, acquirers, supplier organizations and regulatory bodies.

Note 1 to entry: Some stakeholders can have conflicting interests

[SOURCE: ISO Guide 73:2009, 3.2.1.1, modified — Example added and note 1 to entry reworded]

3.1.23

support

provision of resources to enable an item to continue to function as required

Note 1 to entry: Examples of resources are human effort, training, tools, jigs, test equipment, lifting equipment, materials, spare parts, facilities, documentation, information and information systems.

Note 2 to entry Support is concerned with providing a quality resource to the correct location at the best time for the optimum cost, taking into account environmental, social and economic impacts.

[SOURCE: <http://www.electropedia.org>, 192-01-xx as currently proposed by WG1]

3.1.24

supportability, <of an item>

ability to be supported to perform as required with a defined life profile and given resources

[SOURCE <http://www.electropedia.org>, 192-01-31 as currently proposed by WG1]

3.1.25

system

combination of interacting parts organized to achieve one or more purposes

Note1 to entry: A system is sometimes considered as a product or as the service it provides.

Note 2 to entry: Parts can include the associated equipment, facilities, material, computer programs, firmware, technical documentation, services and personnel required.

[SOURCE <http://www.electropedia.org>, 192-01-03 as currently proposed by WG1]

3.1.26

usability

extent to which a system, product or service can be used by specified users to achieve specified objectives with effectiveness, efficiency and satisfaction in a specified context of use

[SOURCE: ISO 9241-210:2010, 3.13 modified — goals changed to objectives and notes to entry omitted.]

3.1.27

tailoring

process to adapt standard activities and tasks to meet specific needs

3.2 Abbreviated terms

AI	Artificial intelligence
DRACAS	Data reporting, analysis and corrective action system
FMEA	Failure modes and effects analysis
FRACAS	Failure reporting, analysis, and corrective action system
HAZOP	Hazard and operability
IAS	International accounting standards
IFRS	International financial reporting standards
IOT	Internet of things

4 Key concepts and application of this document

4.1 Overview

Dependability is the ability to perform as and when required. The term applies equally well to items, products, processes and services, and to systems ranging from a simple component to a system of systems. A dependable system, product or service provides the user with assurance that requirements will be met into the future and quality maintained over time.

This clause explains the concept of dependability, and the attributes of systems, products and services that fall under the umbrella of dependability. The principles of dependability management and the benefits of devoting effort to it are described. The relationship between an organization's management system and dependability is discussed. The concept of a technical programme of dependability activities which is carried out through the life cycle is introduced.

4.2 Principles of dependability management

Dependability management encompasses a number of principles as follows.

- **Holistic approach:** Managing dependability integrates considerations of performance, cost, risk and compliance across the entire life of a system, product or service. It does so by taking a systems approach with continual improvement over the life.
- **Assurance and accountability:** Managing dependability establishes the grounds for justified confidence that claims relating to dependability have been, or will be achieved. This satisfies the assurance and accountability requirements of the organization's management framework, which in turn fulfils the needs and expectations of stakeholders for assurance and accountability.
- **Risk based:** Managing dependability involves identifying factors that could cause systems products and services, and the systems that support them, to fail or deviate from requirements. These risks represents a potential cost throughout the life of a system product or service Improving dependability incurs an initial cost to the designer and/or manufacturer but may result in a saving when considered across the life of the product. Deciding how much to invest to improve dependability at all stages of the life cycle is directly related to risk and value and the amount of risk that the organization is willing to bear.
- **Adaptability:** Dependability activities and the systems to manage them need to be sufficiently flexible to able to respond to changes in needs and context in a timely way. Adaptability can also be a desirable attribute of a system product or service which can improve its maintainability and supportability and extend its useful life.
- **Sustainability:** For a system, product or service to meet the needs and expectations of stakeholders, economic, social and environmental issues need to be considered as well as technical excellence. For example as well as seeking to achieve a reliable, maintainable and supportable product, system or service, a dependable design should also aim to reduce energy consumption and environmental impacts. A system, product or service that is