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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



56/1850/CD

COMMITTEE DRAFT (CD)

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56/1835/NP, 56/1844/RVN

IEC TC 56 : DEPENDABILITY

SECRETARIAT:

United Kingdom

SECRETARY:

Mr Mick Maghar

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:

☐

Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☐ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Dependability management - Part 3-17: Application guide - Availability

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DEPENDABILITY MANAGEMENT –

Part 3-17: Application guide –Availability

FOREWORD

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International Standard IEC XXXXX 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 2.

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.

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

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

This document provides guidance on the application of analysis and assurance techniques for the dependability attribute of availability, including best practice, the measures appropriate for requirements and how to evaluate them, and the relationship with other dependability attributes.

Dependability is the ability to perform as and when required. A dependable item is one where there is justifiable confidence (developed through analytical and risk-based approaches) that the item will operate as desired and satisfy agreed stakeholder expectations. Dependability has many attributes, but is usually characterized in terms of reliability, maintainability and supportability (including maintenance and support), which may be applied individually or combined into an availability performance measure.

This document is one of the six 'top level' interrelated dependability standards that provides managers and technical personnel with guidance on how to effectively plan and implement dependability activities throughout the life cycle. As such, this standard should be used in conjunction with:

- IEC 60300-1 to recognize the importance of dependability, how to integrate dependability activities into existing management systems and life cycle processes, and to derive the management activities to achieve and improve dependability outcomes;
- IEC 60300-3-4 to specify performance measures of dependability, including the requirements and the means by which the achievement of the requirements may be demonstrated;
- IEC 60300-3-1, IEC 60300-3-10 and IEC 60300-3-14 to apply analysis and assurance techniques for reliability, maintainability (and maintenance) and supportability (and support).

There are various scenarios where availability applies in different ways. Availability is closely related to the up time and down time of items, which are terms that are commonly used to describe operational aspects of item availability. There is an increasing interest in preventing or minimizing the causes of down time that lead to unavailability by making items resilient and thereby increasing availability.

Availability can be defined and measured in different ways depending on the factors that are included or excluded such as whether the availability is inherent or operational. Availability measures include, but are not limited to, instantaneous availability, mean availability, asymptotic availability, asymptotic mean availability and steady-state availability. The preference for and application of these measures vary from one industry sector to another and from one item to another, among others depending on their application and end user needs. The need for different availability measures is due to the need to distinguish and communicate different aspects of performance with respect to different risks an organization needs to manage. Having items available to perform their required functions, when required to do so, is fundamental to the generation of value for any entity. Consequently, the management of item availability to maximize value is a critical activity for any entity.

How and where availability is applied is a function of the use of an item where this term refers to subjects such as equipment, systems, products or software. As a fundamental aspect of many system requirements, it is an important consideration in design and the specification of dependability requirements. In some cases, availability can be tested prior to operation whereas in other instances, this can only be determined during actual operation. It is often an important measure of dependability that needs to be tracked during the utilization phase of the item life cycle in order to verify original or ongoing requirements are being met.

Most organisational objectives can be grouped into measures of effectiveness, efficiency and compliance. Availability contributes to all of these objective groups. For example, availability is often an intermediate performance measure that can be combined with other measures to produce a final performance measure that is applicable to that system or application. For

200 example, availability may be combined with a rate of production to produce a total amount
201 produced for a specific time period. It is also a critical part of ensuring safety of systems.

202 Various dependability analysis techniques can be used to assess the expected performance
203 using different modelling approaches. Availability analysis may be carried out during
204 conceptual, preliminary and detailed design, testing prior to operation and during utilization.

205 Availability is a critical measure for stakeholders across the entire life cycle of items.

DEPENDABILITY MANAGEMENT –

Part 3-17: Application guide - Availability

1 Scope

This document describes the different ways in which availability can be derived from its supporting attributes and applied in actual situations, depending on its use during the life cycle of systems and products. It describes how availability can be modelled to assess expected performance of a system or product.

This document describes how availability can be considered in design and the specification of dependability requirements as well as during utilization. Availability is a key attribute needed to satisfy other system performance requirements, such as output, efficiency, quality, safety and integrity.

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.

IEC 60050-192: International electrotechnical vocabulary – Part 192: Dependability

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

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 (192-01-24), recoverability (192-01-25), and maintainability (192-01-27) of the item, and the maintenance support performance (192-01-29).

Note 2 to entry: Availability may be quantified using appropriate measures. See Section 192-08, Availability related measures.

[SOURCE: IEC 60050-192:2015, definition 192-01-23]

3.1.2

down state, <of an item>

unavailable state, <of an item>

internally disabled state, <of an item>

internal disabled state, <of an item>

state of being unable to perform as required, due to internal fault, or preventive maintenance

Note 1 to entry: Down state relates to unavailability of the item.

Note 2 to entry: The adjectives “down” or “unavailable” designate an item in a down state.

[SOURCE: IEC 60050-192:2015, definition 192-02-20]

3.1.3**down time**

time interval for which the item is in a down state

[SOURCE: IEC 60050-192:2015, definition 192-02-21]

3.1.4**inherent availability**

intrinsic availability

availability provided by the design under ideal conditions of operation and maintenance

Note 1 to entry: Delays associated with maintenance, such as logistic and administrative delays, are excluded.

[SOURCE: IEC 60050-192:2015, definition 192-08-02]

3.1.5**instantaneous availability**

point availability

probability that an item is in a state to perform as required at a given instant

[SOURCE: IEC 60050-192:2015, definition 192-08-01]

3.1.6**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. See sub item (192-01-02) and indenture level (192-01-05).

Note 4 to entry: IEC 60050-191:1990 (now withdrawn; replaced by IEC 60050-192:2015) identified the term “entity” as an English synonym, which is not true for all applications.

Note 5 to entry: The definition for item in IEC 60050-191:1990 (now withdrawn; replaced by IEC 60050-192:2015) is a description rather than a definition. This new definition provides meaningful substitution throughout this document. The words of the former definition form new note 1.

[SOURCE: IEC 60050-192:2015, definition 192-01-01]

3.1.7**mean availability**

average availability

average value of the instantaneous availability over a given time interval (t_1 , t_2)

Note 1 to entry: The mean availability is related to the instantaneous availability $A(t)$ as:

[SOURCE: IEC 60050-192:2015, definition 192-08-06]

3.1.8**operational availability**

availability experienced under actual conditions of operation and maintenance

Note 1 to entry: Operational availability is determined considering down time due to failures and associated delays, but excluding external causes.

[SOURCE: IEC 60050-192:2015, definition 192-08-03]