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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.

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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 Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.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

- **Annotated drafts are not acceptable and will be rejected.**
- 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	Comment (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.	



56/1993A/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 60300-3-17 ED1	
DATE OF CIRCULATION: 2023-04-21	CLOSING DATE FOR COMMENTS: 2023-06-09
SUPERSEDES DOCUMENTS: 56/1850/CD, 56/1861A/CC	

IEC TC 56 : DEPENDABILITY	
SECRETARIAT: United Kingdom	SECRETARY: Ms Stephanie Lavy
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	

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TITLE:

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

NOTE FROM TC/SC OFFICERS:

The closing date has been changed to 2023-06-09 from 2023-07-07 to obtain comments to be discussed at the TC 56 plenary in June. The content of this CD remains unchanged.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DEPENDABILITY MANAGEMENT –

Part 3-17: Application guide –Availability

FOREWORD

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International Standard IEC 60300-3-17 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

- 138 • reconfirmed,
- 139 • withdrawn,
- 140 • replaced by a revised edition, or
- 141 • amended.

142

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

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

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INTRODUCTION

Availability is a characteristic of an item determined by the fundamental characteristics of the reliability, maintainability and supportability of its components.

Having items available to perform their required functions is one prerequisite to the generation of value. Consequently, managing availability to maximize, produce or maintain value is a critical activity for any entity.

Most organisational objectives can be grouped into effectiveness, efficiency, and conformity. Availability contributes to all of these. For example, availability directly affects performance measures such as productivity and service provision.

Availability is also a critical part of ensuring the safety of systems by ensuring that there is a high probability that protection systems will function when required.

This document provides guidance on how to identify and apply appropriate analysis and assurance techniques for availability. It describes the measures appropriate to be included in requirements and how to verify them. It discusses the relationship between availability and reliability, maintainability, and supportability.

Various dependability analysis techniques can be used to assess the expected or actual availability performance. These analyses can be carried out during all stages of the item's lifecycle.

This document is one of the 'top level' interrelated dependability standards that provide managers and technical personnel with guidance on how to effectively plan and implement dependability activities. Other documents in the series are:

- IEC 60300-1 which highlights the importance and benefits of managing dependability. It gives guidance on dependability activities and how to integrate them into an existing management system and life cycle processes.
- IEC 60300-3-4 which provides guidance for writing dependability requirements in specifications, together with a means of assuring the achievement of those requirements.
- IEC 60300-3-10 and IEC 60300-3-14 which provide guidance on how to identify and apply appropriate analysis and assurance techniques for maintainability (and maintenance) and supportability (and support) respectively.
- A standard covering reliability which is planned.

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 of reliability, maintainability and supportability, during the life cycle of systems and products and services. It describes the different ways that availability can be expressed and their relevance to different situations.

It describes how availability can be considered in the specification of dependability requirements and in design and how it can be assured.

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

IEC 61703:2016: Mathematical expressions for reliability, availability, maintainability and maintenance support terms.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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>

3.1.1

availability,

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

Note 1 to entry: Availability depends upon the combined characteristics of the reliability (192-01-24), maintainability (192-01-27) and supportability) of the item, and on the maintenance and support provided.

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

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

[SOURCE: IEC 60050-192:2015, 192-01-23, modified – in the definition "of an item" has been deleted "under given conditions" has been added, Note 1 to entry has been modified, and Note 2 to entry has been added.]

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, 192-02-20]

3.1.3**down time**

time interval for which the item is in a down state

[SOURCE: IEC 60050-192:2015, 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, 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, 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, service or process.

Note 2 to entry: The item may consist of hardware, software, people, knowhow, finance, natural resources and other capital 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).

[SOURCE: IEC 60050-192:2015, 192-01-01, modified – Note 2 to entry has been extended and notes 4 and 5 deleted]

3.1.7**mean availability**

average availability

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

[SOURCE: IEC 60050-192:2015, 192-08-06, modified – Note 1 omitted]

3.1.8**off the shelf**

available for purchase without undertaking development activity

3.1.9**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, 192-08-03]

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

ability to recover from a failure, without corrective maintenance

Note 1 to entry: The ability to recover may or may not require external actions. For recovery where no external actions are required, see self-recoverability (191-41-26).

Note 2 to entry: Recoverability may be quantified using measures such as the probability of recovery within a specified time interval.

[SOURCE: IEC 60050-192:2015, 192-01-25]

3.1.12**steady state availability**

asymptotic availability

limit, if it exists, of the instantaneous availability when the time tends to infinity

Note 1 to entry: Under certain conditions the steady state availability may be expressed as the quotient of the mean up time to the sum of the mean up time, to mean down time. See IEC 61703, *Mathematical expressions for reliability, availability, maintainability and maintenance support terms*.

[SOURCE: IEC 60050-192:2015, 192-08-07]

3.1.13**up state, <of an item>**

available state, <of an item>

state of being able to perform as required

Note 1 to entry: The absence of necessary external resources may prevent operation, but do not affect the up state. See externally disabled state (192-02-23).

Note 3 to entry: An item may be considered to be in an up state for some functions and in a down state for others, concurrently.

[SOURCE: IEC 60050-192:2015, 192-02-01, modified – Notes to entry 2 and 4 omitted]

3.1.14**up time**

time interval for which the item is in an up state

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

3.2 Abbreviations

MAPMT mean active preventive maintenance time

MCMT mean corrective maintenance time

MDT mean down time

METBF mean elapsed time between failures

MOTBF mean operating time between failures (also MTBF)

MPMT mean preventive maintenance time

MTBF mean time between failures (

MTBPM mean time between preventive maintenances

MTTF mean operating time to failure

MTTFF mean time to first failure

MTTR mean time to repair

MUT mean up time

NERC North American Electric Reliability Corporation

NRT non-required time

OTS off-the-shelf

RBD Reliability Block Diagram

RT required time

4 Overview of availability**4.1 Meaning of availability**

Availability is the ability of an item to be in a state to perform as required. Availability is often quantified as a ratio of up time to total time. The primary drivers of up time and down time are:

- the frequency with which the item transitions between up state and down state. (reliability);