



BSI Standards Publication

Dependability management

Part 3-14: Application guide — Supportability and support

National foreword

This British Standard is the UK implementation of EN IEC 60300-3-14:2024. It is identical to IEC 60300-3-14:2024. It supersedes BS EN 60300-3-14:2004, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee DS/1, Dependability.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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(IEC 60300-3-14:2024)

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European foreword

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This document supersedes EN 60300-3-14:2004 and all of its amendments and corrigenda (if any).

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DEPENDABILITY MANAGEMENT –

Part 3-14: Application guide – Supportability and support

FOREWORD

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IEC 60300-3-14 has been prepared by IEC technical committee 56: Dependability. It is an International Standard.

This second edition cancels and replaces the first edition published in 2004. This edition constitutes a technical revision.

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

- a) consistency with the other core dependability standards prepared by IEC TC 56;
- b) expansion of supportability and support principles and activities in dependability.

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

Draft	Report on voting
56/2050/FDIS	56/2055/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2 and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

This document provides guidance on how to identify and apply appropriate analysis and assurance techniques for supportability and support on an item. This document includes good practice, the measures appropriate for requirements and how to evaluate them. This document also includes the relationship with other dependability attributes together with the elements of an effective supportability and support programme. Support, in the context of this document, is the provision of quality resources to enable an item to perform as required. Supportability focuses on:

- identifying and quantifying:
 - support for a defined item in a given context of use;
 - time to provide that support;
 - resourcing, cost and quality of the support activity;
 - quality of the delivered support;
- influencing the design of an item and support arrangements to achieve value over the item's life.

A primary objective of "designing for item supportability" is to influence the support activity during operations and maintenance. However, supportability is not just an attribute of the design as it is also dependent on the conditions of use and the organization providing the support arrangements. Achieving the desired capabilities inherent in an item design implies that the necessary support capability is also designed, implemented and continuously evolved to align with changes to the item's configuration and its conditions of use including the capability of the managing organization and its suppliers. Supportability of an item ensures that:

- support requirements to achieve a desired item capability are balanced and known;
- financial capability to deliver that support is known for the short and long term;
- there is a desired balance between item design, the design of the support and the design of the organization delivering that support in order to achieve technical and financial requirements.

Support is a major contributor to the overall costs for an item to operate smoothly throughout its life for a given life profile. The current trend is to extend the life of an item by ensuring spares and other support resources are readily available over a longer period of time (particularly for items which will have problems such as obsolescence). The current trend also aims to ensure that parts are retired and recycled in a sustainable manner. Supportability will benefit from innovative solutions if it is to meet these future sustainability and circularity demands.

An item which is easily supported is better able to withstand adversity and recover from it. Such an item is more resilient and less reliant on the people and systems that can be affected by serious adverse events and situations.

An effective supportability and support programme ensures that the customer will have increased confidence in the support organization, with lower life cycle costs, improved availability and fewer modifications due to supportability deficiencies. In turn, this will result in improved customer confidence in the item leading to improved sales as well as improved sales for future items from the same company.

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 suite 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 the means of assuring the achievement of those requirements;
- IEC 60300-3-10 which provides guidance on how to identify and apply appropriate analysis and assurance techniques for maintainability (and maintenance);
- guidance documents to cover reliability and availability which are under development.

DEPENDABILITY MANAGEMENT –

Part 3-14: Application guide – Supportability and support

1 Scope

This part of IEC 60300 introduces the dependability attribute of supportability (and support) and the relationship with related dependability attributes of reliability, maintainability and availability.

This document can be used at any time during an item's life to guide the planning and implementing of supportability and support activities focused on achieving an intended balance of performance, cost and risk. All activities can be tailored to the nature of the item and its conditions of use.

Guidance is offered on how supportability and support activities can be applied at any life cycle stage for newly designed items, existing items available for commercial procurement, or for items during their operational life.

This document considers the life cycle implications by formally managing risks associated with the management and delivery of activities to create, operate, maintain and refurbish an item to achieve its stated purpose.

This document describes the:

- nature of supportability and support;
- role of supportability and support in achieving item value over its life;
- trade-offs associated with supportability and support to achieve desired balance of cost, performance and risk during the life of an item;
- importance of aligning the structure of an organization with its objectives, with the ultimate aim of improving efficiency and effectiveness in order to deliver the required supportability and support.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

3.1

availability

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

Note 1 to entry: Availability depends upon the combined attributes of the reliability (IEV 192-01-24), maintainability (IEV 192-01-27), supportability (IEV 192-01-31) and 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, as well as conditions defined in the life profile.

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

[SOURCE: IEC 60050-192:2015, 192-01-23, modified – The definition is no longer specific, "under given conditions" has been added and the existing Notes to entry have been replaced with new Notes to entry.]

3.2

built-in test

BIT

integrated capability of a test item enabling automatic fault recognition and fault localization

[SOURCE: IEC 60706-5:2007, 3.1.1]

3.3

built-in test equipment

BITE

hardware and firmware built into an item exclusively for the purpose of carrying out built-in test

3.4

corrective maintenance

maintenance carried out after fault detection to effect restoration

Note 1 to entry: Corrective maintenance of software invariably involves some modification.

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

3.5

dependability

ability to perform as and when required

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

Note 2 to entry: In most cases, the term "dependability" is used as an umbrella term to express its core attributes of reliability, maintainability and supportability and the resulting availability. In some cases, attributes such as resilience, recoverability, durability, integrity, safety, security, and trustworthiness are included in or overlap with dependability.

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

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

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

[SOURCE: IEC 60050-192:2015, 192-01-22, modified – The definition is no longer specific, existing Notes to entry have been replaced with new Notes to entry.]

3.6

item

subject being considered

Note 1 to entry: The item can be an individual part, component, material, device, functional unit, equipment, subsystem, system, product, service or process.

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

Note 3 to entry: The item is often comprised of elements that can each be individually considered. See sub item (IEV 192-01-02) and indenture level (IEV 192-01-05).

[SOURCE: IEC 60050-192:2015, 192-01-01, modified – In Note 1 to entry, "material, product, service or process" has been added and the Notes referring to IEC 60050-191 have been deleted.]

3.7

life cycle

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

EXAMPLE A typical system life cycle 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 the application.

[SOURCE: IEC 60050-192:2015, 192-01-09]

3.8

life profile

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

Note 1 to entry: Stresses can be internal (such as operating cycles) or external (such as environmental stress, input power level and rate of service requests over the network).

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

3.9

maintainability

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 conditions defined in the life profile.

Note 2 to entry: Maintainability can be quantified using appropriate measures. See IEC 60050-192:2015, Section 192-07, Maintainability and maintenance support: measures.

[SOURCE: IEC 60050-192:2015, 192-01-27, modified – The definition has been generalized and reworded, "of use and maintenance" has been deleted and the existing Notes to entry have been replaced with new Notes to entry.]

3.10

maintenance concept

maintenance objectives, line of maintenance, indenture levels, maintenance levels, maintenance support and their interrelationships

Note 1 to entry: The maintenance concept provides the basis for maintenance planning, determining supportability requirements and developing logistic support.

[SOURCE: IEC 60050-192:2015, 192-06-02, modified – The first preferred term "maintenance policy" has been deleted and in the Note, "policy" has been replaced with "concept".]

3.11

mean waiting time

MWT

average time for a spare part to be made available to repair an item

Note 1 to entry: If a spare part is available as a stock item, then the waiting time is zero. The worst waiting time is the repair turnaround time.

3.12

off-the-shelf

OTS

non-developmental item of supply that is both commercial and sold in substantial quantities in the commercial marketplace

Note 1 to entry: Sometimes referred to as COTS (commercial off-the-shelf) or MOTS (modified off-the-shelf).

[SOURCE: IEC 62741:2015, 3.1.3]

3.13

preventive maintenance

maintenance carried out to mitigate degradation and reduce the probability of failure

Note 1 to entry: See also condition-based maintenance (IEV 192-06-07) and scheduled maintenance (IEV 192-06-12).

[SOURCE: IEC 60050-192:2015, 192-06-05, modified – The second preferred term "preventative maintenance" has been deleted.]

3.14

repair turnaround time

RTRT

time taken for a failed part to be repaired and returned to store (including transportation)

3.15

replacement rate

rate at which an item is replaced to meet specified operational requirements over a period of time

Note 1 to entry: The likelihood of failures detected when no fault is found shall be included in the calculation of the replacement rate. Some failures (secondary failures) are induced by external events, such as inappropriate repair, failure of other items. For these reasons the replacement rate, and not the failure rate, shall be applied in spare parts quantification. The replacement rate includes all factors which are influencing the number of replacements of an item.

3.16

special type equipment

STE

equipment which is required for performing a specific task for a specific item

EXAMPLE Tools, jigs and test equipment.

3.17

support

<in dependability> 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 provides a quality resource to the correct location at the best time for the optimum cost, taking into account environmental, social and economic impacts.

3.18**supportability**

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

[SOURCE: IEC 60050-192:2015, 192-01-31, modified – The definition has been generalized and extended and the Note to entry has been deleted.]

3.19**system**

<in dependability> combination of interacting parts that achieve one or more purposes

Note 1 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, other systems, services and personnel required.

[SOURCE: IEC 60050-192:2015, 192-01-03, modified – The definition has been reworded to be specific and the existing Notes to entry have been replaced with new Notes to entry.]

3.20**useful life**

interval, from the defined first use until a defined end state is reached, due to performance, obsolescence or economic factors

Note 1 to entry: The first use has to be defined. In this context, "first use" excludes testing activities prior to hand-over of the item to the end-user. The "first use" can commence after an initial period of early mortality.

Note 2 to entry: The end state has to be defined and can include safety margins that prevent the onset of failure or percentages of accumulated failures.

Note 3 to entry: The applicable interval 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 4 to entry: In some cases, the useful life of an item is more than that required by an organization in which case it will have residual value and can be repurposed.

Note 5 to entry: For items where the useful life ends when the item fails, the life of the item can be specified as the time when a stated percentage of the items have failed. This is often stated as a L_{10} or B_{10} value for 10 % accumulated failures.

Note 6 to entry: For consumer products and other products produced in large volumes, where only a small percentage of the products fail, the L_{10} or B_{10} value can be used as an approximation.

[SOURCE: IEC 60050-192:2015, 192-02-27, modified – The definition is no longer specific, has been reworded and the existing Note to entry has been replaced with new Notes to entry.]

4 Overview of supportability and support

4.1 Description of supportability and support

Supportability is involved with identifying and quantifying the support required for a defined item in a given context of use, time to provide that support, resourcing, cost and quality of that support, and quality of the delivered support. Specifically, supportability addresses "what is required" for an item to continue to function as well as "how to implement" this requirement. The "what is required" element is inherent within the item design, but the way in which it is implemented is determined by the organization undertaking the support. Hence the organizational aspects can heavily influence supportability and therefore supportability should be an integral part of the design and development of an item. Supportability can change during the life of an item: for example, if the number of items requiring support changes.

Support is the provision of resources to enable an item to continue to function as required throughout its life for a given life profile. Examples of resources are personnel, training, tools, jigs, test equipment, lifting equipment, materials, spare parts, facilities, documentation, information and information systems including the maintenance and calibration of these resources. In essence, support provides a quality resource (including quantity) to the correct location at the best time for the optimum cost, taking into account environmental, social and economic impacts.

In order to clarify the difference between supportability and support: supportability management establishes the required support and manages changes (improvements) within the area of support which can involve changes to the item design as well as changes in the organizational structure; support addresses the day to day management and operation for the provision of the specified support resources in order to ensure that the quality of these resources and their timeliness of delivery is always maintained.

There are two types of supportability and support that can be considered: operational and maintenance. Operational support examples can be providing accommodation and sustenance for an aircrew that has landed in a foreign country or providing a helpdesk service. However, the boundaries of support have to be clearly understood. The above examples are support, but will not necessarily be within a support organization. For example, they can form part of the duties conducted by customer services which the company has classified as a separate cost centre involving support and non-support activities and therefore excluded from support accountability. Measurement of specific support activities for quality, timeliness and cost-effectiveness cannot be easily obtained from the data if the organization has other non-support duties and the effectiveness and efficiency of the organization is measured collectively. As mentioned in 5.4, measures for cost centres and profit centres are outside the scope of this document.

Interface boundaries are also an important consideration. For example, the maintenance support organization is responsible for ordering spare parts, but the purchasing of these spare parts can be conducted by a procurement department. Procurement can be responsible for determining the financial viability of a company and also conducting competitive bidding. These would be outside the responsibilities of support, but the support organization has to clearly understand this interface if any undue delay is to be pre-empted for the timely delivery of the spare part.

4.2 Principles

Supportability and support are founded on a set of principles. Applying these principles will ensure that the support organization is economically viable and that the reliability, maintainability and availability measures established during design and development are achieved

Supportability principles are:

- simplifying, minimizing and eliminating aspects of support particularly with regard to the inherent design;
- collectively analysing supportability, reliability, maintainability and availability to provide a balanced solution at an optimum overall cost;
- establishing an organizational structure that is efficient and effective and is constantly striving to improve its effectiveness and efficiency whilst taking into account changes in environmental, social, and economic requirements;
- structuring the organization to incorporate the different support approaches depending on the different types of support (such as addressing different types of restoration and maintenance);
- providing resources as required, ensuring that these resources have been defined, including the quality of these resources;

- delivering resources to known locations as well as providing flexibility in delivery where these locations can change;
- providing support with minimal delay time;
- ensuring support is cost-effective.

4.3 Benefits

Supportability and support activities facilitate the assurance that integrated technical, financial and organizational decisions associated with sustained operation and maintenance of an item or group of items, can be achieved in a balanced manner. The benefits from controlling supportability and support activities include:

- providing justified confidence that spare parts will provide value by performing as and when required;
- enabling supportability design weaknesses to be identified and improved with consideration for performance, risk, other dependability characteristics and costs during the whole life;
- providing information and data that enable continual improvement;
- providing justification for the cost of supportability activities and demonstrating affordable levels of supportability and support performance;
- reducing item down time resulting in improved availability;
- optimizing supportability and support effort;
- assisting in achieving defined, technical and financial outputs for the organization;
- improving resilience to disruptive events.

From these benefits, the stakeholder will have increased confidence in the support organization, with lower life cycle costs, improved availability and fewer modifications due to supportability deficiencies. In turn, this can result in improved stakeholder confidence in the item leading to improved sales as well as improved sales for future items from the same company.

4.4 Interfaces

4.4.1 General

Supportability is an attribute of dependability (see IEC 60300-1). The other main dependability attributes are reliability, maintainability and availability. Support, as an outcome of supportability, provides the quality and timeliness of delivery for the resources that are required and can therefore influence these attributes. The interfaces between these are explained in more detail in 4.4.2 to 4.4.5.

Supportability and support are influenced during the design stage by the intended types of restoration (7.2.2) and the intended types of maintenance (Annex A) and the potential loss in revenue due to delays. During use of the item, supportability and support are influenced by the variations in the use of the items in relation to the life profile and variations in the quantity of items that will be supported.

Conversely, all design activities (including modifications) require supportability and support to be considered so that any design decisions address the impact upon support to ensure an optimized solution is achieved. Hence, the primary interfaces are systems design and manufacture, dependability requirements (IEC 60300-3-4), reliability, maintainability and maintenance (IEC 60300-3-10) including testability and diagnostics (IEC 60706-5), availability and also life cycle costing (IEC 60300-3-3).

Additional interfaces include project management, risk management, safety and hazard analysis, human factors analysis (IEC 62508), trials and acceptance, quality, environmental, social issues, design reviews, including dependability reviews (IEC 62960), sustainability, resilience and organizational aspects.