IEC 62309

Edition 2.0 2024-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Dependability of new products containing reused parts and life-extended products

Sûreté de fonctionnement des produits neufs contenant des composants réutilisés et des produits à durée de vie prolongée

IEC 62309:2024-12(en-fr)

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DEPENDABILITY OF NEW PRODUCTS CONTAINING REUSED PARTS AND LIFE-EXTENDED PRODUCTS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 62309 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) the previous Annex A has been separated into Annex B (Dependability aspects) and Annex C (Example with QAGAN parts);
b) a new normative Annex A has been written with expansion of lifecycle activities, to describe extending the useful life by refurbishment, life extension, updating, upgrading and second-hand use;
c) revision of Figure 1 accordingly;

d) minor editorial alignments throughout the document;

e) the abbreviation "quagan" has been changed "QAGAN" to reflect more contemporary use.

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

Draft	Report on voting
56/2057/FDIS	56/2073/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/publications.

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

The marketplace for products in the 21st century is a rapidly changing one, with increased speed of technological growth, and new pressures on environmental sustainability as humanity's demand for ecological resources currently far exceeds what the Earth can regenerate in the same timeframe.

Owing to the improving quality of manufacturing, most parts have been manufactured with a life expectancy far longer than the user needs.

Technological changes are also making products more reliable. However, commercial pressures and legislation changes are leading to an increased rate of technological change, resulting in a difficulty in obtaining supplies, spares and or support for the superseded parts [a discipline known as obsolescence management (see IEC 62402 [1][1])], and the need to upgrade systems before all their parts have reached their life expectancy.

The disposal of products and their component parts, which can be potentially useful, is fuelling the cycle of waste and the overuse of finite materials.

It is unlikely that the speed of technological growth can be slowed, or significant changes can be made to user needs. However, what can be done is to increase the reuse of parts that have not reached their life expectancy. This document addresses this goal to reduce waste by reusing parts, and the additional benefits that come with reusing parts.

This document provides customers with dependability assurance when manufacturers are producing new products containing previously used parts. The main concept is to qualify the reused parts to ensure that the product under consideration will fulfil the requirements for a product containing only new parts. The reused parts can then be declared QAGAN (qualified-as-good-as-new) and used interchangeably with new parts in the product.

This document firstly describes, in Clauses 4 to 7, requirements for qualification of reuse of parts in new products. A QAGAN part is qualified only for a specific application, often the same or similar to that for which it was previously used. This means that QAGAN parts are not declared as qualified for general use.

QAGAN parts are already type approved for their original application. The declaration QAGAN certifies that a reused part that has previously been qualified for use in a specific product has been checked that it has not deteriorated to a degree that it cannot be used in new products. A new product containing QAGAN parts is tested only to the same extent as if it contained only new parts.

Secondly, in Clauses A.3 to A.7, this document describes the life extension of products already in use. In most cases, life extension can be made using new components, new parts, or QAGAN parts that have been qualified for the specific application.

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1 Numbers in square brackets refer to the Bibliography.

Reuse of parts and materials is one way to save resources. Another way is to extend the useful life of products as described in Annex A, extending the useful life by refurbishment, life extension, updating, upgrading or second-hand use. These concepts are defined and the requirements for using the term QAGAN with reference to this document are stated. This document expresses guidance to support the circular economy and anticipates application by organisations to enable, permit and encourage reuse of functional parts. This document envisages that the item, the subject under consideration, which attracts the declaration or designation "QAGAN" may be an individual part, component, device, or functional unit. This document does not cover reused materials or large structures and large systems, nor does it cover software products, concepts, and ideas.

DEPENDABILITY OF NEW PRODUCTS CONTAINING REUSED PARTS AND LIFE-EXTENDED PRODUCTS

1 Scope

This International Standard introduces the concept to check the reliability and functionality of reused parts and their usage within new products. It also provides information and criteria about the assurance [for example, testing and analysis, required for products containing reused parts, which are declared "qualified-as-good-as-new" (QAGAN)] relative to the designed life of the product.

This document specifies requirements to be satisfied before making a declaration or applying a designation of QAGAN. This document also gives guidance to support any organisation that makes declarations about dependability of products containing reused parts.

In this document, the term "product" covers electrical, electro-mechanical, mechanical parts or hardware that can contain software.

"Qualified-as-good-as-new" (QAGAN) does not apply to reused materials or large structures and large systems, nor does it cover software products, concepts, and ideas.

The purpose of this document is to ensure by tests and analysis that the reliability and functionality of a new product containing reused parts is comparable to a product that contains only new parts. This would justify the manufacturer granting the next customer the full warranty of the product with "qualified-as-good-as-new" (QAGAN) parts.

NOTE This document can also be applied in producing product-specific standards by technical committees responsible for an application sector.

Annex A describes extending useful life by refurbishment, updating, upgrading, maintenance and used as second-hand. These concepts are defined and the requirements for using the term with reference to this document are stated.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

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 Terms and definitions

3.1.1
process
set of interrelated or interacting activities that use inputs to deliver an intended result

Note 1 to entry: Whether the "intended result" of a process is called output, product or service depends on the context of the reference.

Note 2 to entry: Inputs to a process are generally the outputs of other processes and outputs of a process are generally the inputs to other processes.

Note 3 to entry: Two or more interrelated and interacting processes in series can also be referred to as a process.

Note 4 to entry: Processes in an organization are generally planned and carried out under controlled conditions to add value.

Note 5 to entry: A process where the conformity of the resulting output cannot be readily or economically validated is frequently referred to as a "special process".

Note 6 to entry: This constitutes one of the common terms and core definitions for ISO management system standards given in Annex SL of the Consolidated ISO Supplement to the ISO/IEC Directives, Part 1. The original definition has been modified to prevent circularity between process and output and Notes 1 to 5 to entry have been added.

[SOURCE: ISO 9000:2015, 3.4.1]

3.1.2
product
output of an organization that can be produced without any transaction taking place between the organization and the customer

Note 1 to entry: Production of a product is achieved without any transaction necessarily taking place between provider and customer but can often involve this service element upon its delivery to the customer.

Note 2 to entry: The dominant element of a product is that it is generally tangible.

Note 3 to entry: Hardware is tangible, and its amount is a countable characteristic (e.g., tyres). Processed materials are tangible, and their amount is a continuous characteristic (e.g., fuel and soft drinks). Hardware and processed materials are often referred to as goods. Software consists of information (3.8.2) regardless of delivery medium (e.g., computer programme, mobile phone app, instruction manual, dictionary content, musical composition copyright, driver's license).

[SOURCE: ISO 9000:2015, 3.7.6]

3.1.3
new product
product as a whole, including all of its constituent parts, that has not yet been put into normal use

Note 1 to entry: A new product can contain one or more qualified-as-good-as-new (QAGAN) parts.

3.1.4
qualified-as-good-as-new, adj
QAGAN
used on one or more occasions, and qualified, fit for purpose and as dependable as new parts, for the as-new designed life (ANDL) of a product

Note 1 to entry: QAGAN parts differ from a second-hand part in that it is not just a re-use, but it is also reconditioned and subjected to fully defined and documented quality assurance prior to re-use. The necessary level of documentation and quality assurance depends on the application and the market requirements.

Note 2 to entry: In IEC 62309:2004, the abbreviation was "quagan". Now changed to "QAGAN" to reflect more contemporary use.

3.1.5
useful life
<of an item> time interval, from first use until user requirements are no longer met, due to economics of operation and maintenance, or obsolescence

Note 1 to entry: In this context, "first use" excludes testing activities prior to hand-over of the item to the end-user.

Note 2 to entry: In this document, user requirements include technical performance defining the limiting state.

[SOURCE: IEC 60050-192, 192-02-27, modified – Note 2 to entry has been added.]

3.1.6
new designed life
NDL
intended life of a product containing only new parts for the first use within a specific set of operating conditions

Note 1 to entry: The new designed life can depend on the usage of the product, market requirements, efficiency, economy, technology, etc.

3.1.7
as-new designed life
ANDL
intended life of a product containing at least one reused part for use within a specific set of operating conditions

Note 1 to entry: The NDL and the ANDL need not be of equal length nor be in any set ratio, but it is desirable that the ANDL should not be less than the NDL.

3.1.8
remaining working life
<for a part> duration of a time interval from a given instant of time to the instant of time when the limiting state of the part is reached

3.1.9
reuse
use of a part that has already served as constituent of a product, after disassembling, as constituent of another product

3.1.10
recycling
any operation by which waste products are reprocessed into products, product parts, materials or substances whether for the original or other purposes

Note 1 to entry: It includes the reuse, the reprocessing of material, but does not include the energy recovery and reprocessing into materials that are to be used as fuels or for back-filling operations.

[SOURCE: IEC TR 62635:2012, 3.16]

3.1.11
life extension
process applied under the responsibility of the manufacturer to extend the useful life of a used product, while maintaining basic safety and essential requirements

Note 1 to entry: Life extension can include activities such as modifying specified life limitations, exchanging life-limited parts with new or improved parts, or updating software and firmware to versions with a longer useful life, to produce a life-extended product. When performing life extension, regulatory submissions to national authorities can apply.

Note 2 to entry: The intention of life extension of a product is the extension of the expected useful life, defined by the manufacturer under specified conditions, to ensure that such kinds of life extended products fulfil basic safety and essential requirements.

Note 3 to entry: The manufacturer may authorize other companies to perform life extension.

3.1.12
refurbishment
process applied under the responsibility of the refurbisher to restore used parts, equipment, systems or sub-assemblies to basic safety and essential performance comparable to when new with the intention to extend the useful life

Note 1 to entry: Refurbishment can include activities such as repair, rework, replacement of worn parts, and update of software/hardware. When refurbishment is performed, regulatory submissions to national authorities can apply before a product is placed on the national market.

Note 2 to entry: Refurbishment according to this document is, for example, not meant when a product has been shown on a trade fair without use and then polished up for selling.

Note 3 to entry: The intention of refurbishment of a product is the extension of the expected useful life, defined by the manufacturer under specified conditions, to ensure that such kinds of refurbished products fulfil basic safety and essential requirements.

Note 4 to entry: The original manufacturer may authorize other companies to perform refurbishment.

3.1.13
update
process applied under the responsibility of the manufacturer to make the functionality of a used product compatible with new products of the same type, while maintaining basic safety and essential requirements

Note 1 to entry: Update can include activities such as making the appearance, performance and functions compatible with a new product of the same type. It is important when updating to consider the status of regulatory submissions to national authorities before an updated product is placed on the national market.

Note 2 to entry: The intention of update of a product is the extension of the expected useful life, defined by the manufacturer under specified conditions to ensure that such kind of updated products fulfils basic safety and essential performance.

Note 3 to entry: The manufacturer may authorize other companies to perform updates.

3.1.14
upgrade
process of enhancing the functionality, performance, capacity, or aesthetics of a product

Note 1 to entry: An upgrade to a product can involve changes to its software, firmware and/or hardware.

Note 2 to entry: Process applied under the responsibility of the manufacturer to improve the functionality of a used product exceeding the original specifications, while maintaining basic safety and essential requirements.

Note 3 to entry: Upgrade can include activities such as significantly improving the appearance, performance and functions compared with the original specification of the product. When performing an upgrade, regulatory submissions to national authorities can apply before the upgraded product is placed on the national market.

Note 4 to entry: The intention of upgrade of a product is the extension of the expected useful life, defined by the manufacturer under specified conditions, to ensure that such kinds of upgraded products fulfil basic safety and essential requirements.

Note 5 to entry: The manufacturer may authorize other companies to perform upgrades.

[SOURCE: EN 45554:2020, 3.1.5, modified – note 2 has been modified. Note 3 to Note 5 to entry have been added]

3.1.15
reconditioning
refurbishment and/or repair of parts to obtain the approximate original design condition

[SOURCE: ISO 3977-9:1999, 3.92

3.1.16
disposability
ability of an item to be fragmented into different waste categories

3.1.17
***B* life**
L percentiles
age at which a given percentage of items have failed

Note 1 to entry: "B_{10}" life is the age at which 10 % of items (e.g., bearings) have failed. Sometimes it is denoted by the *L* (life) value. *B* lives may be read directly from Weibull plot or determined more accurately from the Weibull equation. The age at which 50 % of the items fail, the B_{50} life, is the median time to failure.

[SOURCE: IEC 61649:2008, 3.1.11]

3.2 Abbreviated terms

QAGAN	qualified-as-good-as-new
NDL	new designed life
ANDL	as-new designed life
PWA	printed wiring assemblies
EOL	end-of-life
EPROM	erasable programmable read-only memory

4 Requirements for products containing reused parts

4.1 Process and decision flows

A product can be made up of new and reused parts (see Figure 1).

Process and decision flows concerning QAGAN parts are illustrated in Figure 1 and Figure 2.