

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

Metod för att uppnå cirkulär design av produkter

Method to achieve circular designs of products

Som svensk standard gäller europastandarden EN 45560:2024. Den svenska standarden innehåller den officiella engelska språkversionen av EN 45560:2024.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1042
172 21 Sundbyberg
Tel 08-444 14 00
elstandard.se

English Version

Method to achieve circular designs of products

Méthode pour réaliser des conceptions circulaires de produits

Verfahren zur Realisierung zirkulärer Produktgestaltung

This European Standard was approved by CENELEC on 14 October 2024. CEN and CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN and CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN and CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN and CENELEC members are the national standards bodies and national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword	3
Introduction	4
1 Scope	6
2 Normative references	6
3 Terms, definitions and abbreviated terms	6
3.1 Terms and definitions relating to circular product design	6
3.2 Terms and definitions relating to environment	8
3.3 Terms and definitions relating to product and resource	9
3.4 Terms and definitions relating to recycling	10
3.5 Terms and definitions relating to durability	11
3.6 Terms and definitions relating to lifetime extension	12
3.7 Abbreviated terms	13
4 Principles and concepts in support of circular product design	14
4.1 Circular product design core principles	14
4.2 Design principles for narrowing, slowing, and closing material flows	14
4.3 Material value hierarchy	16
4.4 EN 4555X-4556X series of standards and the material value hierarchy	18
5 Transition by an organization towards circularity	20
5.1 Circular economy as part of the vision, mission, and strategy	20
5.2 Circular goals of the organization	20
5.3 Measuring the organization's transition towards circularity	21
6 Circular product design requirements and guidance	22
6.1 Circular product design implementation process	22
6.2 Circular targets of the organization	23
6.3 Circular product attributes	27
6.4 Building a circular product design matrix	29
6.5 Trade-offs considerations in circular product design	32
6.6 Circular product design requirements	35
7 Communication	45
7.1 Communication of the circular goals of the organization	45
7.2 User information and guidance on circular aspects of the product	45
Annex A (informative) Background information	46
A.1 Considerations of sustainable development goals	46
A.2 Circular product design extends environmentally conscious design	46
Annex B (informative) Strategies contributing to slowing, narrowing and closing material flows	48
B.1 Examples of strategies for narrowing material flows	48
B.2 Examples of strategies for slowing material flows	49
B.3 Examples of strategies for closing material flows	51
Annex C (informative) Circular product attributes explained	53
C.1 Circular product attribute groups, rationale and objectives	53
Bibliography	56

European foreword

This document [EN 45560:2024] has been prepared by CEN/CLC/JTC 10 “Material efficiency aspects for products in scope of Ecodesign legislation”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2025–11–30
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2027–11–30

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

CEN/CLC/JTC 10 has the objective to produce generic and horizontal CEN-CENELEC publications covering aspects such as assessment methods, design rules, dematerialization, digitalization and transfer of information on a variety of material efficiency topics, in particular (but not limited to):

- a) Extending product lifetime;
- b) Ability to reuse components or recycle materials¹ from products at end-of-life;
- c) Use of reused components and/or recycled materials in products.

This document is intended to be used by organizations applying directly to products but can also be used by product technical committees when producing horizontal, generic, product-group, or product-specific standards. It can, therefore, be cited together with product-group or product-specific standards, e.g. developed by product technical committees.

Any feedback and questions on this document should be directed to the users’ national committee. A complete listing of these bodies can be found on the CENELEC website.

¹ Including coverage of the European Commission defined list of critical raw materials (CRM).

Introduction

0.1 Background

Climate change, biodiversity loss, resource depletion and the ever-increasing production of waste and pollution represent major challenges to society today. Circular economy, with its focus on material efficiency and the promise for longer lifetime of products, minimization of waste and closing the flows for materials is believed to be an important means to overcome these challenges. When transitioning into a circular economy, design plays a crucial role. It has been reported that 80 % of a product's environmental impacts are determined at the product design phase [1] and design choices can determine whether the efforts to improve circularity will be successful or not. Circular product design is a key element of developing and implementing circular business models and transitioning towards a circular economy.

In Europe, the Green Deal [2] launched in 2019 proposes a concerted strategy for a climate-neutral, resource-efficient and competitive economy. Scaling up the circular economy from front-runners to the mainstream economic players will make decisive contributions to achieving climate neutrality by 2050 and to decoupling economic growth from the use of natural resources by using these resources more effectively, while ensuring long-term competitiveness of and within the EU. This document, focusing on circular product design, supports achieving the ambition stated in the European Circular Economy Action Plan (CEAP) [3].

Sustainable management and efficient use of natural resources is addressed by the UN's sustainable development goals (SDGs). This document supports these goals, particularly SDG 12, to ensure sustainable consumption and production patterns (see Annex A for more details).

The main purpose of this document is to develop a systematic way (method) of defining design rules and activities for the design and development of products such that these are made circular by design within a circular economy.

This document is intended for organizations designing and developing products that fall under the scope of the ecodesign legislation [4]. It focusses on optimizing material utilization and efficiency with strategies that enable narrowing (use less materials), slowing (extend product life, keep quality of products and materials as high as possible for as long as possible) and closing flows (parts recovery, remanufacture, repurpose and recycling).

0.2 Relation with other horizontal or generic standards

Although there are regulatory requirements for resource efficiency across most geographies, to date, the focus has been mostly on the energy efficiency of products. Recently standards focusing on the material efficiency became available, with the publication of the CEN/CLC/JTC 10 EN 4555X-4556X series of standards. These standards focus on the assessment of different aspects of material efficiency, such as durability of products (EN 45552 [5]), ability to remanufacture (EN 45553 [6]), ability to be repaired, reused and upgraded (EN 45554 [7]), recyclability (EN 45555 [8]), proportion of reused components (EN 45556 [9]), recycled content (EN 45557 [10]), and communication on the use of critical raw materials (CRMs) (EN 45558 [11]) and material efficiency (EN 45559 [70]). These standards address how to assess ability (how easy or difficult it is) to e.g. repair, remanufacture or recycle a product. However, these standards do not provide guidance on what aspects to consider when designing a product. This document intends to fill in such a gap.

The standard EN IEC 62430 (see Clause 2 in this document) assists organizations to incorporate environmentally conscious design (ECD) into their product design and development process. IEC/TS 63428 [12] links circularity to environmentally conscious design.

ISO 14009 [13] provides guidelines to organizations on how to incorporate circular product design strategies in the design and development within their environment management system. ISO 14006 [14] provides guidelines to assist organizations in establishing a systematic and structured approach to the incorporation and implementation of ecodesign within an environment management system, such as described in ISO 14001 [15]. Assessments of environmental impacts including aspects of material circularity and material cost accounting are considered in documents such as EN 50693 [16], EN 15804 [17], and ISO 14040 [18], ISO 14044 [19], and ISO 14051 [20].

IEC 62309 [21] contains guidance and requirements for dependability assessment of products containing reused parts and it also specifies requirements about declaration and designation of reused parts "qualified-as-

good-as-new". The IEC 60300 series [22] include general guidance on dependability, availability, reliability and maintainability, and IEC 62402 [23] addresses obsolescence management.

International standards currently under development by ISO/TC 323 on circular economy are ISO 59004 on terminology, principles and guidance for implementation [24], ISO 59010 providing guidance on the transition of business models and value networks [25], ISO 59020 on measuring and assessing circularity [26], and ISO/FDIS 59040 proposing a product circularity data sheet [27].

The ITU-T recommendation L.1023 [28] has standardized a framework for circularity performance scoring, defining key circularity terms and how these fit together in a scoring system.

In the design rules for circular economy, all domains such as environmental, social, economic, and technical are considered. As part of this holistic approach, value management is addressed in EN 12973 [29] and EN 16271 [30].

To avoid duplication as much as possible, this document references the above listed standards (sometimes normatively).

1 Scope

This document proposes a method to achieve circular designs of products. It details principles, requirements and guidance associated with the proposed method. This document:

- specifies requirements and guidance for integrating circularity into the design and development process of products by an organization and,
- supports organizations to develop product design rules to fulfil their chosen circular business targets (e.g. the circular business models chosen by the organization or the legislation requirements).

Having life cycle thinking as a core principle, this document provides guidance on how to reduce environmental impacts, and how to deal with challenges such as trade-offs during circular product design, without compromising other product functions including safety.

This document focusses on material efficiency. It is not a management system standard.

This document can be applied when no product-specific or product group standard exist. Where such documents are developed, this document can be used as reference to ensure consistency and harmonization across the different product areas and supply chains or networks.

NOTE For the purpose of this document, the following products are excluded: food, feed, medicinal products for human use, veterinary medicinal products, living plants, animals and microorganisms, products of human origin, products of plants and animals relating directly to their future reproduction.

2 Normative references

The following documents are referred to in the text in such a way that some or all 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.

EN IEC 62430:2019, *Environmentally conscious design (ECD) — Principles, requirements and guidance*