

BS EN 62075:2012

*Incorporating corrigendum March 2013*



BSI Standards Publication

# Audio/video, information and communication technology equipment — Environmentally conscious design

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### National foreword

This British Standard is the UK implementation of EN 62075:2012, incorporating corrigendum March 2013. It is identical to IEC 62075:2012. It supersedes BS EN 62075:2008 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/100, Audio, video and multimedia systems and equipment.

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

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EUROPEAN STANDARD  
 NORME EUROPÉENNE  
 EUROPÄISCHE NORM

**EN 62075**

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*Incorporating corrigendum March 2013*

English version

**Audio/video, information and communication technology equipment -  
 Environmentally conscious design  
 (IEC 62075:2012)**

Equipements relatifs aux technologies de  
 l'audio/vidéo, de l'information et de la  
 communication -  
 Conception éco-environnementale  
 (CEI 62075:2012)

Audio/Video-, Informations- und  
 Kommunikationstechnikgeräte –  
 Umweltbewusstes Design  
 (IEC 62075:2012)

This European Standard was approved by CENELEC on 2012-10-24. 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 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 CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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**CENELEC**

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

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of document 108/448/CDV, future edition 2 of IEC 62075, prepared by IEC/TC 100, "Audio, video and multimedia systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62075:2012.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-07-24
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-10-24

This document supersedes EN 62075:2008.

EN 62075:2012 includes the following significant technical changes with respect to EN 62075:2008:

EN 62075:2012 is primarily an editorial revision that adds information related to the modifications noted in certain definitions and updating of regulation references.

NOTE The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

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

## Endorsement notice

The text of the International Standard IEC 62075:2012 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60065	NOTE	Harmonized as EN 60065.
IEC 60950-1	NOTE	Harmonized as EN 60950-1.
IEC 62018	NOTE	Harmonized as EN 62018.
IEC 62430	NOTE	Harmonized as EN 62430.
ISO 14001:2004	NOTE	Harmonized as EN ISO 14001:2004 (not modified).
ISO 14050	NOTE	Harmonized as EN ISO 14050.
ISO 14040:2006	NOTE	Harmonized as EN ISO 14040:2006 (not modified).

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 3741	-	Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms	EN ISO 3741	-
ISO 3744	-	Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane	EN ISO 3744	-
ISO 3745	-	Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for anechoic and hemi-anechoic rooms	EN ISO 3745	-
ISO 7779	-	Acoustics - Measurement of airborne noise emitted by information technology and telecommunications equipment	EN ISO 7779	-
ISO 9296	-	Acoustics - Declared noise emission values of computer and business equipment		-
ISO 11201	-	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Engineering method in an essentially free field over a reflecting plane	EN ISO 11201	-
ISO 11469	-	Plastics - Generic identification and marking of plastic products	EN ISO 11469	-

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## INTRODUCTION

Every **product** has an effect on the **environment**, which may occur at any or all stages of its **life cycle** – raw-material acquisition, manufacture, distribution, use, and disposal. These effects may range from low to significant; they may be short-term or long-term; and they may occur at the local, regional or global level (or a combination thereof).

The interest of customers, users, developers and other stakeholders in **environmental aspects** and effects of **products** is increasing.

Anticipating or identifying the **environmental aspects** of a **product** throughout its **life cycle** may be complex. The **environmental aspects** of a **product** have to be balanced against other factors, such as its intended use, performance, safety and health, cost, marketability, quality and regulatory requirements. It is important to consider the **product** functionality within the context of the system where it will be used.

The process of integrating **environmental aspects** into **product** design and development has to be continuous and flexible, promoting creativity and maximizing innovation and opportunities for environmental improvement. Environmental issues should be addressed in the policies and strategies of the **organization** involved.

Early identification and planning enable **organizations** to make effective decisions about **environmental aspects** that they control. This provides a better understanding of how their decisions will affect **environmental aspects** controlled by others, for example, at the raw-material and **parts** acquisition or **end of life** stages.

The purpose of this document is to help **designers** of **products** in the field of audio/video, information technology and communication technology to appropriately manage related environmental issues within the design process.

This sector specific document takes into account the publication of the second edition of ECMA-341 (2004), recent engineering best practices as well as current market and regulatory environmental **product** requirements.

# AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT – ENVIRONMENTALLY CONSCIOUS DESIGN

## 1 Scope

This International Standard applies to all audio/video, information and communication technology equipment marketed as final **products**, hereafter referred to as **products**.

Although this standard does not explicitly apply to individual components and subassemblies to be incorporated into final **products**, component **manufacturers** also should consider this standard, to enable **manufacturers** using such components to meet the requirements herein.

Only the intended use of **products** as defined by the **manufacturer** is within the scope of this standard.

This standard specifies requirements and recommendations for the design of environmentally sound **products** regarding

- **life cycle** thinking aspects,
- material efficiency,
- **energy efficiency**,
- **consumables** and batteries,
- chemical and noise emissions,
- extension of **product** lifetime,
- **end of life**,
- **hazardous substances/preparations**, and
- **product** packaging.

This standard covers only criteria directly related to the environmental performance of the **product**. Criteria such as safety, ergonomics and electromagnetic compatibility (EMC) are outside the scope of this standard and covered by other standards.

## 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.

ISO 3741, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for reverberation rooms*

ISO 3744, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane*

ISO 3745, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for anechoic and hemi-anechoic rooms*



ISO 7779, *Acoustics – Measurement of airborne noise emitted by information technology and telecommunications equipment*

ISO 9296, *Acoustics – Declared noise emission values of computer and business equipment*

ISO 11201, *Acoustics – Noise emitted by machinery and equipment – Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections*

ISO 11469, *Plastics – Generic identification and marking of plastics products*

### 3 Terms and definitions

For the purpose of this document the following terms and definitions apply.

#### 3.1 chemical emissions

chemical **substances** and particulate matter emitted from a **product** into the air

#### 3.2 consumable

user-replaceable **part** or piece of equipment that **manufacturers** place on the market for direct sale for use in equipment

Note 1 to entry: **Consumables** include, for example, printer cartridges and photographic film, and not **parts** required for repairs or **product** upgrades.

#### 3.3 designer

person responsible for the design and development of a product under the supervision of the manufacturer

Note 1 to entry: See 3.12 for context with **manufacturer**.

#### 3.4 end of life

**life cycle** stage of a **product** starting when it is removed from a **use stage**

#### 3.5 energy efficiency

a comparative measure of energy required to achieve a particular performance

Note 1 to entry: A more precise definition is not applicable in this context as the output performance largely depends on the specific device.

EXAMPLE For power supplies the **energy efficiency** is defined as the percentage of output power per input power.

#### 3.6 environment

surroundings in which an **organization** operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation

[SOURCE: ISO 14001:2004, 3.5]

#### 3.7 environmental aspect

element of an **organization's** activities, **products** or services that can interact with the **environment**

[SOURCE: ISO 14001: 2004, 3.6]

Note 1 to entry: A significant **environmental aspect** is one that has or can have a significant **environmental impact** (ISO 14001:2004, 3.7).

### 3.8

#### **environmental impact**

any change to the **environment**, whether adverse or beneficial, wholly or partially resulting from an **organization's environmental aspects**

[SOURCE: ISO 14001:2004, 3.7]

### 3.9

#### **environmental management system**

part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedure, processes, and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy

[SOURCE: ISO 14001:2004, 3.8, modified to include notes as part of definition and eliminate use of ISO 14001 defined terms]

### 3.10

#### **hazardous substances and preparations**

**substance** or **preparation** that can adversely impact the **environment** with immediate or retarded effect

[SOURCE: IEC Guide 109:2003, 3.6, modified to include "preparations" in the definition and eliminate the note]

### 3.11

#### **life cycle**

consecutive and interlinked stages of a **product** system, from raw material acquisition or generation of natural resources to the final disposal

[SOURCE: ISO 14040:2006, 3.1]

### 3.12

#### **manufacturer**

**organization** responsible for the design, development and manufacture of a **product** in view of its being placed on the market, regardless of whether these operations are carried out by that **organization** itself or on its behalf

### 3.13

#### **module**

assembly of **parts** of a **product** with a function in itself (for example, a power supply) including those separately put on the market as a **product**

### 3.14

#### **organization**

company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration

[SOURCE: ISO 14001:2004, 3.16]

### 3.15

#### **part**

any piece or object of, or included with, a **product**

**3.16****preparations**

mixtures or solutions composed of two or more **substances**

EXAMPLE Tin is a **substance** and solder is a preparation (an alloy) that may contain tin.

**3.17****product**

audio/video, information and communication technology equipment

**3.18****recycling**

reprocessing of **products, modules** or **parts** thereof for **reuse** or other purposes during their **end of life** stage

**3.19****renewable material**

organic material not based upon fossil carbon sources

**3.20****reuse**

**recycling** of **products, modules** or **parts** by entering in a subsequent **product use stage**

**3.21****skilled person**

person with relevant education or experience to enable him or her to avoid dangers and to reduce the likelihood of risks that may be created by the equipment

[SOURCE: IEC 60050-826:2004, 826-18-01, modified to eliminate electrical specificity]

**3.22****substance**

matter with an individual molecular identity

**3.23****upgrading**

process to enhance the functionality or capacity of a **product**

**3.24****use stage**

period of the **product's** life from placing it into service until it enters its **end of life** stage

## 4 Life cycle thinking (LCT) aspects

Environmentally conscious design (ECD) according to IEC 62430 shall be based on the concept of life cycle thinking (LCT), which requires consideration during the design and development process of the significant environmental aspects of a product in all life cycle stages.

Key elements of life cycle thinking are:

- a) having an objective to minimize the overall adverse environmental impact of the product;
- b) identifying, qualifying and where feasible, quantifying the significant environmental aspects of the product;
- c) considering the trade-offs between environmental aspects and life cycle stages.

The above shall be initiated as early as possible in the design and development process, when most opportunities exist to make changes and improvements to the product affecting its overall environmental performance throughout its life cycle.

This LCT text has been intentionally copied for alignment reasons to use the same understanding as in IEC 62430.

As a first step in LCT, the intended function of the product should be determined. In subsequent design and development stages the influence of any applied business model should be recognized.

NOTE 1 The life cycle stages of any product under control of the organization usually include the processing of materials, manufacturing, distribution, use, maintenance, and end of life management (including reuse, recycling, recovery and final disposal).

NOTE 2 When a product is part of a system, the environmental performance of one product during one or more life cycle stages can be altered by other products in that system.

NOTE 3 ECD requires collaboration and contributions of all stakeholders along the supply chain.

## 5 Design requirements and recommendations

### 5.1 General considerations

The following requirements have been compiled for use when designing and developing **products** as defined in the scope of this standard, as far as they can be practically influenced by the **designer**.

#### The designer

- shall identify the latest environmental related legal and market requirements (from customers, government, environmental groups, industrial associations, etc.);
- should do benchmarking addressing the comparison of **energy efficiency**, material efficiency, and the use of **hazardous substances and preparations**;
- should gather and evaluate experience from the subsequent manufacturing, sales, **product** usage, maintenance and disposal stages;

to continually improve the process of environmentally conscious **product** design.

The entire environmental performance of the **product** should be evaluated, while the considerations should give priority to those factors that can be substantially influenced through **product** design and are identified as major **environmental impacts** (for example, very often energy consumption). The evaluation should take into consideration the functions and normal usage of the **product** as well as the technical and economical feasibility.

As a minimum, the **designer** shall document decisions by some means, such as by maintaining a design checklist covering **environmental aspects** (an example for such a checklist is provided in Annex A).

This standard requires certain **product** environmental characteristics to be made available in a form the **manufacturer** deems appropriate.

Further applicable information may be made available in an environmental **product** declaration (for example, ECMA-370).

### 5.2 Material efficiency

Material selection has an impact on the **environment**. When specifying materials, the **designer** should consider design alternatives that:

- reduce the variety of materials used;
- reduce the amount of material used and consequently the weight of the **product**;
- use materials that are considered to have lower adverse **environmental impact**;
- seek to use materials that can be easily **recycled**.

Material-related **end of life** aspects are covered in 5.7. For replacing materials containing **hazardous substances and preparations**, see 5.8.

## 5.3 Energy efficiency

### 5.3.1 General

To focus efforts on increasing **energy efficiency**, the **designer** shall be aware in which stage of the **product life cycle** the **product** will consume the most energy.

The intended use patterns of the **product**, including where relevant its typical system interactions, shall be considered. Where possible, the **organization** should strive for improving the overall system performance in respect to **energy efficiency**.

Energy consumption information shall be made available (see 5.3.5 d) and 5.3.7).

### 5.3.2 Energy modes and related energy efficiency measures

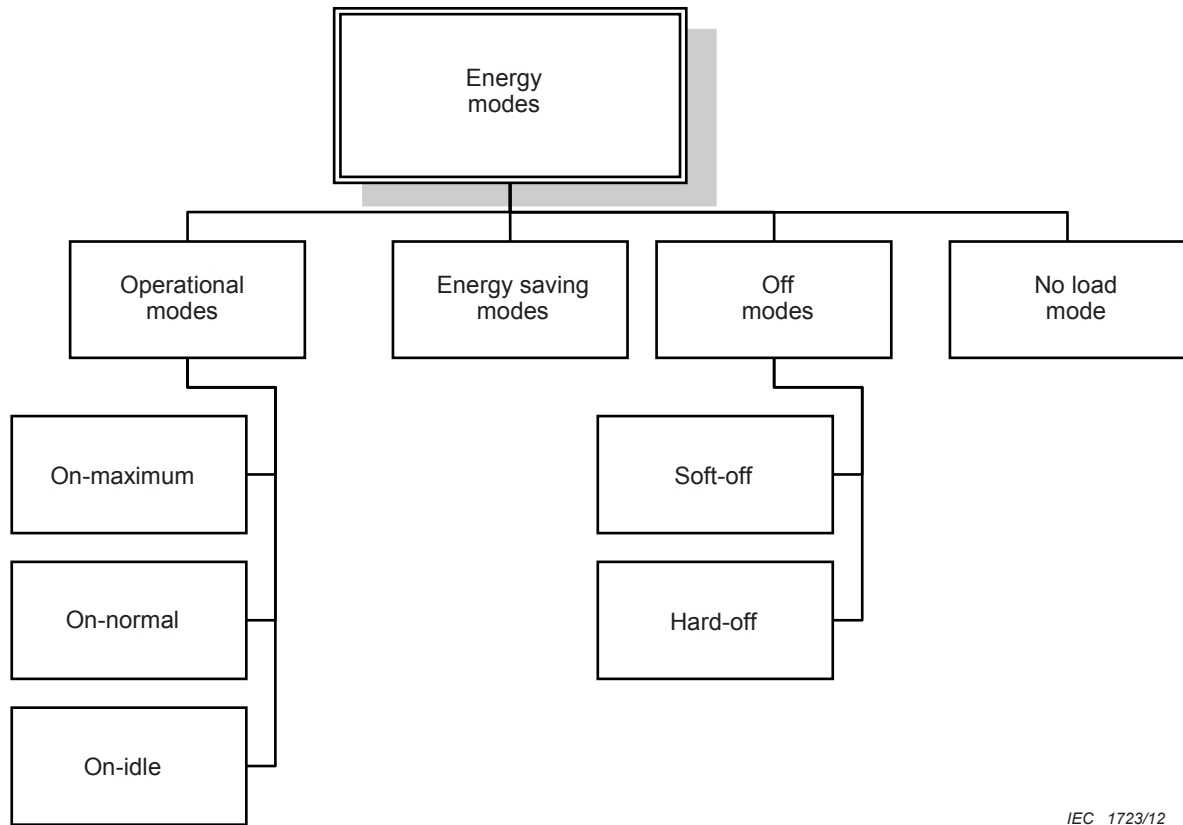
Energy mode definitions and applied terms vary depending on the **product** group. Therefore, rather than providing precise definitions of energy modes in this standard, modes are described in generic terms as defined in 5.3.3 to 5.3.6 and illustrated in Figure 1. The intent is to balance the technical complexity with the simplicity needed for ease of communication and use.

NOTE Due to the high diversity of **products** covered by this standard, examples are intended to clarify the energy modes and to guide the **designer**.

The **designer** shall identify specific energy modes that apply to the **product** under development.

The **designer** shall consider **energy efficiency** measures for the identified energy modes (described in more detail in 5.3.3 to 5.3.7).

**Designers** shall also identify where energy is consumed with the **product** and take steps to reduce the overall energy consumption.



IEC 1723/12

Figure 1 – Energy mode classification

### 5.3.3 Operational modes

**Products** perform their intended functions in the on-maximum, on-normal and on-idle operational modes.

- On-maximum: Operation with all options in use.

EXAMPLE 1 A television with maximum contrast, brightness and sound, or a personal computer with all slots and bays populated and operating.

- On-normal: Operation with default/standard configuration.

EXAMPLE 2 The factory setting of a computer display or a printer in active/run mode.

- On-idle: Operation with minimum system load by user and ready to operate without delay.

EXAMPLE 3 A personal computer running with no user initiated task consuming significant computing resources, or a printer in ready mode.

The **designer** shall consider:

- using low power components and/or design options as well as efficient power supply components to reduce the energy consumption in the on modes;

NOTE 1 The reason for the above is that less efficient designs result in higher heat dissipation in the system, which leads to increased cooling requirements. By improving the **energy efficiency** of these designs in the on-mode, it may become possible to apply passive cooling thereby avoiding the use of fans and the resulting additional energy consumption.

NOTE 2 **Energy efficiency** improvements typically reduce costs and noise and improve serviceability.

- identified modes (see 5.3.2) when specifying the power supply. The AC-DC conversion efficiency should be high in the most used modes, for example, by applying voluntary programs and agreements as described in 5.3.7;

EXAMPLE 4 For typical personal computers in office use, the on-idle mode might represent a substantial percentage of the on-mode consumption and thus the conversion efficiency for this mode is necessarily high. However, in many personal computers, the power supply loading is low in the on-idle mode, and hence often the conversion efficiency is low.

NOTE 3 Another reason for a low loading and therefore reduced power supply efficiency is the inherent extendibility of a system such as a personal computer. As such, the **designer** can decide to balance extendibility vs. energy consumption.

- the true specification needs for the **product**. For example, over-specifying the rating of the power supply can lead to an energy inefficient design;
- the effect of the operating **environment** specification provided to users and installers. For example, over-specifying the maximum allowed ambient (room) operating temperature for large telecom, server or storage units can lead to energy inefficiencies in the room cooling systems.

### 5.3.4 Energy saving modes

Energy saving modes, often denoted as low power, sleep, deep sleep or stand-by, are states in which the equipment is connected to an electrical supply and is ready to resume an operational mode, within a user acceptable timeframe, through the use of remote control or another signal. In complex systems, various energy save modes may be present.

EXAMPLE 1 Sleep [stand-by/suspend to RAM (random access memory) mode for computers], stand-by-active high mode (set-top-box exchanging data with an external source but not providing picture or sound to the television), stand-by-active low mode (DVD-recorder programmed for recording but not recording/providing picture or sound to the television), stand-by-passive (television not providing picture or sound, but can be switched into operational mode by the remote control).

The **designer** shall:

- consider practical design options to automatically switch from on mode to energy save modes. The energy save mode settings should be adjustable by the user and designed in a way that it is likely to be adjusted if necessary to an alternative or custom setting, more suitable to their typical use. Other innovative solutions shall be considered;

EXAMPLE 2 A computer monitor may activate sleep mode when the user is detected to have left the viewing area or after a specified period of inactivity of manual input devices such as keyboard and mouse.

- consider the effect of the time to resume on the user acceptance to use the energy save modes;

EXAMPLE 3 The delay time for the first copy/print to start from energy save mode on a copier/printer.

- consider design options to reduce the energy consumption in the energy save modes by also applying similar methods as described in 5.3.3;
- inform the user of the higher energy consumption if the energy save mode is disabled.

### 5.3.5 Off modes

While connected to an electrical supply, **products** consume the least power in the following off modes:

- **Soft-off**: The equipment is switched off by the device itself or initiated by the user via remote control or command.

EXAMPLE 1 Printer in auto-off mode or computer after shutdown was completed.

- **Hard-off**: The off-power state in which the device uses zero watt (minimum energy consumption might occur due to line filters). The equipment is manually switched off with the main power switch (see c) and d) below).

EXAMPLE 2 Monitors, televisions and laser printers switched off at the primary side of the power supply and thus consuming no energy.

The **designer** shall

- a) consider design options to automatically switch from energy save mode to an off mode where practical,
- b) consider design options to reduce the energy consumption in the soft off modes to lowest values (minimum energy consumption might occur due to line filters),
- c) consider a main power switch. If applicable, the main power switch should be placed on the **product** such that the user can easily reach and use it,
- d) prepare energy consumption data (energy level in watthours) for a state a user would consider hard off but for which a power level of zero watt is not achievable and inform the user through documentation or other means.

### 5.3.6 No load mode

No load mode is the mode in which external power supplies or chargers are connected to an electrical supply, but are not connected to electrical or electronic equipment for which they have been designed.

EXAMPLE A mobile phone charger is plugged in, but the phone is not connected.

The **designer** shall consider design options that reduce energy consumption of no load mode to the lowest value.

### 5.3.7 General energy efficiency measures

All available energy saving features shall be documented during the design process.

Information on the **product's** energy consumption and, where applicable, its related energy modes shall be made available to the user.

**Designers** shall consider the requirements of international programmes, applicable for the **product** category, aimed to increase **energy efficiency**.

EXAMPLE 1 The Energy Star international programme has made a number of **product** specifications and memoranda of understanding, available here: <http://www.energystar.gov>.

**Designers** should consider other agreements as applicable aimed to improve **energy efficiency**.

The effects of the improved design decisions compared to previous similar designs should be quantified and communicated to **product** marketing departments in order to enable them to promote **products** with lower adverse total **environmental impact** through lower energy consumption.

The **designer** should enable the most **energy efficient** on modes and transitions to energy saving mode as the default modes with performance taken into consideration after transitions to energy saving modes as the default mode. If this is not reasonably achievable, the user shall be made aware of this and instructions on proper use of available energy saving controls and/or settings shall be provided to users. Instructions may be included in **product** user documentation in either printed or electronic form.

EXAMPLE 2 A user is made aware that enabling the wake-up on Local Area Network features prevents the **product** from entering the soft-off energy saving mode.

If the **product** applies software and/or firmware, the **designer** shall be aware of the relevance of those for the overall **energy efficiency** of a system. The **designer** should balance the flexibility of software running on multipurpose devices and the **energy efficiency** of special purpose hardware.



## 5.4 Consumables and batteries

### 5.4.1 Consumables

For **consumables**, **designers** shall also consider the guidance specified in 5.7.

**Products** should be designed such that the use of **consumables** can be optimized relative to the functionality of the **product**. **Designers** should consider:

- functions to reduce or save the use of **consumables**;
- ease of replacement and maintenance of **consumables**.

The **manufacturer** shall provide users with information on the proper use of **consumables** relative to the functionality of the **product** and, where appropriate, **end of life** management of the **consumables**.

### 5.4.2 Batteries

Batteries shall comply with all applicable restrictions such as on **hazardous substances and preparations** (see 5.8), design requirements on equipment containing batteries and, to the extent possible, all international labelling requirements.

Batteries with reduced **environmental impact** shall be considered. When materials with adverse **environmental impact** cannot be avoided (for example, mercury in button cells), the material and its justification shall be documented during the design process.

Batteries shall be easily identifiable and removable, either by users or **skilled persons**, except where the battery life span exceeds that of the **product**. In case the life span of the battery exceeds that of a **product**, batteries shall be removable for **end of life** treatment.

**Product** documentation shall give advice for the safe removal of the battery by either users or **skilled persons**. Information on batteries in the **product** shall be made available. This information shall include details on the types of the batteries and their locations, as well as proper procedures for safe removal and handling of the batteries, including information on **end of life** management/proper battery disposal.

Designs that prolong the durability of batteries shall be considered.

## 5.5 Emissions

### 5.5.1 Chemical emissions

**Products** shall be designed such that **chemical emissions** with adverse **environmental impact** during use are reduced wherever possible.

For **products** that use an electrostatic process, emission rates determined according to ISO/IEC 28360 should be made available.

### 5.5.2 Noise emissions

The **designer** shall consider techniques to reduce noise emissions.

NOTE 1 Reduced noise emissions improve **energy efficiency**.

In particular, noise emissions shall be evaluated according to ISO 7779, for **products** covered by ISO 7779 (or ECMA-74).

For **products** under the scope of this standard and not covered by a **product** specific international standard noise test code, such as ISO 7779 (or ECMA-74), noise emissions do not have to be evaluated.

If noise emissions are evaluated for **products** under the scope of this standard but not covered by either ISO 7779/ECMA-74 or another **product**-specific international standard noise test code, the basic sound power standards, ISO 3741, ISO 3744 or ISO 3745, and the basic emission sound pressure standard, ISO 11201, shall be used. The test conditions used should be recorded.

The resulting sound power levels and, where applicable, emitted sound pressure levels (including emission sound pressure measurement distance if not covered by ISO 7779/ECMA-74) shall be declared according to ISO 9296 (or ECMA-109) and should be documented according to available eco-declaration standards (such as ECMA-370). The levels shall be made available in the **product** information.

NOTE 2 The additional noise from cooling systems is a frequent issue for audio and video systems and computers in home or silent office **environments**.

NOTE 3 The declared A-weighted sound power level  $L_{WAAd}$ , according to ISO 9296, is a statistical maximum value to account for **product** variation and lab-to-lab variations, and  $L_{WAAd}$  is typically about 0,3 bels to 0,4 bels (3 dB to 4 dB) greater than the average A-weighted sound power level  $L_{WA}$ , measured according to ISO 7779, ISO 3741, ISO 3744 or ISO 3745. ISO 9296 (or ECMA-109) specifies how to determine and verify  $L_{WAAd}$ .

## 5.6 Product lifetime

Where technically and economically feasible, **products** shall be designed to have a prolonged useful life and be easy to **upgrade** and repair. However, **designers** shall consider the balanced compromise of using up to date and efficient technology and prolonging the life of inefficient **products**. **Designers** shall consider incorporating the following features:

- use of common mechanical packages (such as covers and chassis) or common **parts** or components that are used for multiple models in the **product** family or in multiple generations of the same **product**, allowing for the **reuse** of common **parts**;
- use of standardised **parts** that may be more easily replaced or repaired;
- use of **modules**;
- **reuse** of **modules**, **parts** and **products**, whenever applicable. **Parts**, which may be targeted for **reuse** (for example, in maintenance and spare **parts** applications) should be identified.

To encourage the optimisation of a **product's** useful life, information on available options for **upgrading**, expanding and repair of **products** shall be made available if appropriate.

NOTE 1 Specifics on design for upgradeability may need to be identified based on **product** categories, and/or initial cost of a **product**. There are categories of **products** for which upgradeability features may not be applicable, for example, single use cameras and pocket calculators.

NOTE 2 Some of the guidelines provided in 5.6 will aid serviceability.

## 5.7 End of life

**Product** design shall facilitate **reuse**, **recycling** and proper disposal at **end of life**.

The following design principles, where appropriate for the expected **end of life** processes, shall be applied:

- easy and safe separation of **parts** containing **hazardous substances and preparations** shall be possible (see 5.8);
- materials (including electronic **modules**) connected to case/housing **parts** or chassis intended for different **end of life** treatment shall be easily separable;

- disassembly down to the **module** level (for example, power supply, disk drive, circuit board) shall be possible using commonly available tools and all such **modules** shall be easily accessible;
- mark type of polymer, copolymer, polymer blends or alloys of plastic **parts**, including additives weighing 25 g or more and with a flat area of 200 mm<sup>2</sup> or more, in conformance with ISO 11469.

NOTE 1 Safety and performance considerations may override some of the requirements mentioned above.

NOTE 2 There are categories of **products** for which dismantling may not be practical at **end of life**.

Considering the expected **end of life** processing, **designers** should:

- limit the number of polymers used in the **product**. Combinations of non-compatible materials which are not readily separated from each other shall be avoided, since this can compromise effective **recycling**. The compatibility guideline in Annex B should be used in selecting polymers when combinations of materials are intended to be used which could not easily be separated from each other. Advice on whether particular combinations of materials are readily compatible for the purposes of **recycling** can be obtained from polymer suppliers, specialized plastics recyclers or **manufacturers** who compound plastics;
- use labels and other identification marks made from the same material as the body of the **products** or a compatible material, where possible;

NOTE 3 There may be specific, for example, safety requirements for labels.

- design for ease of disassembly;
- avoid the use of:
  - non-recyclable composites;
  - coatings and surface finishes on plastic **parts**;
  - adhesive backed stickers or foams on plastic **parts** (if stickers are required, they should be separable);
  - metal inserts in plastic **parts** (unless easily removable with common tools);
- reduce the number and variety of:
  - welds and glued joints;
  - connections (for example, fasteners and screws);
  - steps necessary to remove targeted **substances, preparations or parts** in a treatment process;
  - tools required for disassembly or extraction;
  - position changes that have to be made by the dismantler.

**Designers** shall be aware of **product end of life** regulations to ensure legal compliance for **products** sold in targeted countries. **Designers** should prepare **end of life** treatment information that includes:

- identification of potentially valuable and/or re-usable **parts**;
- identification of **parts** containing **hazardous substances and preparations** and the location of such **parts**;
- special handling and disposal precautions.

## 5.8 Hazardous substances and preparations

Reducing and/or eliminating **hazardous substances and preparations** shall be considered as one of the priorities in the design of **products**. **Designers** shall be aware of (international, regional and national) prohibitions on the use of **hazardous substances and preparations** to ensure legal compliance for **products** sold in targeted countries. Consult Annex C for a list of examples of such regulations.

**Designers** shall attempt to reduce the use of **substances** that require special handling or disposal during the **product recycling** process.

Appropriate information on **parts** requiring special handling or disposal shall be made available to **product** users and **recyclers**.

When **hazardous substances and preparations** other than those that are restricted cannot be avoided, they shall be identified and an indication as to why they cannot be avoided shall be recorded during the design process.

### 5.9 Product packaging

Packaging material selection and its design has an impact on the **environment**. When specifying materials and designing packaging, the **designer** should consider design alternatives that:

- reduce the amount of material used and consequently the weight and size of the package;
- use materials that are considered to have lower adverse **environmental impact**;
- use **recycled** materials;
- use **renewable/recyclable** (considering available **recycling** technologies) materials.

As a minimum requirement the **designer** shall ensure compliance to international, regional and national regulations, concerning:

- restrictions on **hazardous substances and preparations**;
- **recyclability**, such as **reuse** or **recycling**;
- appropriate marking (material content) of packaging materials.

## Annex A (informative)

### Design guidance and design for environment checklist

#### A.1 General

The design checklist is intended solely for use of the **designer**. It is not intended to document environmental features for end users or to be used by end users to compare **products**.

This annex provides guidance in the form of an example checklist that may be used to evaluate and record the requirements and recommendations according to this standard during the design and/or redesign process. This is a generic checklist and not every item on the checklist is applicable to every **product** and/or **product** group.

It is recognised that there is a wide range of **products** covered under the scope of this standard. For this reason it is not possible to provide a unique checklist for every type of **product** or family (group) of **products**. **Designers** should generate a design checklist based on the design requirements of this standard and through other reference material and technical reports that will accurately reflect their specific **product** or family of **products**.

#### A.2 Life cycle thinking aspects

**A.2.1 The organization has a management system such as an environmental management system in place covering environmental product design aspects.**

ISO 14001  Other, please list: .....

No

**A.2.2 The designer has followed those policies/programs.**

Yes  
 No

**A.2.3 It has been checked that any emphasis on a single stage of the life cycle of a product does not negatively alter the environmental impacts in other stages.**

Yes, describe briefly .....

No, please explain why:.....

**A.2.4 The designer has checked with the relevant departments within the organization, which of the following aspects are considered in the environmental policy or programs of the organization:**

- Extraction/processing of raw materials
- Procurement
- Manufacturing
- Transportation/distribution
- Product design
- Packaging
- Use
- Recycling, reuse and final disposal

### A.3 General considerations

**A.3.1 The designer has identified in cooperation with the responsible departments within the company the latest environmentally related legal and market requirements applicable to the product.**

( ) Yes

( ) No

**A.3.2 The significant adverse/beneficial environmental impacts of the product during its life have been identified and analyzed in order to respectively reduce/increase them by alternative design solutions.**

( ) Yes, describe briefly

( ) No

**A.3.3 Experiences from the subsequent manufacturing, sales, product usage, maintenance and disposal stages have been considered.**

( ) Yes

( ) No

**A.3.4 A benchmarking with the environmental performance of competitor models has been carried out.**

( ) Yes

( ) No

**A.3.5 All applicable environmental product information to be made available is provided in an environmental product declaration (for example ECMA-370).**

( ) Yes

( ) No

**A.3.6 Certain product environmental characteristics are available.**

( ) Yes, list sources

[ ] Product specification document

[ ] Manufacturer environmental product declaration

[ ] Product user manual (hard copy)

[ ] Product user manual (soft copy)

[ ] Product labels or packaging

[ ] Product packaging insert

[ ] Internet. Provide URL: .....

[ ] Other. Describe:.....

( ) No

### A.4 Material efficiency

**A.4.1 The variety of materials used in the product has been reduced.**

( ) Yes, describe briefly .....

( ) No

**A.4.2 The amount of material used in the product has been reduced.**

( ) Yes, describe briefly .....

( ) No

**A.4.3 The product contains materials that are considered to have less adverse or more beneficial environmental impact.**

- ( ) Yes, describe briefly .....
- ( ) No

**A.4.4 The product contains recycled materials (see 5.2).**

- ( ) Yes
- ( ) No

**A.4.5 The product uses renewable materials.**

- ( ) Yes describe briefly .....
- ( ) No

**A.5 Energy efficiency**

**A.5.1 Energy modes and related energy efficiency measures**

Energy consumption information is made available in an environmental product declaration, at (URL): .....

**A.5.1.1 Ease of use as related to the selection and operation of energy saving features was considered and implemented.**

- ( ) Yes, considered and implemented;  
describe briefly: .....
- ( ) Yes, considered but not implemented;  
specify reason(s): .....
- ( ) Not applicable
- ( ) No

**A.5.1.2 List specific energy modes that apply to the product:**

.....

**A.5.1.3 Detail significant energy consumption modules and plans to reduce their energy consumption:**

.....

**A.5.2 Operational modes**

**A.5.2.1 Note actions taken to use low power components and design options.**

.....  
.....

**A.5.2.2 Note actions taken to improve the energy efficiency of power supply components.**

.....  
.....

**A.5.2.3 Note actions taken to ensure the AC-DC conversion efficiency is highest in the most used energy mode.**

.....  
.....

**A.5.2.4** Note actions taken to ensure that overspecification of items such as the power supply has not taken place.

.....  
.....

**A.5.2.5** Detail analysis undertaken to ensure that operating characteristics, such as room temperature, have not been overspecified.

.....  
.....

**A.5.3** Energy saving modes

**A.5.3.1** Note design actions taken to automatically switch from on mode to energy save modes.

.....  
.....

**A.5.3.2** Note design actions taken to reduce the time taken for the product to switch from energy save mode to active mode.

.....  
.....

**A.5.3.3** List actions taken to reduce energy consumption in energy save mode similar to those taken in A.5.3.2 above.

.....  
.....

**A.5.4** Off modes

**A.5.4.1** Note design options taken to automatically switch from energy save mode to off mode.

.....  
.....

**A.5.4.2** Note design options taken to reduce energy consumption in soft-off mode.

.....  
.....

**A.5.4.3** Note options considered in the placing of the power switch to make it more user accessible.

.....  
.....

**A.5.4.4** In hard-off mode, is the energy consumed zero watthours?

( ) Yes

( ) No. If no, what actions have been taken to inform the user of this?

.....  
.....



**A.5.5 No load modes**

List design options taken to reduce the energy consumption of the no load mode to the lowest possible.

.....  
.....

**A.5.6 General energy efficiency measures**

**A.5.6.1 List any energy saving features of this product here that have not been noted elsewhere.**

.....  
.....

**A.5.6.2 Information on energy consumption in all relevant energy modes has been made available to product users.**

( ) Yes, list sources

- Environmental product declaration
- Product specification document
- Product user manual (hard copy)
- Product user manual (soft copy)
- Product labels or packaging
- Product packaging insert
- Internet. Provide URL .....
- Other. Describe. ....

( ) Not applicable

( ) No

**A.5.6.3 Applicable voluntary agreements aimed at improving energy efficiency of products were considered and recommendations met.**

( ) Yes, considered and recommendations met;

describe briefly: .....

( ) Yes, considered but recommendations not met;

specify reason(s): .....

( ) Not applicable

( ) No

**A.5.6.4 The product is compliant to the requirements of the international ENERGY STAR<sup>®</sup> program<sup>1</sup>.**

( ) Yes, according to version .....

( ) Not applicable

( ) No; give reason(s) for non-compliance. ....

.....

<sup>1</sup> Energy Star is the name of an international program of the U.S. Department of Energy. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the program named. Equivalent programs may be used if they can be shown to lead to the same results.

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**A.5.6.5 The effects of improved energy design features have been quantified and communicated to marketing.**

- Yes  
 No/Not applicable

**A.5.6.6 Default setting is set to the most energy efficient on modes and/or transitions to energy save mode.**

- Yes  
 No

**A.5.6.7 Information on proper use of available energy saving controls and/or settings is available to product users.**

- Yes, list sources
- Product user manual (hard copy)
  - Product user manual (soft copy)
  - Product or packaging labels
  - Product packaging insert
  - Internet. Provide URL. ....
  - Other. Describe. ....
- Not applicable  
 No

**A.6 Consumables and batteries****A.6.1 Consumables****A.6.1.1 The avoidance of hazardous substances and preparations in consumables has been considered.**

- Yes  
 Not applicable (no consumables)  
 No

**A.6.1.2 The product has been designed such that the use of consumables associated with the product can be optimised relative to the functionality of the product.**

- Yes  
 Not applicable (no consumables)  
 No

**A.6.1.3 Information on the proper use of consumables associated with the product has been provided to the user.**

( ) Yes, list sources (all that apply):

- Environmental product declaration
- Product user manual (hard copy)
- Product user manual (soft copy)
- Product service manual
- Internet. Provide URL. ....
- Other. Describe.....

( ) Not applicable (no consumables)

( ) No

**A.6.2 Batteries**

**A.6.2.1 All batteries in the product comply with applicable restrictions on hazardous substances and preparations contained in relevant national, regional and international legislation.**

( ) Yes

( ) Not applicable (no batteries)

( ) No, rationale: .....

**A.6.2.2 All batteries in the product are labelled according to requirements of relevant regional, national or international legislation.**

( ) Yes

( ) Not applicable (no batteries)

( ) No

**A.6.2.3 Consideration has been given to batteries with reduced environmental impact.**

( ) Yes; specify type of batteries considered (check all that apply).

- Li-Ion
- Li-Polymer
- NiMH
- Other; describe .....

( ) Not applicable (no batteries)

( ) No; specify reason(s) .....

**A.6.2.4 The product has batteries containing materials regarded as detrimental to the environment that cannot be avoided.**

( ) No

( ) Not applicable (no batteries)

( ) Yes

[ ] Identify batteries

.....

[ ] Where reported

.....

[ ] Reason(s) why material(s) cannot be avoided

.....

.....

**A.6.2.5 All batteries and assemblies containing those batteries are easily identifiable and removable.**

( ) Yes

( ) Not applicable (no batteries)

( ) No; specify reason(s):

[ ] Batteries are not intended to be removed until the end of life, or the product needs a continuous power supply.

[ ] Other

**A.6.2.6 Information on proper procedures for removal and safe handling of batteries is available in product user documentation.**

( ) Yes, list sources

[ ] Environmental product declaration

[ ] Product user manual (hard copy)

[ ] Product user manual (soft copy)

[ ] Product service manual

[ ] Product labels

[ ] Internet. Provide URL. ....

[ ] Other: describe. ....

( ) Not applicable (no batteries)

( ) No; give reason(s)

.....

**A.6.2.7 For NOT easily removable batteries: advice on service outlets for exchange of non-removable batteries (during product life) is provided in the product documentation.**

( ) Yes

( ) Not applicable (no non-removable batteries)

( ) No

**A.6.2.8 Information on type and location is available in the appropriate product documentation.** Yes Type of battery..... Location..... Not applicable (no batteries) No**A.6.2.9 Battery management features that help to prolong battery life have been considered and implemented.** Yes, considered and implemented Yes, considered but not implemented Not applicable (no batteries) No; give reason(s) .....**A.7 Emissions****A.7.1 Chemical emissions****A.7.1.1 Product has been designed such that chemical emissions are reduced wherever possible.** Yes Not applicable No**A.7.1.2 For a product based on the electrostatic process, chemical emissions [ozone and VOC (volatile organic compound)] and dust emissions have been evaluated and emission rates have been determined in accordance with ISO/IEC 28360.** Yes Not applicable (product is not based on electrostatic process) No**A.7.2 Noise emissions****A.7.2.1 Noise emissions have been measured and evaluated according to ISO 7779 (equivalent to an earlier edition of ECMA-74).** Yes No Other: describe. .... Not applicable**A.7.2.2 For products outside the scope of ISO 7779, one of the sound power standards, ISO 3741, ISO 3744 or ISO 3745, and the emission sound pressure level standard ISO 11201 have been used to measure and evaluate noise emissions.** Yes No Not applicable

**A.7.2.3 For all products under the scope of this standard, declared A-weighted sound power level  $L_{WAAd}$  and declared A-weighted sound pressure level  $L_{pAm}$  are determined and declared in accordance to ISO 9296 (equivalent to ECMA-109).**

- Yes  
 No  
 Not applicable

NOTE The declared A-weighted sound power level  $L_{WAAd}$ , according to ISO 9296, is a statistical maximum value to account for sound power variations between products and lab-to-lab measured sound power level variations, and  $L_{WAAd}$  is typically about 0,3 to 0,4 bels (3 to 4 dB) greater than the average A-weighted sound power level  $L_{WA}$ , measured according to ISO 7779, ISO 3741, ISO 3744 or ISO 3745. ISO 9296 (or ECMA-109) specifies how to determine and verify  $L_{WAAd}$ .

**A.7.2.4 Declared noise emission values according to ISO 9296 (ECMA-109) are available in the appropriate product documentation.**

- Yes  
 No  
 Not applicable

**A.7.2.5 For the declared sound pressure level  $L_{pAm}$  values, whether the value is for the operator position or bystander positions is indicated in the appropriate product documentation with the declared levels. Furthermore, if  $L_{pAm}$  is measured for the operator position, then the documentation shall indicate whether the unit is table top or floor standing. For products not covered by ISO 7779, the distance used to measure  $L_{pAm}$  shall be indicated.**

- Yes  
 No  
 Not applicable

NOTE The usage of a particular product determines which positions are appropriate. For example, for a personal computer the operator position is always the defined sound pressure level position; similarly for a server, bystander positions are the defined positions.

## A.8 Product lifetime

**A.8.1 The product contains common mechanical packages (such as covers and chassis) or common parts or components that are used for multiple models in the product family or in multiple generations of the same product.**

- Yes, describe.....  
 Not applicable  
 No

**A.8.2 The product contains standardised parts.**

- Yes, list.....  
 No  
 Not applicable

**A.8.3 The product contains modular components.**

- Yes, list.....  
 Not applicable  
 No

**A.8.4 The product contains reused components and/or parts.**

- ( ) Yes, list .....
- ( ) Not applicable
- ( ) No

**A.8.5 The product contains parts targeted for reuse in maintenance and spare parts applications.**

- ( ) Yes, list .....
- ( ) Not applicable
- ( ) No

**A.9 End of life**

**A.9.1 Separation of parts containing hazardous substances and preparations is possible.**

- ( ) Yes
- ( ) No
- ( ) Not applicable

**A.9.2 Incompatible materials (including electronic modules) connected to case/housing parts or chassis are easily separable.**

- ( ) Yes
- ( ) No
- ( ) Not applicable

**A.9.3 The product can be disassembled down to the module level using commonly available tools.**

- ( ) Yes
- ( ) No, list all special tools required for disassembly.  
.....  
.....

**A.9.4 All plastic parts weighing 25 g or more and with a flat area of 200 mm<sup>2</sup> or more are marked with the type of polymer, copolymer, polymer blends or alloys in conformance with ISO 11469.**

- ( ) Yes
- ( ) No
- ( ) Not applicable

**A.9.5 The following design choices have been avoided.**

- Incompatible non-recyclable composites and coatings on major plastic parts
- Coatings and surface finishes on plastic parts that are difficult to recycle without downgrading
- Adhesive backed stickers or foams on plastic parts (if stickers are required they should be separable)
- Metal inserts in plastic parts, which are not easily removable with common tools

**A.9.6 The following aspects have been considered and their number and variety reduced.**

- Welds and adhesives
- Connections (for example, fasteners and screws)
- Steps necessary for disassembly
- Tools required for disassembly
- Position changes that have to be made by the dismantler

**A.9.7 The treatment information for the product includes guidance regarding the following aspects.**

- Identification of potentially valuable and/or reusable parts
- Identification of parts containing hazardous substances and preparations
- Special handling and disposal precautions
- Plan for the disassembly of the product into major modules or subassemblies

**A.10 Hazardous substances and preparations in products (refer to Annex C for regulation examples)****A.10.1 The product complies with the applicable international, regional and national prohibitions on the use of certain hazardous substances and preparations.**

- Yes, list .....
- Not applicable
- No

**A.10.2 Use of substances that require special handling or disposal during the recycling process has been reduced or eliminated.**

- Yes, eliminated
- Yes, reduced; list .....
- Not applicable
- No

**A.10.3 Appropriate information on parts requiring special handling or disposal has been made available to users and recyclers.**

- Yes
- No
- Not applicable



**A.10.4 Hazardous substances other than those restricted are used in this product.**

( ) Yes, list the substances and give rationale for their use

.....  
.....  
.....  
.....

( ) No

**A.11 Packaging**

**A.11.1 The variety of packaging materials used has been reduced.**

( ) Yes, describe briefly .....

( ) No

**A.11.2 The amount of packaging materials used has been reduced.**

( ) Yes, describe briefly .....

( ) No

**A.11.3 The used packaging materials are considered to have lower environmental impact.**

( ) Yes, describe briefly .....

( ) No

**A.11.4 The packaging was manufactured using recycled materials.**

( ) Yes

( ) No

**A.11.5 The packaging was manufactured using renewable materials.**

( ) Yes describe briefly .....

( ) No

**A.11.6 The packaging complies with the applicable international, regional and national regulations.**

( ) Yes, list .....

( ) No

**A.11.7 The packaging materials have an appropriate marking.**

( ) Yes, list applied standard

.....

( ) No

## Annex B (informative)

### Polymers compatibility guide

**Designers** should verify identified compatibilities and recheck them with the polymer vendors, see Table B.1 for examples. The listed polymers have many different characteristics, depending on the used additives, that need a thorough analysis of the suggested compatibility on the material level, especially when they are not marked to be compatible. Therefore, further analysis may be necessary.

Abbreviations used in the table:

ABS	Acrylonitrile-butadiene-styrene
ASA	Acrylonitrile-styrene-acrylate
PA	Polyamide
PBT	Poly (butylene terephthalate)
PC	Polycarbonate
PE	Polyethylene
PET	Poly (ethylene terephthalate)
PMMA	Poly (methyl methacrylate)
POM	Poly (oxymethylene)
PP	Polypropylene
PPE	Poly (phenylene ether)
PS	Polystyrene
PVC	Poly (vinyl chloride)
SAN	Styrene-acrylonitrile
TPU	Thermoplastic polyurethane

NOTE In Table B.1 the proposed or identified thermoplastics do not take into account all the compounds and reinforcements, charges and other protection substances or technical features improvements.

Table B.1 – Example of compatibility of various thermoplastics 2

Mixture component	Excess component																			
	ABS	ASA	PA	PBT	PBT+PC	PC	PC+ABS	PC+PBT	PE	PET	PMMA	POM	PP	PPE	PPE+PS	PS	PVC	SAN	TPU	
ABS	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	+	+	+	+
ASA	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	+	+	+	+
PA	@	@	+	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@	+
PBT	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	@
PBT+PC	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	+
PC	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	@
PC+ABS	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	+
PC+PBT	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	+
PE	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	@
PET	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	@
PMMA	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	@
POM	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@
PP	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	@
PPE	@	@	@	@	@	@	@	@	@	@	@	@	@	+	+	+	+	+	+	@
PPE+PS	@	@	+	@	@	@	@	@	@	@	@	@	@	+	+	+	+	+	+	@
PS	@	@	@	@	@	@	@	@	@	@	@	@	@	+	+	+	+	+	+	@
PVC	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	+	+	+	+
SAN	+	+	@	+	+	+	+	+	@	+	+	+	+	@	@	@	+	+	+	@
TPU	+	+	+	+	+	+	+	+	@	+	+	+	+	@	@	@	+	+	+	+

Key:

+	Good compatibility over a wide range of mixtures
@	Limited compatibility for small excess component amounts
	Incompatible

2 Table B.1 was adapted from Table 5.3, page 632 of H. Saechtling, *Kunststoffaschenbuch*, Carl Hanser Verlag, München, 1998 (27<sup>th</sup> edition).

## Annex C (informative)

### Examples of regulations

#### C.1 Government environmental agency URLs

Many regulations exist which relate to aspects of environmentally conscious design. This annex is an incomplete list of URLs (see Table C.1) where **designers** may find some regional regulations. Clauses C.2 to C.6 point to further legislation as a reference and example. The reader is encouraged to verify the latest status of any amendments that may exist to the mentioned regulations.

NOTE Since regional regulations are emerging and being modified on a constant basis, this standard cannot provide more complete and accurate information.

**Table C.1 – Government environmental agency URLs**

Region	URL
Argentina	<a href="http://www.msal.gov.ar">http://www.msal.gov.ar</a> (in Spanish)
Australia	<a href="http://www.deh.gov.au">http://www.deh.gov.au</a>
Brazil	<a href="http://www.mma.gov.br/port/CONAMA">http://www.mma.gov.br/port/CONAMA</a> (in Portuguese)
Canada	<a href="http://www.ec.gc.ca">http://www.ec.gc.ca</a>
China	<a href="http://english.sepa.gov.cn/">http://english.sepa.gov.cn/</a>
Chile	<a href="http://www.conama.cl">http://www.conama.cl</a> (in Spanish)
Columbia	<a href="http://www.minambiente.gov.co">http://www.minambiente.gov.co</a> (in Spanish)
Costa Rica	<a href="http://www.minae.go.cr/">http://www.minae.go.cr/</a> (in Spanish)
European Union (EU)	<a href="http://ec.europa.eu/environment">http://ec.europa.eu/environment</a>
Hong Kong	<a href="http://www.info.gov.hk/epd">http://www.info.gov.hk/epd</a>
Japan	<a href="http://www.env.go.jp/en/">http://www.env.go.jp/en/</a>
Malaysia	<a href="http://www.doe.gov.my/">http://www.doe.gov.my/</a>
Mexico	<a href="http://www.conae.gob.mx/">http://www.conae.gob.mx/</a> (in Spanish)
Singapore	<a href="http://www.mewr.gov.sg">http://www.mewr.gov.sg</a>
South Korea	<a href="http://eng.me.go.kr">http://eng.me.go.kr</a>
Taiwan	<a href="http://www.epa.gov.tw/english/">http://www.epa.gov.tw/english/</a>
USA	<a href="http://www.epa.gov">http://www.epa.gov</a>

#### C.2 Example of regulations for energy efficiency

- Energy related Products (ErP) Directive (2009/125/EC) is a framework for setting the rules for eco-design in the EU, and will cover electrical and electronic devices and heating equipment.

NOTE There are also voluntary requirements for **energy efficiency**, such as US EPA Energy Star. These should not be confused with regulatory requirements, but may also be considered in **product** design.

#### C.3 Examples of regulations for batteries

- EU Directive 2006/66/EC defines for example limits on heavy metal content related to mercury, cadmium and lead and the types of batteries covered amended by the regulation (EU) No. 1103/2010 related to capacity marking.

- USA Mercury-Containing and Rechargeable Battery Management Act. Pub. L. No. 104-142 (1996) which was intended to facilitate the **recycling** or proper disposal of rechargeable batteries.

#### C.4 Examples of regulations for hazardous substances and preparations

- Lead, cadmium, mercury, hexavalent chromium, PBDE and PBB as defined in Directive 2002/95/EC (commonly named RoHS directive) and its amendments. A 'RoHS2' directive 2011/65/EU has been published already.
- Asbestos (US TSCA and NESHAP, EU 76/769/EEC)
- Ozone Depleting Substances (according to Montreal Protocol): Chlorofluorocarbons (CFC), Hydrobromofluorocarbons (HBFC), Hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, bromochloromethane [EU: Regulation (EC) No. 2037/2000, 2038/2000, 2039/2000];
- Nickel for articles coming into direct and prolonged contact with skin (EU 76/769/EEC).

#### C.5 Example of regulations for end of life treatment

- EU Directive 2002/96/EC (commonly named WEEE directive) has been amended by directives 2003/108/EC and 2008/34/EC.

#### C.6 Examples of regulations for product packaging

- EU – EU Directive 94/62/EEC requiring that the sum of the concentrations of lead, cadmium, mercury, chromium-VI does not exceed 0,01 % by weight. For **products** placed on the market in the European Union the packaging essential requirements as defined in the standards (EN 13427 – EN 13432) shall be applied.
- South Korea - 'Act on the Promotion of Saving and Recycling Resources' covers the labelling and **recycling** of **product** packaging.
- USA – California's Rigid Plastic Packaging Container ("RPPC") Law requires packaging to meet one of four **reuse**, **recycling** or reduction criteria. California's Toxics in Packaging Prevention Act (A.B. 455) prohibits packaging which contains intentionally introduced cadmium, hexavalent chromium, lead, or mercury.

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