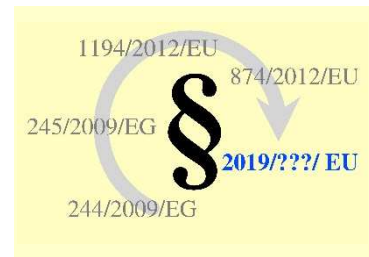


Texte zu den geplanten neuen EU-Regelungen zur umweltgerechten Produktgestaltung und zur Energieverbrauchs-kennzeichnung in der Beleuchtung – Zusammenstellung ^[1] des Umweltbundesamtes (UBA), Deutschland



Entwürfe der EU-Kommission vom 16. November 2018

Entwurf der EU-Kommission für eine Regelung mit Anforderungen an die Produktgestaltung bei Lichtquellen und Betriebsgeräten

– Begründungstext, Haupttext und Anhang –

Hinweis: Bitte beachten Sie, daß der angehängte Text nur in Englisch verfaßt ist. Vorangestellt ist aber ein vom UBA eingefügtes Inhaltsverzeichnis in Deutsch.

EN: Information on the coming EU Lighting Regulations – Ecodesign and Energy Labelling – Compilation ^[1] of the Federal Environment Agency (UBA), Germany

The EU Commission's drafts of 16 November 2018

Draft of the EU Commission for a regulation with requirements on the design of light sources and control gear

– Explanatory Memorandum, Main text and Annex –

Notice: A content list has been added by UBA.

FR: Informations sur les futures réglementations de l'UE concernant l'éclairage – l'écoconception et l'étiquetage énergétique – Compilation ^[1] de l'Agence Fédérale de l'Environnement (UBA), Allemagne

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Projet de la Commission Européenne pour une réglementation des exigences de la conception des sources lumineuses et des appareillages de commande

– mémoire explicatif, texte principal et annexe –

Indication : Veuillez noter que le présent texte n'est disponible qu'en anglais. Mais antéposé par l'UBA, il y a une table des matières en français.

^[1] <https://www.eup-network.de/de/eup-netzwerk-deutschland/offenes-forum-eu-regelungen-beleuchtung/dokumente/texte/>

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Brussels, **XXX**
[...](2018) **XXX** draft

Explanatory Memorandum to

COMMISSION REGULATION (EU) .../...

of **XXX**

laying down ecodesign requirements for light sources and separate control gears pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No 1194/2012

This draft has not been adopted or endorsed by the European Commission. Any views expressed are the preliminary views of the Commission services and may not in any circumstances be regarded as stating an official position of the Commission. The information transmitted is intended only for the Member State or entity to which it is addressed for discussions and may contain confidential and/or privileged material.

COMMISSION REGULATION (EU) .../...

laying down ecodesign requirements for light sources and separate control gears pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No 1194/2012

EXPLANATORY MEMORANDUM

1. CONTEXT OF THE PROPOSAL

Grounds for and objectives of the proposal

The Ecodesign Directive 2009/125/EC¹ establishes a framework for the setting of ecodesign requirements for energy-related products at EU level. Through this legislation the Union can improve the energy efficiency and other environmental aspects of products being sold in the single market.

Currently there are three Commission Regulations implementing Directive 2009/125/EC for the ecodesign of lighting products:

- Commission Regulation (EC) No 244/2009², as amended by Commission Regulation (EC) No 859/2009 and Commission Regulation (EU) 2015/1428, for non-directional household lamps, covering e.g. compact fluorescent lamps with integrated ballast (CFLi), halogen lamps (HL) and incandescent lamps (GLS). The requirements of this Regulation resulted in removing incandescent light bulbs from the market.
- Commission Regulation (EC) No 245/2009³, as amended by Commission Regulation (EU) No 347/2010 and Commission Regulation (EU) 2015/1428, for lamps mainly used in office and street lighting, covering linear fluorescent lamps (LFL), compact fluorescent lamps without integrated ballast (CFLni) and high-intensity discharge lamps (HID). The requirements of this Regulation resulted in the removal of e.g. high-pressure mercury lamps from the market and also set requirements for control gears (ballasts).
- Commission Regulation (EU) No 1194/2012⁴, as amended by as amended by Commission Regulation (EU) 2015/1428, for directional lamps (spots), including light emitting diodes (LED).

The review of these regulations has been performed according to the respective revision clauses (Article (7) or (8) depending on the Regulation) during several studies: the 2013 ‘Stage 6

¹ Directive 2009/125/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285, 31.10.2009, p. 10).

² Commission Regulation (EC) No 244/2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps, OJ L76/3, 24.3.2009

³ Commission Regulation (EC) No 245/2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council, OJ L76/17

⁴ Commission Regulation (EU) No 1194/2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for directional lamps, light emitting diode lamps and related equipment, OJ L342/1, 14.12.2012

review study'⁵, the 2014 'Omnibus study'⁶, the 2015 'Market assessment on directional lamps'⁷ and the 2015 'Lot 8/9/19 Preparatory study'⁸, which integrates the results of the previous studies.

The Ecodesign Working Plan 2016-2019⁹ established by the Commission in application of Article 16(1) of Directive 2009/125/EC sets out the working priorities under the ecodesign and energy labelling framework for the period 2016-2019. The Working Plan identifies the energy-related product groups to be considered as priorities for the undertaking of preparatory studies and eventual adoption of implementing measures, as well as the review of the current regulations.

Measures from the Working Plan have an estimated potential to deliver a total in excess of 260 TWh of annual final energy savings in 2030, which is equivalent to reducing greenhouse gas emissions by approximately 100 million tonnes per year in 2030. Lighting is one of the product groups listed in the Working Plan, with an estimated 41,9 TWh of annual final energy savings in 2030 (combined effect of ecodesign and energy labelling).

In addition, there are new policies that require the revision to look beyond the strict scope mentioned in the review articles of the existing implementing acts for lighting products: a renewed effort in carbon emission abatement through the Paris climate agreement¹⁰; the Commission's Circular Economy Action Plan¹¹; the Better Regulation policy aiming at more efficient and effective legislation¹²; and the need to address possible circumvention of testing standards¹³.

Following the conclusions of the 2015 preparatory study, the main objectives of this proposal are to:

- Simplify the ecodesign regulations for lighting products by integrating the three existing Regulations into one and unifying the way in which requirements are set. This is expected to reduce the administrative burden for industry and to facilitate market surveillance.
- Further facilitate compliance verification by market surveillance authorities by improving definitions for scope and exemptions (reduce risk of circumvention of the Regulation), clarifying the parameters to test and reducing number of test samples and test duration where possible.
- Increase the minimum required energy efficiency of light sources to reflect technological progress made in recent years, in particular for LED technology. This will have as an effect to remove from the market some of the remaining less efficient light

⁵ Review study on the stage 6 requirements of Commission Regulation (EC) No 244/2009, final report, VHK/VITO for the European Commission, 14.6.2013

⁶ 'Omnibus' Review Study on Cold Appliances, Washing Machines, Dishwashers, Washer-Driers, Lighting, Set-top Boxes and Pumps, consortium of VHK, VITO, Viegand Maagøe, Wuppertal Institut für Klima, Umwelt, Energie for the European Commission, DG ENER-C3, Brussels/Delft, April 2014.

⁷ Market Overview on Directional Mains-Voltage Lamps related to stage 3 of Commission Regulation (EU) No 1194/2012, VHK for the European Commission, 3 September 2015

⁸ Preparatory Study on Light Sources for Ecodesign and/or Energy Labelling Requirements ('Lot 8/9/19'), Task reports 0-7, VHK for the European Commission, October 2015. <http://ecodesign-lightsources.eu/documents>

⁹ COM(2016) 773 final, Brussels, November 2016.

¹⁰ http://ec.europa.eu/clima/policies/international/negotiations/future/index_en.htm

¹¹ Closing the loop - An EU action plan for the Circular Economy". COM(2015) 614

¹² http://ec.europa.eu/smart-regulation/better_regulation/key_docs_en.htm#_br

¹³ <http://www.europarl.europa.eu/committees/en/emis/home.html>

source types, thus capturing significant energy savings at EU-level and bringing economic advantages for users.

- Ensure that fully integrated luminaires (from which the light source cannot be removed) are in scope and that light sources contained in a product (e.g. mirrors, shelves...) can be accessible for verification.
- Align the verification procedure with the common approach used in Commission Regulation (EU) 2016/2282¹⁴ and redefine the tolerances to be used during verification by market surveillance authorities.

General context

In 2015, around 1.7 billion light sources were sold in EU-28, of which approximately 22 % based on LED technology. In the same year, around 11.4 billion light sources were operating in EU-28, of which 6.5 % LED. These light sources consumed a total of 336 TWh/a of electricity, covering 12.4 % of the overall EU-28 electricity use. This corresponded to greenhouse gas (GHG) emissions of 132 megatons of CO₂ equivalent per year (MtCO₂eq/a), i.e. 2.8 % of the overall EU-28 GHG-emission.

Without the current Regulations, in 2015 the electricity consumption of light sources in scope would have been 41 TWh higher (377 TWh instead of 336 TWh), equivalent to the total final electricity consumption of Denmark and Lithuania together.

The evaluation of the impact of the Regulations also showed that electricity savings due to the existing requirements were expected to be 110 TWh in 2020, but according to the last estimation they will be limited to 70 TWh. The evaluation showed that the gap in energy savings is the result of:

- (1) insufficient market surveillance by Member States;
- (2) too many parameters to verify by market surveillance, and too expensive/long verification testing required (e.g. 6000 h test for lumen maintenance);
- (3) unclear definitions for exempted lamp types ("special purpose lamps", as defined in the current legislation), using a description of intended use rather than measurable parameters;
- (4) tolerances intended for use by market surveillance during verification that have been used also by manufacturers in the declaration of lamp characteristics, with the result to bring on the market products with an efficacy that is lower than the minimum required one;
- (5) recent appearance on the market of 'fully-integrated luminaires' from which the light source cannot be removed for compliance verification.

Moreover, incandescent lamps, which the ecodesign legislation phased-out from 2009, were expected to be mainly replaced by compact fluorescent lamps. However, many consumers preferred the less energy-efficient halogen lamps. Fluorescent lamps have not been adopted as expected because of (real or perceived) sub-standard performance (e.g. colour rendering and temperature, ignition time, mercury hazards).

The review is the occasion to tackle the abovementioned problems. Moreover, technology for light sources keeps evolving, thereby improving energy efficiency. LED technology, which is

¹⁴ OJ L 346, 20.12.2016, p.51.

for almost all applications the most energy efficient lighting technology that exists, has had a rapid uptake on the EU market: from 0 % of sold lamps in 2008 to 22 % in 2015 with models on the market often being replaced by updated versions every six months to one year. In addition, the average energy efficiency of LEDs quadrupled between 2009 and 2015, and prices dropped significantly: compared to 2010, in 2017 a typical LED lamp for household use was 75 % cheaper and a typical LED lamp for offices 60 % cheaper. Without requirements adapted to technological progress, light sources used in the EU are expected to be less energy efficient than they could be, and EU consumers will lose out from buying slightly cheaper but more energy consuming products, because the lifecycle costs, which include energy consumption, will be higher. Without improved legislation, the potential to save energy would not be reached in time to contribute to achieving the EU's energy and greenhouse gas emissions reductions goals for 2030.

Consistency with other EU policies and objectives

Energy efficiency is a crucial element of the EU Climate and Energy Policy Framework and is key to moderate energy demand. The Ecodesign Framework Directive 2009/125/EC is an important instrument for achieving the Union's energy efficiency target set in Directive 2012/27/EU on energy efficiency.

The provisions of this Regulation are without prejudice to Directive 2011/65/EU¹⁵ (RoHS Directive) with regard to the content of hazardous substances in light sources, in particular mercury. It is to be noted that the exemptions for mercury use in certain light sources currently valid under the RoHS Directive are undergoing a review: the corresponding delegated acts are expected to be finalised late 2018.

The provisions of Commission Regulation (EU) 2016/2282¹⁶ with regard to the use of tolerances in verification procedures of the measured parameters by Member State authorities for lighting products are also added to this Regulation.

As for circular economy aspects, a main concern is the growth on the market of luminaires with non-dismountable light sources. In 2017 the Commission checked the possibility to have mandatory removability of light sources from luminaires, but there are technological drawbacks: many non-dismountable luminaires contain LED light sources and are manufactured so that LED light sources are tightly mechanically integrated to optimise thermal management and for protection purposes. The unsealing and resealing of LED lights in the luminaire (e.g. by a final user to replace the light source) may hamper their energy efficiency. At the same time there is evidence of the long lifetime of LED light sources (which can reach 10-15 years), which could translate into no real need to replace the light source during the time that the luminaire is used. Summing up, what is important at this point of time about the non-dismountable luminaires is that their energy performance is clear and verifiable: overall, energy consumption during the use phase is by far the most relevant environmental item for lighting products.

What the review does is thus to clarify that when a luminaire is not dismountable, it must be treated as a light source: that luminaire should comply with all the requirements set out for a light source, as explained in section 3.1 of this memorandum. This approach will stimulate

¹⁵ OJ L 174, 1.7.2011, p. 88, and amendments.

¹⁶ OJ L 346, 20.12.2016, p. 51.

manufacturers to find innovative solutions and design and set the ground for the next review of the legislation to investigate mandatory removability of light sources from luminaires.

Even though the mandatory removability of light sources from luminaires cannot be required at this stage, the proposed requirements for non-dismountable luminaires are in the spirit of a circular economy, because they will: (i) resolve the problem that market surveillance authorities have to test light sources when these are not accessible (thus improving the verification of energy efficiency goals); (ii) resolve the issue of an unfair level playing field for industry when the same light source type is accessible; and (iii) support consumers in their conscious choice when buying luminaires.

As for end of life, the producers of the lighting equipment in scope of the Waste of Electrical and Electronic Equipment Directive 2012/19/EU¹⁷ (WEEE Directive) are in charge of meeting recycling and recovery targets that increase over time. In August 2018, the WEEE Directive introduced new recovery and recycling targets, including for lighting products. Because of the new WEEE requirements, this Regulation does not introduce further requirements for the recyclability of lighting products.

Parallel to the Lot 8/9/19 preparatory study on lighting products, a Lot 37 preparatory study on lighting systems was performed¹⁸. The recommendations of this study are currently being discussed in the context of Directive 2010/31/EU on the energy performance of buildings¹⁹. The proposed Regulation focuses on light sources and separate control gears, i.e. on some of the basic parts of a lighting system, while the work of Lot 37 focuses on design of luminaires, layout of luminaires inside a space, surface reflections inside the space, lighting calculations to verify if quantities of light required by standards are met and automatic control of lighting (switching on/off or dimming; use of occupancy and daylight sensors, etc.), possibly in the wider context of building automation systems. Lot 8/9/19 and Lot 37 are therefore complementary, and energy savings in the Lot 37 analysis have been estimated in addition to those of the Lot 8/9/19 study, using the same MELISA model, without double counting²⁰.

The proposed Regulation is developed in parallel with the proposed delegated act for energy labelling of lighting products.

2. CONSULTATION OF INTERESTED PARTIES AND IMPACT ASSESSMENT

Consultation of interested parties

Methods used, main sectors targeted and general profile of respondents

There was extensive consultation of stakeholders during the review studies, and before and after the Consultation Forum meetings. Further external expertise was collected and analysed during this process.

¹⁷ OJ L 197, 24.7.2012, p. 38

¹⁸ Preparatory study on lighting systems 'Lot 37', final report 15 December 2016, VITO, VHK, Paul Waide and Kreios for the European Commission DG ENER C3, <http://ecodesign-lightingsystems.eu/documents>

¹⁹ <https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings>

²⁰ With Lot 8-9-19 in place, extra savings compared to BAU from Lot 37 would result in 10% of EU 28 electricity consumption for non-residential lighting at 2030: this low amount is the reason why the Commission's service is still analysing if the introduction of ecodesign requirements for Lot 37 is worthy.

Stakeholders (industry, Member States, NGOs) were consulted during the Lot 8/9/19 review study on two occasions. A 1st stakeholder meeting was held on 5 February 2015 on the MEERP²¹ Task 0, 1, 2 and 3 reports; a 2nd meeting was held on 17 June 2015 on the Task 4, 5 and 6 reports.

Study reports were updated to reflect stakeholders' comments. Importantly, the future projections for LED prices and LED efficiencies used in the analysis of the MELISA model were agreed with industry. Stakeholder comments were also taken into account when preparing the Commission Working Document (WD) for the Ecodesign Consultation Forum (ECF) of 7 December 2015.

The comments on the 2015 WD showed a lack of consensus among stakeholders on the general approach, the level of ambition and on many details, especially on the ecodesign part. To resolve this situation following the 2015 ECF, between Spring 2016 and Spring 2017 further stakeholder meetings took place in an attempt to address the different comments. The MELISA model was extensively discussed with industry experts and adapted accordingly.

A second ECF took place on 7 December 2017.

An online public consultation (OPC) took place from 12 February to 7 May 2018, with the aim to collect stakeholders' views on issues such as the expected effect of potential legislative measures on business and on energy consumption trends.

The OPC contained a common part on Ecodesign and Energy labelling, followed by product specific questions on (i) refrigerators, (ii) dishwashers, (iii) washing machines, (iii) televisions, (iv) electronic displays and (v) lighting.

1230 responses were received of which 67 % were consumers and 19 % businesses (of which three quarters were SMEs and one-quarter large companies). NGOs made up 6 % of respondents, and 7 % were "other" categories. National or local governments were under 1 % of respondents, and 0.25 % came from national Market Surveillance Authorities.

The countries of residence of the participants were predominantly the UK (41 %) and Germany (26 %), with a second group of Austria, Belgium, France, the Netherlands and Spain comprising together some 17 %. Nine other Member States comprised another 9.5 % of replies, but residents in 12 EU Member States gave either zero or a negligible number of responses. Non-EU respondents comprised around 5 % of replies.

Almost all respondents (1229 out of 1230) answered the questions on lighting products. 719 participants (58 %) replied only on lighting.

Inception impact assessments for the regulatory measures on the review of ecodesign and energy labelling requirements for this product group were published on 26 January 2018 for feedback until 23 February 2018. In total 17 comments were received for the ecodesign measure and 16 for the energy labelling measure.

In general, all stakeholders are in favour of Ecodesign and Energy labelling requirements for lighting products. The submitted feedback commented amongst others on the strictness of

²¹ MEERP is the methodology that the European Commission applies to make studies for ecodesign of energy-related products.

Ecodesign requirements, the quality of light, the blue light content and requirements that would make light sources easily replaceable//repairable in containing products.

Impact assessment

An impact assessment (IA) is required when the expected economic, environmental or social impacts of EU action are likely to be significant. The IA for the review of regulations (EC) No 874/2012 and No 244/2009, No 245/2009 and No 1194/2012 was carried out between May 2017 and March 2018.

The data collected in the review studies served as a basis for the IA. Additional data and information was collected and discussed by the IA study team with industry and experts, and other stakeholders including Member States. During this process, several meetings were organised with industry and Member State experts. The additional data and information collection focused on:

- additional market data on energy efficiency for the period 2015-2017;
- update on lighting catalogues for the availability of LED replacements;
- fine-tuning of the requirements;
- fine-tuning of definitions;
- investigation of various options for the phase out of T8 lamps;
- sensitivity analysis regarding electricity tariffs;
- extended information on SMEs, possible impacts;
- extended information on specific sectors using T8 lamps.

The IA report was submitted to the Regulatory Scrutiny Board (RSB) on 16 May 2018. Following a meeting on 13 June 2018, on 18 June 2018 the RSB delivered a positive opinion with reservations. The draft IA was subsequently improved, based on the RSB's Opinion²² and the horizontal and specific technical comments that the RSB sent prior to the meeting of 13 June 2018. Their main considerations and how these considerations were taken into account are outlined below:

- (a) RSB: the report does not sufficiently analyse current exemptions, i.e. explain what they cover, why they remain relevant, alternative ways to close loopholes, and the associated impacts.

Action: an annex was added to compare exemptions in the current legislation with the exemptions proposed with this review.

- (b) RSB: the report does not integrate circular economy aspects comprehensively and in a way which is consistent across ecodesign products. It does not assess them either.

Action: text was added to give a better explanation.

- (c) RSB: The report should better present supporting evidence from the evaluation of the existing legislation. It should also clarify what expectations were of the original legislation, how outcomes have been different from what was expected, and what lessons to draw from this.

Action: a specific section and clarifications in an annex were added.

²² Ref. Ares(2018)3220771 - 18/06/2018

- (d) RSB: the limitations and risks of the methodology behind assessing the impacts of the proposed measures should be better described.

Action: text was added to give a better explanation.

Collection and use of expertise

Analysis model MELISA

The ‘Model for European Light Sources Analysis, MELISA’ was first developed during the Lot 8/9/19 preparatory study. Following the 2015 ECF it was extensively discussed with industry experts and adapted accordingly.

New methodology for setting energy efficiency requirements

In unifying the three existing ecodesign regulations for lighting products into a single regulation, a central element was the development of a unified method for setting energy efficiency requirements for all light source types. The result was a maximum power formula containing two parameters (a threshold efficacy and an end-loss factor), and bonus factors for special circumstances. Extensive work has been performed with industry experts to determine the values of the parameters and of the bonus factors (for each light source type) such that requirements using the new maximum power formula could be considered to be equivalent to the requirements in the existing regulations. Consensus was reached on these parameter values, which were used as the basis for proposing a higher level of ambition, i.e. to set more stringent energy efficiency requirements.

Flicker and stroboscopic effects

Experts from industry and from standardisation organisations have been consulted specifically on so-called ‘temporal lighting artefacts’ (TLA), including flicker and stroboscopic effects. This is an important topic for users, being potentially related to health problems or discomfort. Intensive contacts are also maintained with consultants for the Australian government and with experts working at NEMA – the US standardisation body, in an attempt to align regulations internationally on this point. Mainly based on expert advice, preliminary requirements on flicker and stroboscopic effects have been included in the proposed Regulation. The research and testing on this topic is very dynamic and the requirements will be reassessed during the revision of the Regulation.

Parameters to test and verification tolerances

The proposed parameters to be tested to verify compliance and the associated tolerances aim to create more clarity for market surveillance authorities.

3. LEGAL ELEMENTS OF THE PROPOSAL

Summary of the proposed action

By 2030, compared to a business-as-usual scenario, the proposed action will result extra energy savings of 41,9 TWh/yr and greenhouse gas emission savings of 14,3 MtCO₂eq./a, i.e. 2,88 % of the Commission’s 2030 target for final energy consumption savings and 1,34 % of the Commission’s 2030 target for greenhouse gas emissions savings.

1. Definition of the scope of the proposed Regulation

The scope of the measures are light sources and separate control gears, where ‘separate’ indicates control gears that are marketed as separate products, i.e. not integrated in the light source. Light sources and separate control gears as defined by this Regulation are always in scope, even when they are parts of ‘containing products’ such as luminaires, mirrors or shelves. However, the containing products themselves are not in scope of this Regulation (but they may be in scope of other ecodesign regulations). A tricky point is how to treat containing products (including luminaires) that cannot be taken apart (i.e. without permanent mechanical damage) to access the contained light source(s) and/or control gear(s) for compliance verification. Two options were investigated:

- Option 1: the entire product could be considered as the light source/control gear, and thus be subject to the requirements of the Regulation. This is expected to stimulate suppliers to make their containing products, including luminaires, dismountable, with replaceable parts, which is a first step to including requirements related to the circular economy (further steps intended to be taken following the next review of this Regulation). As mentioned in section 1 of this memorandum, many luminaires are manufactured so that LED light sources are tightly mechanically integrated to optimise thermal management and for protection purposes.
- Option 2: introducing already now the obligation that light sources and/or control gears in scope of the Regulation must be readily removed (meaning without permanent mechanical damage for both the light source/control gear and the containing product) from any product containing them that is placed on the market.

Despite the importance of the principle of circular economy with the recently adopted EU strategy and the focus on circular economy objectives in the Ecodesign Working Plan 2016-2019, as a general principle Option 1 was chosen. The possibility to have more stringent resource efficiency requirements will be reassessed during the review of the Regulation.

For containing products that are different from non-dismountable luminaires (e.g. shelves, mirrors), the proposal is already retaining some parts of Option 2: in order to allow compliance verification by market surveillance authorities, the proposal requires that light sources and control gears contained in a product must be removable for verification purposes and not permanently damaged (while the containing product can be damaged).

The scope of this Regulation covers all lighting technologies, including incandescent, halogen, fluorescent, high-intensity discharge and light-emitting diodes (both inorganic LED and organic OLED). This means that the proposed single lighting regulation will replace the three existing ecodesign regulations for lighting products.

To avoid that too many exemptions would have to be made for light sources with special characteristics or for use in special applications (increasing the risk of circumvention of the Regulation), the term ‘light source’ has been intentionally defined with the following limitations:

- emitting white light within specified chromaticity coordinates: this excludes from the scope e.g. coloured, ultraviolet (blue), infrared (red, gold), horticulture (purple), collagen (pink) lamps;
- density of light emission less than 1000 lumen per square millimetre, excluding from the scope e.g. light guidance applications, laser sources, photographic flash tubes, etc.;

- emitting between 60 and 82000 lumen of light. The lower boundary excludes from the scope a huge variety of dashboard-, status-display or other pilot lights as well as purely decorative lamps. The burden to verify compliance of these numerous small lamps would outweigh the small energy savings that could be obtained. The upper limit excludes very powerful lamps for e.g. sports lighting, theatre-, stage- and studio-lighting, and some outdoor and industrial applications. Higher efficiency (LED) lamps are not (yet) readily available for these high power lamps, while users tend to be professionals that already pay attention to energy efficiency;
- colour rendering index larger than zero. This excludes from the scope e.g. monochrome lasers and low pressure sodium lamps.

In addition to this limitation of the scope, exemptions have been made, following the precautionary principle, for light sources that are related to health and safety (e.g. explosive atmospheres, emergency lighting, nuclear installations, military installations and equipment, applications in medicine, lights for signalling, and lights in or on means of transport for persons and goods).

Other exemptions cover light sources with special characteristics (e.g. very small LFL, HID with special features, spots with very concentrated light, lights for ovens), light sources already covered by regulations for other products (e.g. electronic displays, imaging equipment), and light sources where inclusion in scope would not be worthwhile (e.g. bicycle lights).

2. Implementation of ecodesign requirements

The ecodesign requirements of the new proposed Regulation will apply from September 2021. Until then, the requirements of the three existing regulations will continue to apply. This gives suppliers sufficient time to prepare for the new requirements and allows for a smooth transition. Also, it has to be recalled that most of the requirements of the last stage (those that had to be applied by 2016) were postponed by Commission Regulation (EU) 2015/1428 to 2018, i.e. no new requirements are introduced between 2016 and 2021.

Energy efficiency requirements are now formulated for all light source types in a uniform manner, using a formula defining the maximum allowed power for a light source in function of the quantity of light emitted. This formula contains two parameters (threshold efficacy and end-loss factor) that can be set differently for each light source type where appropriate. In addition, power bonuses apply for special circumstances (presence or not of a control gear inside the light source, directional or non-directional light, light sources connected in a network, special features of the light).

For light sources typically used in households, a single efficiency requirement applies to all types. The level of this requirement is such that most LED lighting products can meet it, while halogen light sources (HL) and compact fluorescent light sources (CFLi) cannot, and thus would no longer be able to enter the market. High-efficiency LED products are already available to replace these HL and CFLi, or will be by the time the Regulation starts to apply. The only exception are linear double-capped HL with R7s caps with a light output below 2700 lm. Therefore, for these light sources this Regulation maintains the existing requirements, allowing them to remain on the market for the time being.

For light sources typically used in offices, industrial applications and street lighting, a diversified approach has been adopted. For T8 linear fluorescent light sources (LFL T8, often used in offices), energy efficiency requirements have been set at the same level as those for

LED lighting products, implying that LFL T8 will no longer be able to enter the market. Suitable LED replacements are already available for LFL T8. Where this is not the case, the Regulation includes specific exemptions.

Manufactures and importers that have recently invested in T5 linear fluorescent light sources (LFL T5) operating on electronic control gear, replacing less efficient T8 fluorescent light sources operating on less efficient electromagnetic control gear e.g. in office lighting, should be given time for their investment to pay back. The same applies for users that have recently invested in high-pressure sodium light sources (HPS) or metal-halide light sources (MH), replacing less efficient high-pressure mercury light sources (HPM) in e.g. street lighting, industrial lighting and sports lighting, because HPM were no longer on the market following Regulation (EC) No 245/2009. For compact fluorescent light sources without integrated control gear (CFLni) no higher-efficiency (LED) light sources are (yet) available that are functionally comparable and cost-effective. Hence, for LFL T5, HPS, MH and CFLni, the proposed regulation maintains the energy efficiency requirements of the existing regulations, implying that these light source types will be allowed on the market also after 2020.

The proposed Regulation does not foresee a second stage with higher energy efficiency requirements in e.g. 2023 or 2024. Although this would give a clear signal of what to expect in future (and some stakeholders are in favour of this), the lighting products market is highly dynamic in this moment, making it difficult to foresee today the situation 10 years from now. Therefore, it is proposed to define further action only during the next review.

For separate control gears, the energy efficiency requirements are essentially the same as those in the existing regulations. The requirements for LED and OLED separate control gears are also not particularly ambitious.

This Regulation aims to reduce the burden for industry and for market surveillance authorities. Most importantly, an endurance test has been included for LED and OLED products, to ensure that they maintain a minimum quality even with the higher energy efficiency limits. The duration of this test is significantly shorter than the 6000h test that is in place under the current regulations.

Other functional requirements are proposed regarding colour rendering, colour consistency, disturbance of the electricity grid and flicker and stroboscopic effects of LED and OLED light sources.

3. Verification procedure for market surveillance purposes

The procedure to be used by market surveillance authorities to verify the compliance of light sources and separate control gears in scope of this Regulation has been changed compared to the formulation in the three existing regulations. In general, the procedure has been aligned with the common approach used in Commission Regulation (EU) 2016/2282²³, which is based on verification of parameter values declared by suppliers. In addition, the required number of samples has been reduced to 10 (3 for expensive products). This will facilitate market surveillance activities and remove some ambiguities.

As regards verification tolerances, the approach has been diversified, using different tolerances for different parameters, and depending on the sample size making them more realistic.

²³ OJ L 346, 20.12.2016, p.51.

4. Date for evaluation and possible revision

The Regulation is to be reviewed no later than 1 September 2024. This revision should at least consider the topics indicated in Article 9 of the proposed Regulation.

5. Repeal

The existing ecodesign regulations for lighting products (Commission Regulations (EC) No 244/2009, No 245/2009 and No 1194/2012) will be repealed with effect from 1 September 2021. The new requirements of this Regulation will apply from that day.

Legal basis

The legal basis of Directive 2009/125/EC on the Ecodesign of Energy-related Products is Article 114 TFEU (ex Article 95 TEC)²⁴. The article mentions specifically amongst others ‘*the establishment and functioning of the internal market*’ (Art. 114.1) and a high level of protection for ‘*health, safety, environmental protection and consumer protection, will take as a base*’ (Art.114.3).

The proposed Regulation is an implementing measure adopted pursuant to Directive 2009/125/EC, in particular Article 15(1) thereof. The legal basis for the review of the existing ecodesign regulations for lighting products is the review clause of those regulations (Article (7) or (8) depending on the Regulation).

In the Commission’s Ecodesign Working Plan 2016-2019 the revision of the implementing acts for lighting products is mentioned as a major energy saving opportunity.

Subsidiarity principle

Light sources and separate control gears are global products for which it is appropriate to have the same requirements at least in the entire EU. The adoption of ecodesign measures by individual Member States, through their national legislation, would create obstacles to the free movement of goods within the EU. The three existing ecodesign regulations for lighting products have successfully avoided this. The proposed substitution of these three regulations by a single Regulation for light sources and separate control gears is a simplification that reduces the administrative burden for industry and that facilitates compliance verification by market surveillance. In line with the principle of subsidiarity, it is thus appropriate for the measures in question to be adopted at EU level.

Proportionality principle

In accordance with the principle of proportionality, this measure does not go beyond what is necessary in order to achieve the objective, which is to set harmonised ecodesign requirements for light sources and separate control gears. As clarified by the above description of the scope and the exemptions, the Regulation does not apply to many small lamps (below 60 lm light output, light sources in portable battery-operated equipment, light sources on bicycles and similar) where the administrative burden for industry and the verification burden for market surveillance would outweigh the small energy savings that could be obtained.

Choice of instrument

²⁴ The Treaty on the European Communities (TEC) was replaced by the Treaty on the Functioning of the European Union (TFEU) entering into force 1.12.2009, following the Lisbon Treaty of 13.12.2007. This led to the transposition of various articles, e.g. Article 95 TEC was moved to Article 114 TFEU. Ecodesign directive 2009/125/EC was defined under the TEC, whereas the recast of the Energy Labelling Directive 2010/20/EU was defined under the TFEU.

The proposed form of action is a directly applicable Commission Regulation implementing Directive 2009/125/EC. This continues the current practice of the existing three ecodesign regulations for lighting products, while simplifying the legal framework.

4. BUDGETARY IMPLICATION

The proposal has no implications for the EU budget.

5. ADDITIONAL INFORMATION

Review/revision/sunset clause

The proposal includes a review clause.

European Economic Area

The proposed Regulation concerns an EEA matter and should therefore extend to the European Economic Area.

Brussels, XXX
[...] (2018) XXX draft

COMMISSION REGULATION (EU) .../...

of XXX

laying down ecodesign requirements for light sources and separate control gears pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No 1194/2012

(Text with EEA relevance)

This draft has not been adopted or endorsed by the European Commission. Any views expressed are the preliminary views of the Commission services and may not in any circumstances be regarded as stating an official position of the Commission. The information transmitted is intended only for the Member State or entity to which it is addressed for discussions and may contain confidential and/or privileged material.

COMMISSION REGULATION (EU) .../...

of XXX

laying down ecodesign requirements for light sources and separate control gears pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No 1194/2012

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to Article 114 of the Treaty on the Functioning of the European Union,

Having regard to Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products¹, and in particular Article 15(1) thereof,

Whereas:

- (1) Pursuant to Directive 2009/125/EC the Commission should set ecodesign requirements for energy-related products which account for significant volumes of sales and trade in the Union and which have a significant environmental impact and presenting significant potential for improvement through design in terms of their environmental impact, without entailing excessive costs.
- (2) The Ecodesign Working Plan 2016-2019² established by the Commission in application of Article 16(1) of Directive 2009/125/EC sets out the working priorities under the ecodesign and energy labelling framework for the period 2016-2019. The Working Plan identifies the energy-related product groups to be considered as priorities for the undertaking of preparatory studies and eventual adoption of implementing measures, as well as the review of the current regulations.
- (3) Measures from the Working Plan have an estimated potential to deliver a total in excess of 260 TWh of annual final energy savings in 2030, which is equivalent to reducing greenhouse gas emissions by approximately 100 million tonnes per year in 2030. Lighting is one of the product groups listed in the Working Plan, with an estimated 41.9 TWh of annual final energy savings in 2030.
- (4) The Commission established ecodesign requirements for lighting products in Commission Regulations (EC) No 244/2009³, (EC) No 245/2009⁴ and (EU)

¹ OJ L 285, 31.10.2009, p. 10.

² COM(2016) 773 final of 30.11.2016.

³ Commission Regulation (EC) No 244/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps (OJ L 76, 24.3.2009, p. 3).

⁴ Commission Regulation (EC) No 245/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to

No 1194/2012⁵. Pursuant to those Regulations the Commission should review them in the light of technological progress.

- (5) The Commission has reviewed those Regulations and analysed the technical, environmental and economic aspects of lighting products as well as real-life user behaviour. The review was carried out in close cooperation with stakeholders and interested parties from the Union and third countries. The results of the review were made public and presented to the Consultation Forum established by Article 18 of Directive 2009/125/EC.
- (6) The review shows the benefit of updating the requirements for lighting products and the benefit of simplifying the requirements to be applied to lighting products, in particular by having one single regulation for this product group. This is in line with the Commission's 'Better Regulation' policy and should aim to decrease the administrative burden for manufacturers and importers, and to facilitate verification by market surveillance authorities, inter alia by better defining the scope and exemptions, reducing the number of parameters for compliance testing and decreasing the time of some test procedures.
- (7) In accordance with the review, all lighting products that fall within the scope of the three existing regulations should be covered by this Regulation. Furthermore, a uniform formula should be set to calculate the energy efficiency of such lighting products.
- (8) The annual electricity consumption of products subject to this Regulation in the Union was estimated at 336 TWh in 2015. This covers 12.4 % of the overall use of electricity by the 28 Member States and corresponds to 132 million tonnes of CO₂ equivalent greenhouse gas emissions. The energy consumption of lighting products in a business-as-usual scenario is projected to decrease by 2030. However, this reduction is expected to slow down unless the existing ecodesign requirements are updated.
- (9) The environmental aspects of lighting products that have been identified as significant for the purposes of this Regulation are energy consumption in the use phase along with mercury content.
- (10) The use of hazardous substances, including mercury in light sources is governed by Directive 2011/65/EU of the European Parliament and of the Council (RoHS)⁶, No specific ecodesign requirements on mercury content should therefore be set in this Regulation.
- (11) The Commission Communication on the circular economy⁷ and the Ecodesign Working Plan 2016-2019 underline the importance of using the ecodesign framework to support the move towards more resource efficient and circular economy. Directive 2012/19/EU⁸ of the European Parliament and of the Council refers to Directive 2009/125/EC and indicates that ecodesign requirements should facilitate the re-use, dismantling and

operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council (OJ L 76, 24.3.2009, p. 17).

⁵ Commission Regulation (EU) No 1194/2012 of 12 December 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for directional lamps, light emitting diode lamps and related equipment (OJ L 342, 14.12.2012, p. 1).

⁶ Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (OJ L 174, 1.7.2011, p. 88, and amendments).

⁷ COM/2015/0614 final of 02.12/2015.

⁸ Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (OJ L 197, 24.7.2012, p. 38).

recovery of waste of electrical and electronic equipment (WEEE) by tackling the issues upstream. The WEEE Directive sets requirements for separate collection and recycling of lighting products, with new provisions from August 2018. This Regulation should therefore not lay down further requirements for this.

- (12) Specific requirements for the standby and networked standby electric power demand of lighting products should be laid down. Therefore, the requirements of Commission Regulation (EC) No 1275/2008⁹ should not apply to lighting products covered by the scope of this Regulation.
- (13) Mandatory ecodesign requirements apply to products placed on the Union market wherever they are installed or used and should therefore not be made dependent on the application in which the product is used.
- (14) Exemptions from the requirements set out in this Regulation should be made for light sources with special technical features for use in specific applications, including those related to health and safety, and for which higher energy efficiency alternatives are not available or not cost-effective.
- (15) The relevant product parameters should be measured using reliable, accurate and reproducible methods. Those methods should take into account recognised state-of-the-art measurement methods, including, where available, harmonised standards adopted by the European standardisation organisations, as listed in Annex I to Regulation (EU) No 1025/2012 of the European Parliament and of the Council¹⁰.
- (16) In accordance with Article 8 of Directive 2009/125/EC, this Regulation should specify the applicable conformity assessment procedures.
- (17) To facilitate compliance checks, manufacturers should provide information in the technical documentation referred to in Annexes IV and V to Directive 2009/125/EC in so far as that information relates to the requirements laid down in this Regulation. The parameters of the technical documentation in accordance with this Regulation which are identical to the parameters of the product information sheet in accordance with Commission Delegated Regulation (EU) *[OP please insert the references of the Regulation with regard to energy labelling of light sources]* and which have been entered in the product database should no longer be included in the technical documentation of this Regulation.
- (18) Commission Regulation (EU) 2016/2282¹¹ requires this Regulation to specify tolerance values for lighting parameters and adopt the approach of declared values.

⁹ OJ L 339, 18.12.2008, p 45

¹⁰ Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No 1673/2006/EC of the European Parliament and of the Council (OJ L 316, 14.11.2012, p. 12).

¹¹ Commission Regulation (EU) 2016/2282 of 30 November 2016 amending Regulations (EC) No 1275/2008, (EC) No 107/2009, (EC) No 278/2009, (EC) No 640/2009, (EC) No 641/2009, (EC) No 642/2009, (EC) No 643/2009, (EU) No 1015/2010, (EU) No 1016/2010, (EU) No 327/2011, (EU) No 206/2012, (EU) No 547/2012, (EU) No 932/2012, (EU) No 617/2013, (EU) No 666/2013, (EU) No 813/2013, (EU) No 814/2013, (EU) No 66/2014, (EU) No 548/2014, (EU) No 1253/2014, (EU) 2015/1095, (EU) 2015/1185, (EU) 2015/1188, (EU) 2015/1189 and (EU) 2016/2281 with regard to the use of tolerances in verification procedures (OJ L 346, 20.12.2016, p. 51).

- (19) To improve the effectiveness of this Regulation and to protect consumers, products that automatically alter their performance in test conditions to improve the declared parameters should be prohibited.
- (20) In addition to the legally binding requirements laid down in this Regulation, indicative benchmarks for best available technologies should be identified to make information on products' environmental performance over their life cycle subject to this Regulation widely available and easily accessible, in accordance with Directive 2009/125/EC, Annex 1, part 3, point 2.
- (21) A review of this Regulation should assess the appropriateness and effectiveness of its provisions in achieving its goals. The timing of the review should be sufficient for all provisions to be implemented and show an effect on the market.
- (22) Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No 1194/2012 should therefore be repealed.
- (23) The measures provided for in this Regulation are in accordance with the opinion of the Committee established by Article 19(1) of Directive 2009/125/EC,

HAS ADOPTED THIS REGULATION:

Article 1

Subject matter and scope

1. This Regulation establishes ecodesign requirements for the placing on the market of
 - (a) light sources;
 - (b) separate control gears;
 as defined in Article 2.
 The requirements also apply to light sources and separate control gears placed on the market in a containing product.
2. This Regulation shall not apply to light sources and separate control gears specified in Annex III, points 1 and 2.
3. Light sources and separate control gears specified in Annex III, point 3 shall comply only with the requirements of Annex II, point 3.e.

Article 2

Definitions

For the purpose of this Regulation, the following definitions shall apply:

- (1) 'light source' means an electrically operated product intended to emit and/or be possibly tuned to emit light with all of the following optical characteristics:
 - (a) chromaticity coordinates x and y in the range

$$0,270 < x < 0,530$$
 and

$$-2,3172 x^2 + 2,3653 x - 0,2199 < y < -2,3172 x^2 + 2,3653 x - 0,1595;$$
 - (b) a luminous flux $< 500 \text{ lm per mm}^2$ of projected light-emitting surface area as defined in Annex I;
 - (c) a luminous flux between 60 and 82 000 lumen;

(d) a colour rendering index (CRI) $R_a > 0$;

using incandescence, fluorescence, high-intensity discharge, inorganic light emitting diodes (LED) or organic light emitting diodes (OLED), or their combinations as lighting technology, and that can be verified as a light source according to the procedure of Annex IV.

High-pressure sodium light sources that do not fulfil condition (a) are considered light sources for the purposes of this Regulation.

Light sources do not include:

- (a) LED dies or LED chips;
- (b) LED packages;
- (c) products containing light source(s) from which these light source(s) can be removed for verification;
- (d) light-emitting parts contained in a light source from which these parts cannot be removed for verification as a light source;

(2) ‘control gear’ means one or more devices, that can be or not physically integrated in a light source, intended to prepare the mains for the electric format required by one or more specific light sources within boundary conditions set by electric safety and electromagnetic compatibility. It may include transforming the supply and starting voltage, limiting operational and preheating current, preventing cold starting, correcting the power factor and/or reducing radio interference.

The term ‘control gear’ does not include power supplies within the scope of Commission Regulation (EC) No 278/2009¹². The term does also not include lighting control parts and non-lighting parts (as defined in Annex I), although such parts may be physically integrated with a control gear or marketed together as a single product.

A Power over Ethernet (PoE) switch is not a control gear in the sense of this Regulation. ‘Power-over-Ethernet switch’ or ‘PoE switch’ means equipment for power-supply and data-handling that is installed between the mains and office equipment and/or light sources for the purpose of data transfer and power supply;

- (3) ‘separate control gear’, means a control gear that is not physically integrated with a light source and is placed on the market as a separate product or as a part of a containing product;
- (4) ‘containing product’ means a product containing one or more light sources and/or separate control gears. Examples of containing products are luminaires that can be taken apart to allow separate verification of the contained light source(s), household appliances containing light source(s), furniture (shelves, mirrors, display cabinets) containing light source(s). If a containing product cannot be taken apart for verification of the light source and separate control gear, the entire containing product is to be considered a light source;
- (5) ‘light’ means electromagnetic radiation with a wavelength between 380 nm and 780 nm;
- (6) ‘mains’ or ‘mains voltage’ (MV) means the electricity supply of 230 (± 10 %) Volt of alternating current at 50 Hz;

¹² OJ L93, 7.4.2009, p.3.

- (7) 'LED die' or 'LED chip' means a small block of light-emitting semiconducting material on which a functional LED circuit is fabricated;
- (8) 'LED package' means a single electric part comprising principally at least one LED die. It does not include a control gear or parts of it, a cap, active electronic components and is not connected directly to the mains voltage. It is used as a part of an LED module or of an LED lamp. It can include one or more of the following: optical elements, light converters (phosphors), thermal, mechanical and electric interfaces, parts to address electrostatic discharge concerns. So called Chip-on-Board (CoB) packages, and similar light-emitting devices that are intended to be used directly in an LED luminaire, are not considered to be LED packages, but LED modules;
- (9) 'chromaticity' means the property of a colour stimulus defined by its chromaticity coordinates (x and y);
- (10) 'luminous flux' or 'flux' (Φ), expressed in lumen (lm), means the quantity derived from radiant flux (radiant power) by evaluating the electromagnetic radiation in accordance with the spectral sensitivity of the human eye. It refers to the total flux emitted by a light source in a solid angle of 4π steradians under conditions (e.g. current, voltage, temperature) specified in applicable standards. It refers to the initial flux for the undimmed light source after a short operating period, unless it is clearly specified that the flux in a dimmed condition or the flux after a given period of operation is intended. For light sources that can be tuned to emit different light spectra and/or different maximum light intensities, it refers to the flux in the 'reference control settings' as defined in Annex I;
- (11) 'colour rendering index' (CRI) means the effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under the reference illuminant and is the average Ra of the colour rendering for the first 8 test colours (R1-R8) defined in standards;
- (12) 'incandescence' means a phenomenon where light is produced from heat, in light sources typically produced through a threadlike conductor ('filament') which is heated by the passage of an electric current. Incandescent light sources include GLS – general lamp shape light sources and halogen light sources;
- (13) 'halogen light source' means an incandescent light source with a threadlike conductor made from tungsten surrounded by gas containing halogens or halogen compounds;
- (14) 'fluorescence' or 'fluorescent light source' (FL) means the phenomenon or a light source using an electric gas discharge of the low-pressure mercury type in which most of the light is emitted by one or more layers of phosphors excited by the ultraviolet radiation from the discharge. Fluorescent light sources may have one ('single-capped') or two ('double-capped') connections ('caps') to their electricity supply. For the purposes of this Regulation, magnetic induction light sources are also considered as fluorescent light sources;
- (15) 'high intensity discharge' (HID) means an electric gas discharge in which the light-producing arc is stabilised by wall temperature and the arc chamber has a bulb wall loading in excess of 3 Watts per square centimetre. HID light sources are limited to metal halide, high-pressure sodium and mercury vapour types, as defined in Annex I;
- (16) 'gas discharge' means a phenomenon where light is produced, directly or indirectly, by an electric discharge through a gas, plasma, metal vapour or mixture of gases and vapours;

- (17) ‘inorganic light emitting diode’ (LED) means a technology in which light is produced from a solid state device embodying a p-n junction of inorganic material. The junction emits optical radiation when excited by an electric current;
- (18) ‘organic light emitting diode’ (OLED) means a technology in which light is produced from a solid state device embodying a p-n junction of organic material. The junction emits optical radiation when excited by an electric current;
- (19) ‘high-pressure sodium light source’ (HPS) means a high intensity discharge light source in which the light is produced mainly by radiation from sodium vapour operating at a partial pressure of the order of 10 kilopascals. HPS light sources may have one (‘single-ended’) or two (‘double-ended’) connectors to their electricity supply.

For the purposes of the Annexes, additional definitions are set out in Annex I.

Article 3

Ecodesign requirements

Products within the scope of this Regulation shall comply with the ecodesign requirements set out in Annex II.

Article 4

Removal of light sources and separate control gears

1. Manufacturers and importers of containing products shall ensure that light sources and separate control gears can be removed without being permanently damaged for verification purposes by market surveillance authorities. For containing products, instructions shall be available on request on how light sources and separate control gears can be removed for verification without these being permanently damaged.
2. Manufacturers and importers of containing products shall ensure that light sources and separate control gears can be dismantled from containing products at end of life. Instructions shall be available on request.
3. Manufacturers and importers of containing products shall provide information about the replaceability or non-replaceability of light sources and control gears by end-users or qualified persons without permanent damage to the containing product. Such information shall be available on free-access websites. For products sold directly to end-users, this information shall be on the packaging, at least in the form of a pictogram, and in the user instructions.

Article 5

Conformity assessment

1. The conformity assessment procedure referred to in Article 8 of Directive 2009/125/EC shall be the internal design control system set out in Annex IV to that Directive or the management system set out in Annex V to that Directive.
2. For the purposes of the conformity assessment pursuant to Article 8 of Directive 2009/125/EC, the technical documentation shall contain the information set out in Annex II, point 3(d) to this Regulation and the results of the calculations in accordance with Annex II, points 1 and 2 to this Regulation.
3. Where the information included in the technical documentation for a particular model

has been obtained by calculation on the basis of design, or extrapolation from another model, or both, the technical documentation shall include details of such calculations or extrapolations, or both, and of tests carried out by manufacturers to verify the accuracy of the calculations undertaken.

Article 6

Verification procedure for market surveillance purposes

Member States shall apply the verification procedure laid down in Annex IV to this Regulation when performing the market surveillance checks referred to in Article 3(2) of Directive 2009/125/EC.

Article 7

Circumvention

The manufacturer or importer shall not place on the market products designed in such a way that a model's performance is automatically altered under test conditions with the aim of reaching a more favourable level for any of the parameters declared by the manufacturer in the technical documentation or included in any of the documentation provided with the product.

The power consumption of the product shall not increase after a software or firmware update when measured with the same test standard originally used for the declaration of conformity, except with explicit consent of the end-user prior to the update.

Article 8

Indicative benchmarks

The indicative benchmarks for the best-performing products and technologies available on the market at the time of adopting this Regulation are set out in Annex VI.

Article 9

Review

The Commission shall review this Regulation in the light of technological progress and shall present the results of this review, including, if appropriate, a draft revision proposal, to the Consultation Forum no later than *[OP – please insert date - five years after its entry into force]*.

This review shall in particular assess:

- (a) setting more stringent energy efficiency requirements for all light source types, in particular for non-LED light source types, and for separate control gears;
- (b) setting requirements on lighting control parts;
- (c) setting more stringent requirements on flicker and stroboscopic effects;
- (d) setting requirements on dimming, including the interaction with flicker;
- (e) setting more stringent requirements on (networked) standby power;
- (f) lowering or abolishing the power bonus for colour-tuneable light sources and removing the exemption for high colour purity;
- (g) substituting the CRI colour rendering metric by a more adequate metric;
- (h) verifying the adequacy of lumen as a stand-alone metric for the quantity of visible light;

- (i) setting additional resource efficiency requirements for products in accordance with the principles of the circular economy.

Article 10

Repeal

Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No 1194/2012 are repealed with effect from 1 September 2021.

Article 11

Entry into force and application

This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union.

It shall apply from 1 September 2021.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels,

For the Commission
Jean-Claude JUNCKER
The President



Brussels, **XXX**
[...](2018) **XXX** draft

ANNEXES 1 to 6

ANNEXES

to the

COMMISSION REGULATION (EU) .../...

**laying down ecodesign requirements for light sources and separate control gears
pursuant to Directive 2009/125/EC of the European Parliament and of the Council**

**repealing Commission Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No
1194/2012**

ANNEX I
Definitions applicable for the Annexes

The following definitions shall apply for the purposes of the Annexes:

- (1) ‘mains light source (MLS)’ means a light source that can be operated directly on the mains electricity supply. Light sources that operate directly on the mains, and can also operate indirectly on the mains using a separate control gear, shall be considered to be mains light sources;
- (2) ‘non-mains light source (NMLS)’, means a light source that is not a mains light source. These light sources require a separate control gear to operate on the mains;
- (3) ‘directional light source’ (DLS) means a light source having at least 80 % of total luminous flux within a solid angle of π sr (corresponding to a cone with angle of 120°);
- (4) ‘non-directional light source’ (NDLS) means a light source that is not a directional light source;
- (5) ‘connected light source’ (CLS) means a light source including data-connection parts that are physically or functionally inseparable from the light emitting parts to maintain the ‘reference control settings’. The light source can have physically integrated data-connection parts in a single inseparable housing, or the light source can be combined with physically separate data-connection parts placed on the market together with the light source as a single product.
- (6) ‘connected separate control gear’ (CSCG) means a separate control gear including data-connection parts that are physically or functionally inseparable from the actual control gear parts to maintain the ‘reference control settings’. The separate control gear can have physically integrated data-connection parts in a single inseparable housing, or the separate control gear can be combined with physically separate data-connection parts placed on the market together with the control gear as a single product;
- (7) ‘data-connection parts’ means parts that perform any one of the following functions:
 - (a) reception or transmission of wired or wireless data signals and the processing thereof (used to control the light emission function and possibly otherwise);
 - (b) sensing and processing of the sensed signals (used to control the light emission function and possibly otherwise);
 - (c) actuation by audio control (including voice control);
 - (d) a combination of these;
- (8) ‘colour-tuneable light source’ (CTLS) means a light source that can be set to emit light with a large variation of colours outside the range defined in Article 2 but can also be set to emit white light inside the range defined in Article 2 for which the light source is within the scope of this Regulation.

The term does not include tuneable-white light sources that can only be set to emit light, with different correlated colour temperatures, within the range defined in Article 2.

The term also does not include dim-to-warm light sources, that shift their white light output to lower correlated colour temperature when dimmed, simulating the behaviour of incandescent light sources;

(9) ‘colour purity index’ means a percentage computed for a CTLS set to emit light of a certain colour, using a procedure further defined in standards, by drawing a straight line on an (x and y) colour space graph from a point with colour coordinates $x=0.313$ and $y=0.330$ (D65 reference point, point 1), going through the point representing the (x and y) colour coordinates of the light source (point 2), and ending on the outer border of the colour space (locus; point 3). The colour purity index is computed as the distance between points 1 and 2 divided by the distance between points 1 and 3. The full length of the line represents 100 % colour purity (point on the locus). The D65 reference point represents 0 % colour purity (white light);

(10) ‘lighting control parts’ means parts that are integrated in a light source or in a separate control gear, or physically separated but marketed together with a light source or separate control gear as a single product, that are not strictly necessary for the light source to emit light at full-load, or for the separate control gear to supply the electric power that enables light source(s) to emit light at full-load, but that enable manual- or automatic-, direct- or remote-, control of luminous intensity, chromaticity, correlated colour temperature, light spectrum and/or beam angle. Dimmers shall also be considered as lighting control parts.

The term also includes data-connection parts, but the term does not include products within the scope of Commission Regulation (EC) No 1275/2008¹;

(11) ‘non-lighting parts’ means parts that are integrated in a light source or in a separate control gear, or physically separated but marketed together with a light source or separate control gear as a single product, that are not necessary for the light source to emit light at full-load, or for the separate control gear to supply the electric power that enables light source(s) to emit light at full-load, and that are not ‘lighting control parts’. Examples include, but are not limited to: speakers (audio), cameras, repeaters for communication signals to extend the range (e.g. WiFi), parts supporting grid balance (switching to own internal batteries when necessary), battery charging, visual notification of events (mail arriving, door bell ringing, alert), use of Light Fidelity (Li-Fi, a bidirectional, high-speed and fully networked wireless communication technology);

(12) ‘useful luminous flux’ (Φ_{use}), means the part of the luminous flux of a light source that is considered when determining its energy efficiency:

- for non-directional light sources it is the total flux emitted in a solid angle of 4π sr (corresponding to a 360° sphere);
- for directional light sources with beam angle $\geq 90^\circ$ it is the flux emitted in a solid angle of π sr (corresponding to a cone with angle of 120°);
- for directional light sources with beam angle $< 90^\circ$ it is the flux emitted in a solid angle of 0.586π sr (corresponding to a cone with angle of 90°);

(13) ‘beam angle’ of a directional light source means the angle between two imaginary lines in a plane through the optical beam axis, such that these lines pass through the centre of the front face of the light source and through points at which the luminous intensity is 50 % of the centre beam intensity, where the centre beam intensity is the value of luminous intensity measured on the optical beam axis.

For light sources that have different beam angles in different planes, the largest beam angle shall be the one taken into account;

¹ OJ L 339, 18.12.2008, p. 45.

For light sources with user-controllable beam angle, the beam angle corresponding to the ‘reference control setting’ shall be the one taken into account;

- (14) ‘full-load’ means:
- the condition of a light source, within the declared operating conditions, in which it emits the maximum (undimmed) initial luminous flux; or
 - the operating conditions and loads of the control gear under efficiency measurement as specified in the relevant standards;
- (15) ‘no-load mode’ means the condition of a separate control gear in which its input is connected to the mains power source and its output is intentionally disconnected from light sources, and, if applicable, from data-connection parts, lighting control parts and non-lighting parts. If these parts cannot be disconnected, they shall be switched off and their power consumption shall be minimised following the manufacturer’s instructions. No-load mode only applies to a separate control gear for which the manufacturer or importer has declared in the technical documentation that it has been designed for this mode;
- (16) ‘standby mode’ means the condition of a light source or of a separate control gear, where it is connected to the power supply but the light sources are intentionally not emitting light, and the light source or control gear is awaiting a control signal (from a source different from a network) to return to a state with light emission. Lighting control parts enabling the standby function shall be in their control mode. Non-lighting parts shall be disconnected or switched off or their power consumption shall be minimised following manufacturer’s instructions;
- (17) ‘networked standby mode’ means the condition of a connected light source (CLS) or a connected separate control gear (CSCG) where it is connected to the power supply but the light source is intentionally not emitting light or the control gear does not supply the electric power that enables light source(s) to emit light, and is awaiting a remotely initiated trigger to return to a state with light emission. Lighting control parts shall be in their control mode. Non-lighting parts shall be disconnected or switched off or their power consumption shall be minimised following manufacturer’s instructions;
- (18) ‘control mode’ means the condition of lighting control parts where they are connected to the light source and/or to the separate control gear and performing their functions in such a way that a control signal can be internally generated or a remotely initiated trigger can be received, by wire or wireless, and processed to lead to a change in the light emission of the light source or to a corresponding desired change in the power supply by the separate control gear;
- (19) ‘remotely initiated trigger’ means a signal that comes from outside the light source or separate control gear via a network;
- (20) ‘control signal’ means an analogue or digital signal transmitted to the light source or separate control gear wirelessly or wired either via voltage modulation in separate control cables or via a modulated signal in the supply voltage. The signal transmission is not through a network but e.g. from an internal source or from a remote control delivered with the product;
- (21) ‘network’ means a communication infrastructure with a topology of links, an architecture, including the physical components, organisational principles, communication procedures and formats (protocols);

- (22) ‘on-mode power’ (P_{on}), expressed in Watt, means the electric power consumption of a light source in full-load with all lighting control parts and non-lighting parts disconnected. If these parts cannot be disconnected, they shall be switched off or their power consumption shall be minimised following the manufacturer’s instructions. In case of a non-mains light source (NMLS) that requires a separate control gear to operate, P_{on} can be measured directly on the input to the light source, or P_{on} is determined using a control gear with known efficiency, whose electric power consumption is subsequently subtracted from the measured mains power input value;
- (23) ‘no-load power’ (P_{no}), expressed in Watt, is the electric power consumption of a separate control gear in no-load mode;
- (24) ‘standby power’ (P_{sb}), expressed in Watt, is the electric power consumption of a light source or of a separate control gear in standby mode;
- (25) ‘networked standby power’ (P_{net}), expressed in Watt, is the electric power consumption of a connected light source (CLS) or of a connected separate control gear (CSCG) in networked standby mode;
- (26) ‘reference control settings’ (RCS) means a control setting or a combination of control settings that is used to verify compliance of a light source with this Regulation. These settings are relevant for light sources that allow the end-user to control, manually or automatically, directly or remotely, the luminous intensity, colour, correlated colour temperature, spectrum, and/or beam angle of the emitted light.

In principle, the reference control settings shall be those predefined by the manufacturer as factory default values and encountered by the user at first installation (out-of-the-box values). If the installation procedure provides for an automatic software update during first installation, or if the user has the option to perform such an update, the resulting change in settings (if any) shall be taken into account.

If the out-of-the-box value is deliberately set differently from the reference control setting (e.g. at low power for safety purposes), the manufacturer shall indicate in the technical documentation how to recall the reference control settings for compliance verification.

The light source manufacturer shall define the reference control settings such that:

- the light source is within the scope of this Regulation according to Article 1 and none of the conditions for exemption applies;
- lighting control parts and non-lighting parts are disconnected or switched-off or, in case this is not possible, the power consumption of these parts is minimal;
- the full-load condition is obtained;
- when the end-user opts to reset factory defaults, the reference control settings are obtained.

For light sources that allow the manufacturer of a containing product to make implementation choices that influence light source characteristics (e.g. definition of the operating current(s); thermal design), and that cannot be controlled by the end-

user, the reference control settings need not be defined. In that case the nominal test conditions as defined by the light source manufacturer apply;

- (27) 'high-pressure mercury light source' means a high intensity discharge light source in which the major portion of light is produced, directly or indirectly, by radiation from predominantly vaporised mercury operating at a partial pressure in excess of 100 kilopascals;
- (28) 'metal halide light source' (MH) means a high intensity discharge light source in which the light is produced by radiation from a mixture of metallic vapour, metal halides and the products of the dissociation of metal halides. MH light sources may have one ('single-ended') or two ('double-ended') connectors to their electricity supply. The material for the arc tube of MH light sources can be quartz (QMH) or ceramic (CMH);
- (29) 'compact fluorescent light source' (CFL) means a single-capped fluorescent light source with a bent-tube construction designed to fit in small spaces. CFLs may be primarily spiral-shaped (i.e. curly forms) or primarily shaped as connected multiple parallel tubes, with or without a second bulb-like envelope. CFLs are available with (CFLi) or without (CFLni) a physically integrated control gear;
- (30) 'T2', 'T5', 'T8', 'T9' and 'T12' means a tubular light source with a diameter of approximately 7, 16, 26, 29 and 38 mm respectively, as defined in standards. The tube can be straight (linear) or bent (e.g. U-shaped, circular);
- (31) 'LFL T5-HE' means a high-efficiency linear fluorescent T5 light source with driving current lower than 0,2 A;
- (32) 'LFL T5-HO' means a high-output linear fluorescent T5 light source with driving current higher than or equal to 0,2 A;
- (33) 'LFL T8 2-foot', 'LFL T8 4-foot' or 'LFL T8 5-foot' means a linear T8 fluorescent light source with a length of approximately 600 mm (2 feet), 1200 mm (4 feet) or 1500 mm (5 feet) respectively, as defined in standards;
- (34) 'magnetic induction light source' means a light source using fluorescent technology, where energy is transferred to the gas discharge by means of an induced high-frequency magnetic field, instead of using electrodes placed inside the gas discharge. The magnetic inductor can be external or internal to the shape of the discharge tube;
- (35) 'G4', 'GY6.35' and 'G9' means an electrical interface for a light source consisting of two small pins at distances of 4, 6,35 and 9 mm respectively, as defined in standards;
- (36) 'HL R7s' means a mains-voltage, double-capped, linear halogen light source with a cap diameter of 7 mm;
- (37) 'G9.5', 'GX9.5', 'GY9.5', 'G9.5HPL', 'G16d', 'GX16d', 'GY16', 'G22' and 'G38' means an electrical interface for a light source consisting of two pins at distances of 9.5, 16, 22 and 38 mm respectively, as defined in standards. 'G9.5HPL' includes a heatsink of specific dimensions as used on high-performance halogen lamps, and may include additional pins for grounding purposes;
- (38) 'P28s', 'P40s' and 'PGJX50' means an electrical interface for a light source that uses a flange contact to correctly position (pre-focus) the light source in a reflector, as defined in standards;
- (39) 'QXL (Quick eXchange Lamp)' means an electrical interface for a light source consisting, on the light source side, of two lateral tabs including the electrical contact

surfaces and, on the opposite (rear) side, of a central protrusion allowing the light source to be grabbed with two fingers. It has been specifically designed for use in a class of stage lighting luminaires, in which the light source is inserted from the rear of the luminaire using a one quarter turn rotation to fix or unfix it;

- (40) ‘battery-operated’ means a product that operates only on direct current (DC) supplied from a source contained in the same product, without being connected directly or indirectly to the mains electricity supply;
- (41) ‘second envelope’ means a second outer envelope on an HID light source that is not required for the production of light, such as an external sleeve for preventing mercury and glass release into the environment in case of lamp breakage. In determining the presence of a second envelope, the HID arc tubes shall not count as an envelope;
- (42) ‘non-clear envelope’ for an HID light source means a non-transparent outer envelope or outer tube in which the light producing arc tube is not visible;
- (43) ‘anti-glare shield’ means a mechanical or optical reflective or non-reflective impervious baffle designed to block direct visible radiation emitted from the light emitter in a directional light source, in order to avoid temporary partial blindness (disability glare) if viewed directly by an observer. It does not include surface coating of the light emitter in the directional light source;
- (44) ‘control gear efficiency’ is the output power that supplies a light source divided by the input power of a separate control gear using the conditions and methods defined in standards. Any lighting control parts and non-lighting parts are disconnected, switched off or set to minimum power consumption according to manufacturer’s instructions and subtracting this power consumption from the overall input power;
- (45) ‘functionality after endurance testing’ means the functionality of a LED or OLED light source after endurance testing as defined in Annex V;
- (46) ‘flicker’ means the perception of visual unsteadiness induced by a light stimulus, the luminance or spectral distribution of which fluctuates with time, for a static observer in a static environment. The fluctuations can be periodic and non-periodic and may be induced by the light source itself, the power source or other influencing factors.

The metric for flicker used in this Regulation is the parameter ‘Pst LM’, where ‘st’ stands for short term and ‘LM’ for light flickermeter method, as defined in standards. A value Pst LM=1 means that the average observer has a 50 % probability of detecting flicker;

- (47) ‘stroboscopic effect’ means a change in motion perception induced by a light stimulus, the luminance or spectral distribution of which fluctuates with time, for a static observer in a non-static environment. The fluctuations can be periodic and non-periodic and may be induced by the light source itself, the power source or other influencing factors.

The metric for the stroboscopic effect used in this Regulation is the ‘SVM’ (stroboscopic visibility measure), as defined in standards. SVM = 1 represents the visibility threshold for an average observer;

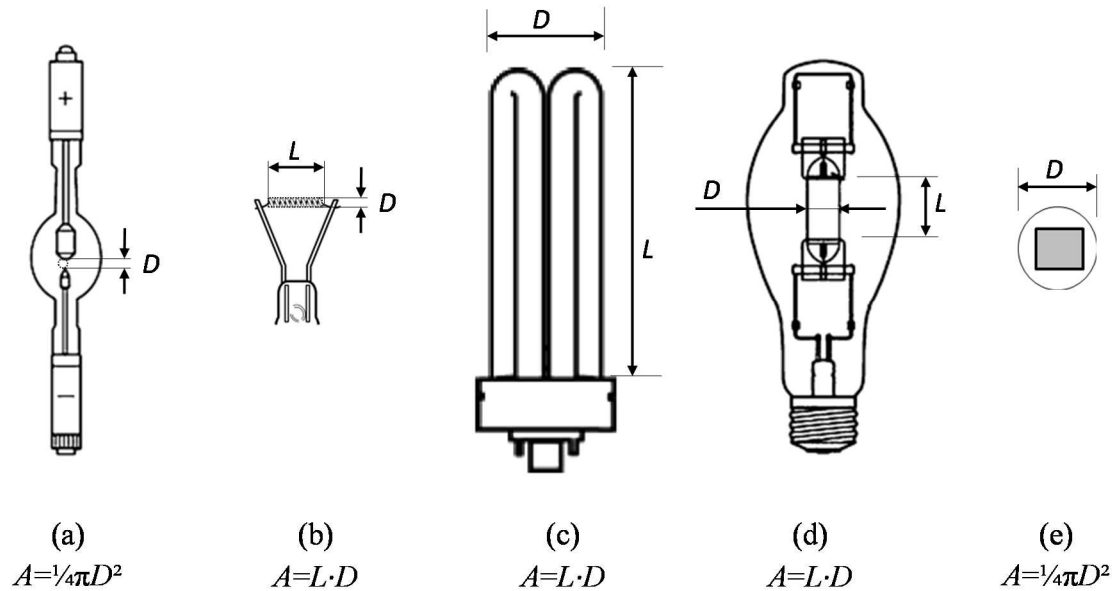
- (48) ‘declared value’ for a parameter means the value given by the manufacturer or importer in the technical documentation pursuant to point 2 of Annex IV to Directive 2009/125/EC;

- (49) ‘specific effective radiant ultraviolet power’ (mW/klm) means the effective power of the ultraviolet radiation of a light source weighted according to the spectral correction factors and related to its luminous flux;
- (50) ‘luminous intensity’ (candela or cd) means the quotient of the luminous flux leaving the source and propagated in the element of solid angle containing a given direction, by the element of solid angle;
- (51) ‘correlated colour temperature’ (CCT [K]) means the temperature of a Planckian (black body) radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions;
- (52) ‘colour consistency’ means the maximum deviation of the initial (after a short period of time), spatially averaged chromaticity coordinates (x and y) of a single light source from the chromaticity centre point (cx and cy) declared by the manufacturer or the importer, expressed as the size (in steps) of the MacAdam ellipse formed around the chromaticity centre point (cx and cy);
- (53) ‘displacement factor (cos ϕ_1)’ means the cosine of the phase angle ϕ_1 between the fundamental harmonic of the mains supply voltage and the fundamental harmonic of the mains current. It is used for mains light sources using LED- or OLED-technology. The displacement factor is measured at full-load, for the reference control settings where applicable, with any lighting control parts in control mode and non-lighting parts disconnected, switched off or set to minimum power consumption according to the manufacturer’s instructions;
- (54) ‘lumen maintenance factor’ (LMF) means the ratio of the luminous flux emitted by a light source at a given time in its life to the initial luminous flux;
- (55) ‘survival factor’ (SF) means the defined fraction of the total number of light sources that continue to operate at a given time under defined conditions and switching frequency;
- (56) ‘lifetime’ for LED and OLED light sources means the time in hours between the start of their use and the moment when for 50 % of a population of light sources the light output has gradually degraded to a value below 70 % of the initial luminous flux. This is also referred to as the $L_{70}B_{50}$ lifetime;
- (57) ‘equivalent model’ means a model with the same relevant technical and performance characteristics as another model placed on the market under a different commercial code;
- (58) ‘end-user’ means a natural person buying or expected to buy a product for purposes which are outside his trade, business, craft or profession;
- (59) ‘photosensitive patients’ means people with a specific condition causing photosensitive symptoms and who experience adverse reactions to natural and/or certain forms of artificial lighting technology;
- (60) ‘projected light-emitting surface area (A)’ is the surface area in mm² (square millimetres) of the view in an orthographic projection of the light-emitting surface from the direction with the highest light intensity, where the light-emitting surface area is the surface area of the light source that emits light with the declared optical characteristics, such as the approximately spherical surface of an arc (a), cylindrical surface of a filament coil (b) or a gas discharge lamp (c, d), flat or semi-spherical envelope of a light-emitting diode (e).

For light sources with a non-clear envelope or with anti-glare shield, the light-emitting surface area is the entire area through which light leaves the light source.

For light sources containing more than one light emitter, the projection of the smallest gross volume enveloping all emitters shall be taken as the light-emitting surface.

For HID light sources definition (a) applies, unless the dimensions defined in (d) apply with $L > D$, where L is the distance between the electrode tips and D the inner diameter of the arc tube.



ANNEX II

Ecodesign requirements

For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and calculations shall be made using harmonised standards the reference numbers of which have been published for this purpose in the *Official Journal of the European Union*, or other reliable, accurate and reproducible methods, which take into account the generally recognised state-of-the-art.

1. Energy efficiency requirements:

- (a) From 1 September 2021, the declared power consumption of a light source P_{on} shall not exceed the maximum allowed power P_{onmax} (in W), defined as a function of the declared useful luminous flux Φ_{use} (in lm) and the declared colour rendering index CRI (-) as follows:

$$P_{onmax} = C * (L + \Phi_{use} / (F * \eta)) * R$$

where:

- The values for threshold efficacy (η in lm/W) and end loss factor (L in W) are specified in Table 1, depending on the light source type. They are constants used for computations and do not reflect true parameters of light sources. The threshold efficacy is not the minimum required efficacy; the latter can be computed by dividing the useful luminous flux by the computed maximum allowed power.
- Basic values for correction factor (C) depending on light source type, and additions to C for special light source features are specified in Table 2.
- Efficacy factor (F) is:
 - 1,00 for non-directional light sources (NDLS, using total flux)
 - 0,85 for directional light sources (DLS, using flux in a cone)
- CRI factor (R) is:
 - 0,65 for $CRI \leq 25$
 - $(CRI+80)/160$ for $CRI > 25$

Table 1 — Threshold efficacy (η) and end loss factor (L)

Light source description	η	L
	[lm/W]	[W]
LFL T5-HE	98,8	1,9
LFL T5-HO, $4000 \leq \Phi \leq 5000$ lm	83,0	1,9
LFL T5-HO, other lm output	79,0	1,9
FL T5 circular	79,0	1,9
FL T8 other than LFL 2-, 4- and 5-foot (including FL T8 U-shaped)	89,7	4,5
FL using magnetic induction, any length/flux	70,2	2,3
CFLni	70,2	2,3
FL T9 circular	71,5	6,2
HPS single-ended	88,0	50,0
HPS double-ended	78,0	47,7
MH ≤ 405 W single-ended	84,5	7,7
MH > 405 W single-ended	79,3	12,3
MH ceramic double-ended	84,5	7,7
MH quartz double-ended	79,3	12,3
Organic light-emitting diode (OLED)	65,0	1,5
HL R7s ≤ 2700 lm	26,0	13,0
Other light sources in scope not mentioned above	120,0	1,5*

* For connected light sources (CLS) a factor L=2,0 shall be applied.

Table 2 — Correction factor C depending on light source characteristics

Light source type	Basic C value
Non-directional (NDLS) not operating on mains (NMLS)	1,00
Non-directional (NDLS) operating on mains (MLS)	1,08
Directional (DLS) not operating on mains (NMLS)	1,15
Directional (DLS) operating on mains (MLS)	1,23
Special light source feature	Bonus on C
FL or HID with CCT > 5000 K	+0,10
FL with CRI > 90	+0,10
HID with second envelope	+0,10
MH NDLS > 405 W with non-clear envelope	+0,10
DLS with anti-glare shield	+0,20
Colour-tuneable light source (CTLS)	+0,10

Where applicable, bonuses on correction factor C are cumulative.

Light sources that allow the end-user to adapt the spectrum and/or the beam angle of the emitted light, thus changing the values for useful luminous flux, colour rendering index (CRI) and/or correlated colour temperature (CCT), and/or changing the directional/non-directional status of the light source, shall be evaluated using the reference control settings, at full-load.

The standby power P_{sb} of a light source shall not exceed 0,5 W.

The networked standby power P_{net} of a connected light source shall not exceed 0,5 W.

The allowable values for P_{sb} and P_{net} shall not be added together.

- (b) From 1 September 2021, the values set in Table 3 for the minimum energy efficiency requirements of a separate control gear operating at full-load shall apply:

Table 3 — Minimum energy efficiency for separate control gear at full-load

Declared output power of the control gear (P_{cg}) or declared power of the light source (P_{ls}) in W, as applicable	Minimum energy efficiency
<u>Control gear for HL light sources</u> all wattages P_{cg}	0,91
<u>Control gear for FL light sources</u> $P_{ls} \leq 5$ $5 < P_{ls} \leq 100$ $100 < P_{ls}$	0,71 $P_{ls} / (2 * \sqrt{(P_{ls} / 36) + 38 / 36 * P_{ls} + 1})$ 0,91
<u>Control gear for HID light sources</u> $P_{ls} \leq 30$ $30 < P_{ls} \leq 75$ $75 < P_{ls} \leq 105$ $105 < P_{ls} \leq 405$ $405 < P_{ls}$	0,78 0,85 0,87 0,90 0,92
<u>Control gear for LED or OLED light sources</u> all wattages P_{cg}	$P_{cg}^{0,81} / (1,09 * P_{cg}^{0,81} + 2,10)$

Multi-wattage separate control gears shall comply with the requirements in Table 3 according to the maximum declared power on which they can operate.

The no-load power P_{no} of a separate control gear shall not exceed 0,5 W. This applies only to separate control gear for which the manufacturer or importer has declared in the technical documentation that it has been designed for no-load mode.

The standby power P_{sb} of a separate control gear shall not exceed 0,5 W.

The networked standby power P_{net} of a connected separate control gear shall not exceed 0,5 W. The allowable values for P_{sb} and P_{net} shall not be added together.

2. Functional requirements:

- (a) From 1 September 2021, the functional requirements specified in Table 4 shall apply for light sources:

Table 4 — Functional requirements for light sources

Colour rendering	CRI ≥ 80 (except for HID with $\Phi_{\text{use}} > 4 \text{ klm}$ and for light sources intended for use in outdoor applications, industrial applications or other applications where lighting standards allow a CRI <80 , when a clear indication to this effect is shown on the light source packaging and in all relevant printed and electronic documentation)
Displacement factor (DF, $\cos \phi_1$) at power input P_{on} for LED and OLED MLS	No limit at $P_{\text{on}} \leq 5 \text{ W}$, DF $\geq 0,5$ at $5 \text{ W} < P_{\text{on}} \leq 10 \text{ W}$, DF $\geq 0,7$ at $10 \text{ W} < P_{\text{on}} \leq 25 \text{ W}$ DF $\geq 0,9$ at $25 \text{ W} < P_{\text{on}}$
Lumen maintenance factor (for LED and OLED)	The lumen maintenance factor $X_{\text{LMF}}\%$ after endurance testing according to Annex V shall be at least $X_{\text{LMF,MIN}}\%$ calculated as follows: $X_{\text{LMF,MIN}}\% = 100 * e^{\frac{3\,000 * \ln(0.7)}{L_{70}}}$ where L_{70} is the declared $L_{70}B_{50}$ lifetime (in hours) Upper limit for $X_{\text{LMF,MIN}}\%$: the calculated required lumen maintenance of the sample shall not exceed 96,0 % (i.e., $X_{\text{LMF,MIN}} \leq 96,0\%$)
Survival factor (for LED and OLED)	Light sources should be operational as specified in row “Survival factor (for LED and OLED)” of Annex IV, Table 6, following the endurance testing given in Annex V.
Colour consistency for LED and OLED light sources	Variation of chromaticity coordinates within a six-step MacAdam ellipse or less.
Flicker for LED and OLED MLS	$P_{\text{st LM}} \leq 1,0$ at full-load
Stroboscopic effect for LED and OLED MLS	$SVM \leq 1,6$ at full-load

3. Information requirements:

(a) Information to be displayed on the light source itself

For all light sources, except CTLS, LFL, CFLni, other FL, and HID, the value and physical unit of the useful luminous flux (lm) and correlated colour temperature (K) shall be displayed in a legible font on the surface if, after the inclusion of safety-related information, there is sufficient space available for it without unduly obstructing the light emission.

For directional light sources, the beam angle ($^\circ$) shall also be indicated.

If there is room for only two values, the useful luminous flux and the correlated colour temperature shall be displayed. If there is room for only one value, the useful luminous flux shall be displayed.

(b) Information to be visibly displayed on the packaging

(1) Light sources:

Light sources within the scope of this Regulation are within the scope of Regulation (EU) *[OP, please insert here references of the accompanying energy labelling regulation]* supplementing Regulation (EU) 2017/1369 with regard to energy labelling for light sources. As concerns the information to be visibly displayed on the packaging of light sources, manufacturers and importers shall apply the requirements set out in Annex V of Regulation (EU) *[OP, please insert here references of the accompanying energy labelling regulation]*.

(2) Separate control gears:

If a separate control gear is placed on the market as a stand-alone product and not as a part of a containing product, in a packaging containing information to be visibly displayed to potential buyers, prior to their purchase, the following information shall be clearly and prominently displayed on the packaging:

- (a) the maximum output power of the control gear (for HL, LED and OLED) or the power of the light source for which the control gear is intended (for FL and HID);
- (b) the type of light source(s) for which it is intended;
- (c) the efficiency in full-load, expressed in percentage;
- (d) the no-load power (P_{no}), expressed in W and rounded to the second decimal, or the indication that the gear is not intended to operate in no-load mode. If the value is zero, it may be omitted from the packaging but shall nonetheless be declared in the technical documentation and on websites;
- (e) the standby power (P_{sb}), expressed in W and rounded to the second decimal. If the value is zero, it may be omitted from the packaging but shall nonetheless be declared in the technical documentation and on websites;
- (f) the networked standby power (P_{net}), expressed in W and rounded to the second decimal. If the value is zero, it may be omitted from the packaging but shall nonetheless be declared in the technical documentation and on websites;
- (g) a warning if the control gear is not suitable for dimming of light sources or can be used only with specific types of dimmable light sources or using specific wired or wireless dimming methods. In the latter cases, detailed information on the conditions in which the control gear can be used for dimming shall be provided on the manufacturer's or importer's website;
- (h) a QR-code redirecting to a website optimised for mobile devices, or the internet address for a website, where full information on the control gear can be found.

The information does not need to use the exact wording on the list above. Alternatively, it may be displayed in the form of graphs, drawings or symbols.

(c) Information to be visibly displayed on a free-access website

(1) Light sources:

Light sources within the scope of this Regulation are within the scope of Regulation (EU) *[OP, please insert here references of the accompanying energy labelling regulation]* supplementing Regulation (EU) 2017/1369 with regard to energy labelling for light sources. As concerns the information to be visibly displayed on a free-access website, manufacturers and importers shall apply the requirements set out in Annex V of Regulation (EU) *[OP, please insert here references of the accompanying energy labelling regulation]* in relation to the product database set out in Article 4 of Regulation (EU) 2017/1369.

(2) Separate control gears:

For any separate control gear that is placed on the market, the following information shall be displayed on at least one free-access website, including a website optimised for mobile devices:

- (a) the information specified in point 3(b)(2), except 3(b)(2)(h);
- (b) the outer dimensions in mm;
- (c) the mass in grams of the control gear, without packaging, and without lighting control parts and non-lighting parts, if any and if they can be physically separated from the control gear;
- (d) instructions on how to remove lighting control parts and non-lighting parts, if any, or how to switch them off or minimise their power consumption during control-gear testing;
- (e) if the control gear can be used with dimmable light sources, a list of minimum characteristics that the light sources should have to be fully compatible with the control gear during dimming, and possibly a list of compatible dimmable light sources;
- (f) recommendations on how to dispose of it at the end of its life in line with Directive 2012/19/EU².

In accordance with point 3(b)(2)(h) of this Annex, the website optimised for mobile devices shall be linked to a QR-code on the packaging of the separate control gear.

The information does not need to use the exact wording in the list above. Alternatively, it may be displayed in the form of graphs, drawings or symbols.

Information on separate control gears that are no longer in production or that are not, or no longer, intended for sale in the European Union should be clearly marked as such and/or moved to a separate section of the website.

(d) Technical documentation

(1) Light sources:

Light sources within the scope of this Regulation are within the scope of Regulation (EU) *[OP, please insert here references of the accompanying energy labelling regulation]* supplementing Regulation (EU) 2017/1369 with regard to energy labelling for light sources. The technical documentation for the purposes of conformity assessment pursuant to Article 5 of this Regulation shall include the information in the order and as set out in Annex VI of

² OJ L 197, 24.7.2012, p. 38.

Regulation (EU) *[OP, please insert here references of the accompanying energy labelling regulation]*. For market surveillance purposes, the verification procedure set out in Annex IV to this Regulation applies; manufacturers may refer to the technical documentation uploaded to the product database which contains the same information in accordance with Regulation (EU) *[OP, please insert here references of the accompanying energy labelling regulation]*.

(2) Separate control gears:

The information specified in point 3(c)(2) of this Annex shall also be contained in the technical documentation file drawn up for the purposes of conformity assessment pursuant to Article 8 of Directive 2009/125/EC.

(e) Information for products specified in Annex III, point 3

For the light sources and separate control gears specified in Annex III, point 3, the intended purpose shall be stated on all forms of packaging, product information and advertisement, together with an explicit indication that the light source or separate control gear is not intended for use in other applications.

In particular for light sources indicated in Annex III, point 3(p), it shall be stated: ‘This light source is only for use by photo sensitive patients. Use of this light source will lead to increased energy cost compared to an equivalent more energy efficient product.’

ANNEX III

Exemptions

1. This Regulation shall not apply to light sources and separate control gears specifically tested and approved to operate:
 - (a) in potentially explosive atmospheres, as defined in Directive 2014/34/EU of the European Parliament and of the Council³;
 - (b) for emergency use, as set out in Directive 2014/35/EU of the European Parliament and of the Council⁴;
 - (c) in radiological and nuclear medicine installations, as defined in Article 3 of Directive 2009/71/EURATOM⁵;
 - (d) in or on military or civil defence establishments, equipment, ground vehicles, marine equipment or aircraft, as set out in Member States' regulations or in documents issued by the European Defence Agency;
 - (e) in or on motor vehicles, their trailers and systems, interchangeable towed equipment, components and separate technical units as set out in Regulation (EC) No 661/2009 of the European Parliament and of the Council⁶, Regulation (EU) No 167/2013 of the European Parliament and of the Council⁷ and Regulation (EU) No 168/2013 of the European Parliament and of the Council⁸;
 - (f) in or on non-road mobile machinery as set out in Regulation (EU) 2016/1628 of the European Parliament and of the Council⁹;
 - (g) in or on civil aviation aircrafts, as set out in Commission Regulation (EU) No 748/2012¹⁰;
 - (h) in railway vehicle lighting, as set out in Directive 2008/57/EC of the European Parliament and of the Council¹¹;
 - (i) in marine equipment, as set out in Directive 2014/90/EU of the European Parliament and of the Council¹²;
 - (j) in medical devices, as set out in Council Directive 93/42/EEC¹³ and in vitro medical devices as set out in Directive 98/79/EC of the European Parliament and of the Council¹⁴.

For the purpose of this point, 'specifically tested and approved' means that the light source or separate control gear:

- has been specifically tested for the mentioned operating condition or application, according to the European legislation mentioned or related

³ OJ L 96, 29.3.2014, p. 309-356.

⁴ OJ L 96, 29.3.2014, p. 357.

⁵ OJ L 172, 2.7.2009, p. 18-.

⁶ OJ L 200, 31.7.2009, p. 1-24.

⁷ OJ L 60, 2.3.2013, p. 1-51.

⁸ OJ L 60, 2.3.2013, p. 52.

⁹ OJ L 252, 16.9.2016, p. 53-117.

¹⁰ OJ L 224, 21.8.2012, p. 1-85.

¹¹ OJ L 191, 18.7.2008, p. 1-45

¹² OJ L 257, 28.8.2014, p. 146-185.

¹³ OJ L 169, 12.7.1993, p. 1.

¹⁴ OJ L 331, 7.12.1998, p. 1.

implementing measures, or relevant European or international standards, or, in the absence of these, according to relevant Member States legislation; and

- is accompanied by evidence, in the form of a certificate, a type approval mark, a test report or other documentation, that the product has been specifically approved for the mentioned operating condition or application; and
- is placed on the market specifically for the mentioned operating condition or application, as evidenced at least by the technical documentation, information on the packaging and any advertising or marketing materials.

2. In addition, this Regulation shall not apply to:

- (a) double-capped fluorescent T5 light sources with power $P \leq 13$ W;
- (b) electronic displays (e.g. televisions, computer monitors, notebooks, tablets, mobile phones, e-readers, game consoles), including but not limited to displays within the scope of Regulation (EU) *[OP, please insert here references of the new regulation on ecodesign requirements for electronic displays and TVs]*, Commission Regulation (EU) No 617/2013¹⁵, Commission Decision (EU) 2015/1402¹⁶, Commission Regulation (EC) No 642/2009¹⁷, Commission Decision (EU) 2016/1756¹⁸, Commission Communication COM(2015) 178¹⁹;
- (c) light sources in range hoods within the scope of Commission Delegated Regulation (EU) No 65/2014;
- (d) light sources and separate control gears in battery-operated products, including but not limited to e.g. torches, mobile phones with an integrated torch light, toys including light sources, desk lamps operating only on batteries, armband lamps for cyclists, solar-powered garden lamps;
- (e) light sources and separate control gears on bicycles and other non-motorised vehicles.

3. Any light source or separate control gear within the scope of this Regulation shall be exempt from the requirements of this Regulation, with the exception of the information requirements set out in Annex II, point 3.e, if they are specifically designed and marketed for their intended use in at least one of the following applications:

- (a) signalling (including, but not limited to, road-, railway-, marine- or air traffic-signalling, traffic control or airfield lamps);
- (b) image capture and image projection (including, but not limited to, photocopying, printing (directly or in pre-processing), lithography, film and video projection, holography);
- (c) light sources with specific effective ultraviolet power >2 mW/klm and intended for use in applications requiring high UV-content;
- (d) light sources with a peak radiation around 253,7 nm and intended for germicidal use (destruction of DNA);

¹⁵ OJ L 175, 27.6.2013, p. 13.

¹⁶ OJ L 217, 18.8.2015, p. 9 (office equipment, computers).

¹⁷ OJ L 191, 23.7.2009, p. 42 (televisions).

¹⁸ OJ L 268, 1.10.2016, p. 90 (office equipment, displays).

¹⁹ COM(2015) 178 final, 22.4.2015 (related to self-regulatory initiative regarding game consoles).

- (e) light sources emitting 5 % or more of total radiation power of the range 250-800 nm in the range of 250-315 nm and/or 20 % or more of total radiation power of the range 250-800 nm in the range of 315-400 nm, and intended for disinfection or fly trapping;
- (f) light sources with the primary purpose of emitting radiation around 185,1 nm and intended to be used for the generation of ozone;
- (g) light sources emitting 40 % or more of total radiation power of the range 250-800 nm in the range of 400-480 nm, and intended for coral zooxanthellae symbioses;
- (h) FL light sources emitting 80 % or more of total radiation power of the range 250-800 nm in the range of 250-400 nm, and intended for sun-tanning;
- (i) HID light sources emitting 40 % or more of total radiation power of the range 250-800 nm in the range of 250-400 nm, and intended for sun-tanning;
- (j) light sources with a photosynthetic efficacy $>1.2 \mu\text{mol/J}$, and/or emitting 25 % or more of total radiation power of the range 250-800 nm in the range of 700-800 nm, and intended for use in horticulture;
- (k) HID light sources with correlated colour temperature CCT $> 7\,000 \text{ K}$ and intended for use in applications requiring such a high CCT;
- (l) light sources with a beam angle of less than 10° and intended for spot-lighting applications requiring a very narrow light beam;
- (m) halogen light sources with cap-type G9.5, GX9.5, GY9.5, GZ9.5, G9.5HPL, G16d, GX16, GX16d, GY16, G22, G38, GX38, GX38Q, P28s, P40s, PGJX50, QXL, designed and marketed specifically for scene-lighting use in film studios, TV studios, and photographic studios, or for stage-lighting use in theatres, discos and during concerts or other entertainment events;
- (n) colour-tuneable light sources that can be set to at least the colours listed in this point and which have for each of these colours, measured at the dominant wavelength, a minimum colour purity index of:

Blue	440nm — 490nm	90 %
Green	520nm — 540nm	65 %
Red	610nm — 670nm	95 %

 and are intended for use in applications requiring high-quality coloured light;
- (o) light sources accompanied by an individual calibration certificate detailing the exact radiometric flux and/or spectrum under specified conditions, and intended for use in photometric calibration (of e.g. wavelength, flux, colour temperature, colour rendering index), or for laboratory use during the evaluation of coloured surfaces and materials under standard viewing conditions (e.g. standard illuminants);
- (p) light sources provided specifically for use by photosensitive patients, to be sold in pharmacies and other authorised selling points (e.g. suppliers of disability products), upon presentation of a medical prescription;
- (q) incandescent light sources (not including halogen light sources) fulfilling all of the following conditions: power $\leq 40 \text{ W}$, length $\leq 60 \text{ mm}$, diameter $\leq 30 \text{ mm}$,

declared suitable for operation at ambient temperature ≥ 300 °C, and intended for use in high temperature applications such as ovens;

- (r) halogen light sources fulfilling all of the following conditions: cap-type G4, GY6.35 or G9, power ≤ 60 W, declared suitable for operation at ambient temperature ≥ 300 °C, and intended for use in high temperature applications such as ovens;
- (s) halogen light sources with blade contact-, metal lug-, cable-, litz wire- or non-standard customised electrical interface, specifically designed and marketed for industrial or professional electro-heating equipment (e.g. stretch blow-moulding process in PET-Industry, 3D-printing, gluing, inks, paint and coating hardening);
- (t) halogen light sources fulfilling all of the following conditions: R7s cap, CCT $\leq 2\,500$ K, length not in the ranges 75-80 mm and 110-120 mm, specifically designed and marketed for industrial or professional electro-heating equipment (e.g. stretch blow-moulding process in PET-Industry, 3D-printing, gluing, inks, paint and coating hardening);
- (u) single capped fluorescent lamps (CFLni) having a diameter of 16 mm (T5), 2G11 4 pin base, with CCT = 3 200 K and chromaticity coordinates $x=0,415$ $y=0,377$, or with CCT=5 500 K and chromaticity coordinates $x=0,330$ $y=0,335$, specifically designed and marketed for studio and video applications for traditional filmmaking.

ANNEX IV

Verification procedure for market surveillance purposes

The verification tolerances defined in this Annex relate only to the verification of the measured parameters by Member State authorities. These tolerances shall not be used by the manufacturer or importer as an allowed tolerance to establish the values in the technical documentation or in interpreting these values with a view to achieving compliance or to communicate better performance by any means.

When verifying the compliance of a product model with the requirements laid down in this Regulation pursuant to Article 3(2) of Directive 2009/125/EC, the authorities of the Member States shall apply the following procedure:

1. The Member State authorities shall verify one single unit of the model for points 2(a) and 2(b) of this Annex.

The Member State authorities shall verify 10 units of the light source model or 3 units of the separate control gear model, supplied from at least two different sources, for point 2(c) of this Annex. For light sources, if the acquisition costs for the 10 units exceed 500 euros, the authorities of the Member State may reduce the sample size to 3 units. The verification tolerances are laid down in Table 6 of this Annex.

2. The model shall be considered to comply with the applicable requirements if:
 - (a) the values given in the technical documentation pursuant to point 2 of Annex IV to Directive 2009/125/EC (declared values), and, where applicable, the values used to calculate these values, are not more favourable for the manufacturer or importer than the results of the corresponding measurements carried out pursuant to paragraph (g) thereof; and
 - (b) the declared values meet any requirements laid down in this Regulation, and any required product information published by the manufacturer or importer does not contain values that are more favourable for the manufacturer or importer than the declared values; and
 - (c) when the authorities of the Member State test the units of the model, the determined values comply with the respective verification tolerances as given in Table 6 of this Annex, where 'determined value' means the arithmetical mean over the tested units of the measured values for a given parameter or the arithmetical mean of parameter values calculated from other measured values.
3. If the results referred to in point 2(a) or (b) are not achieved, the model and all models that have been listed as equivalent models in the manufacturer's or importer's technical documentation shall be considered not to comply with this Regulation.
4. If the result referred to in point 2(c) is not achieved, the model and all models that have been listed as equivalent models in the manufacturer's or the importer's technical documentation shall be considered not to comply with this Regulation.
5. The authorities of the Member State shall provide all relevant information to the authorities of the other Member States and to the Commission without delay after a decision is taken on the non-compliance of the model in accordance with points 3 and 4 of this Annex.

The authorities of the Member State shall only apply the verification tolerances that are set out in Table 6 and shall use only the procedure described in this Annex. No other tolerances, such as those set out in harmonised standards or in any other measurement method, shall be applied.

Table 6

Parameter	Sample size	Verification tolerances
Full-load on-mode power P_{on} [W]:		
$P_{on} \leq 2W$	3	The determined value shall not exceed the declared value by more than 0,20 W.
	10	The determined value shall not exceed the declared value by more than 0,20 W.
$2W < P_{on} \leq 5W$	3	The determined value shall not exceed the declared value by more than 10 %.
	10	The determined value shall not exceed the declared value by more than 10 %.
$5W < P_{on} \leq 25W$	3	The determined value shall not exceed the declared value by more than 10 %.
	10	The determined value shall not exceed the declared value by more than 5 %.
$25W < P_{on} \leq 100W$	3	The determined value shall not exceed the declared value by more than 7,5 %.
	10	The determined value shall not exceed the declared value by more than 5 %.
$100W < P_{on}$	3	The determined value shall not exceed the declared value by more than 5 %.
	10	The determined value shall not exceed the declared value by more than 2,5 %.
Displacement factor [0-1]	3	The determined value shall not be less than the declared value minus 0,1 units.
	10	The determined value shall not be less than the declared value minus 0,1 units.
Useful luminous flux Φ_{use} [lm]	3	The determined value shall not deviate from the declared by more than 10 %.
	10	The determined value shall not deviate from the declared by more than 5 %.
No-load power P_{no}, Standby power P_{sb} and Networked standby power P_{net} [W]	3	The determined value shall not exceed the declared value by more than 0,10 W.
	10	The determined value shall not exceed the declared value by more than 0,10 W.
CRI [0-100]	3	The determined value shall not be less than the declared value by more than 3,0 units.
	10	The determined value shall not be less than the declared value by more than 2,0 units.
Flicker [P_{st} LM] and stroboscopic effect [SVM]	3	The determined value shall not exceed the declared value by more than 10 %.
	10	The determined value shall not exceed the declared value by more than 10 %.
Colour consistency [MacAdam ellips steps]	3	The determined number of steps shall not exceed the declared number of steps. The centre of the MacAdam ellipse shall be the centre declared by the supplier with a tolerance of 0,01 units.
	10	The determined number of steps shall not exceed the declared number of steps. The centre of the MacAdam ellipse shall be the centre declared by the supplier with a tolerance of 0,005 units.
Beam angle (degrees)	3	The determined value shall not deviate from the declared

		value by more than 25 %.
	10	The determined value shall not deviate from the declared value by more than 25 %.
Control gear efficiency [0-1]	3	The determined value shall not be less than the declared value minus 0,05 units.
	10	The determined value shall not be less than the declared value minus 0,025 units.
Efficacy [lm/W]	3	The determined value (quotient) shall not be less than the declared value minus 10 %.
	10	The determined value (quotient) shall not be less than the declared value minus 5 %.
L₇₀B₅₀ lifetime (for LED and OLED)	3	The determined value shall not be less than the declared value minus 20 %.
	10	The determined value shall not be less than the declared value minus 10 %.
Lumen maintenance factor (for LED and OLED)	3	The determined X _{LMF} % of the sample following the test in Annex V of this Regulation shall not be less than X _{LMF, MIN} % ²⁰ .
	10	
Survival factor (for LED and OLED)	3	All 3 light sources of the test sample must be operational after completing the test in Annex V of this Regulation.
	10	At least 9 light sources of the test sample must be operational after completing the test in Annex V of this Regulation.
Colour purity index [%]	3	The determined value shall not be less than the declared value minus 10 %.
	10	The determined value shall not be less than the declared value minus 5 %.
Correlated colour temperature [K]	3	The determined value shall not deviate from the declared value by more than 10 %.
	10	The determined value shall not deviate from the declared value by more than 5 %.

For light sources with linear geometry which are scalable but of very long length, such as LED strips or strings, verification testing of market surveillance authorities shall consider a length of 50 cm, or, if the light source is not scalable there, the nearest value to 50 cm. The light source manufacturer or importer shall indicate which control gear is suitable for this length.

When verifying if a product is a light source, market surveillance authorities shall compare the measured values for chromaticity coordinates (x and y), luminous flux, luminous flux density, and colour rendering index directly with the limit values set out in the definition for light source of Article 2 of this Regulation, without applying any tolerances. If any of the 3 or 10 units in the sample satisfies the conditions for being a light source, the product model shall be considered to be a light source.

²⁰ There is no tolerance associated with this metric, as it is a fixed requirement and it is up to the manufacturer to declare an L₇₀B₅₀ value to meet it.

ANNEX V

Functionality after endurance testing

Models of LED- and OLED- light sources shall undergo endurance testing to verify their lumen maintenance and survival factor. This endurance testing consists of the test method outlined below. The authorities of a Member State shall test 10 units of the model for this test. However, if the acquisition costs for 10 units exceed EUR 500, the authorities of a Member State have the option to reduce the sample size to 3 units.

The endurance test for LED and OLED light sources shall be conducted as follows:

- (a) Ambient conditions and test setup:
 - (i) The switching cycles are to be conducted in a room with an ambient temperature of 25 ± 10 °C and an average air velocity of less than 0.2 m/s.
 - (ii) The switching cycles on the sample shall be conducted in free air in a vertical base-up position. However, if a manufacturer or importer has declared the light source suitable for use in a specific orientation only, then the sample shall be mounted in that orientation.
 - (iii) The applied voltage during the switching cycles shall have a tolerance within 2 %. The total harmonic content of the supply voltage shall not exceed 3 %. Standards provide guidance on the supply voltage source.
- (b) Provisional endurance test method:
 - (i) Initial flux measurement: measure the luminous flux of the light source prior to starting the endurance test switching cycle.
 - (ii) Switching cycles: operate the light source for 1 200 cycles of repeated, continuous switching cycles without interruption. One complete switching cycle consists of 150 minutes of the light source switched ON at full power followed by 30 minutes of the light source switched OFF. The hours of operation recorded (i.e., 3 000 hours) include only the periods of the switching cycle when the light source was switched ON, i.e. the total test time is 3 600 hours.
 - (iii) Final flux measurement: at the end of the 1 200 switching cycles, note if any lamps have failed (see ‘Survival factor’ in Annex IV, Table 6 of this Regulation) and measure the luminous flux of the light sources that have not failed.
 - (iv) For each of the units in the sample which have not failed, divide the measured final flux by the measured initial flux. Average the resulting values over all the units that did not fail to compute the determined value for the lumen maintenance factor X_{LMF} %.

ANNEX VI **Benchmarks**

For the environmental aspects that were considered significant and are quantifiable, the best available technology on the market, at the time of entry into force of this Regulation, is indicated below.

The best available technology on the market for light sources in terms of their efficacy based on useful luminous flux was identified as follows:

- Non-directional light sources: 120-140 lm/W
- Mains voltage directional light sources: 90-100 lm/W
- Extra low voltage directional light sources: 85- 95 lm/W
- Linear light sources (tubes): 140-160 lm/W

The best available technology on the market for separate control gears have an energy efficiency of 95 %.

Features required in certain applications, e.g. a high colour rendering, might prevent products offering those features from achieving these benchmarks.

The best available technology on the market for light sources and separate control gears do not have any mercury content.