

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



Entwürfe der EU-Kommission vom 13. November 2017

Entwurf der EU-Kommission für eine Regelung mit Anforderungen an die umweltgerechte Gestaltung von Lichtquellen

– 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 * of the Federal Environment Agency (UBA), Germany

The EU Commission's drafts of 13 November 2017

Draft of the EU Commission on a regulation as regards ecodesign requirements for light sources

– 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 * de l'Agence Fédérale de l'Environnement (UBA), Allemagne

Les projets de la Commission Européenne du 13 novembre 2017

Projet de la Commission Européenne pour une réglementation des exigences relatives à l'écoconception de sources lumineuses

– 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.

* <http://www.eup-network.de/de/eup-netzwerk-deutschland/offenes-forum-eu-regelungen-beleuchtung/dokumente/texte/>

Liste der von der EU-Kommission am 13. November 2017 versandten Dokumente und Kennzeichnung des vorliegenden Textes

EN: List of the documents, sent out by EU-Commission on 13 November 2017 and identification of the text at hand

FR: Liste des documents qui la Commission européenne a envoyé le 13 Novembre 2017 et marquage de le présent document

- **Begründung** ◇ **EN: Explanatory memorandum** ◇ **FR: Mémoire explicatif**

Entwurf für Anforderungen an die umweltgerechte Produktgestaltung ◇ **EN: Draft for ecodesign requirements** ◇ **FR: Projet d'exigences d'écoconception**

- Haupttext ◇ **EN: Main text** ◇ **FR: Texte principal**
- Anhang ◇ **EN: Annex** ◇ **FR: Annexe**

Entwurf für Anforderungen an die Energieverbrauchskennzeichnung ◇ **EN: Draft for energy labelling requirements** ◇ **FR: Projet d'exigences sur étiquetage énergétique**

- Haupttext ◇ **EN: Main text** ◇ **FR: Texte principal**
- Anhang ◇ **EN: Annex** ◇ **FR: Annexe**

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* ALED = Anorganische LED (Leuchtdiode), im Gegensatz zur OLED = Organischen LED

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* “LED and OLED” stands here for ILED and OLED; ILED = inorganic LED (light-emitting diode) as opposed to OLED = organic LED

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* DELi = diode électroluminescente inorganique, contrairement à la diode électroluminescente organique (DELo).

Es folgt ein unveränderter Originaltext.

EN: The following is an unmodified original text.

FR: Ce qui suit est un texte original.

DRAFT ANNEXES

of

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

of XXX

**implementing Directive 2009/125/EC of the European Parliament and of the Council
with regard to ecodesign requirements for light sources and separate control gears,**

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.

ANNEX I - 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 ⁽¹⁾ of the European Parliament and of the Council;
 - (a) for emergency use as set out in Directive 2014/35/EU of the Council and the Parliament ⁽²⁾;
 - (b) in radiological and nuclear medicine installations, as defined in Article 3 of Directive 2009/71/EURATOM ⁽³⁾;
 - (c) 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;
 - (d) in or on motor vehicles, their trailers and systems, components and separate technical units intended as set out in Regulation No 661/2009 ⁽⁴⁾ , Regulation (EU) No 168/2013 ⁽⁵⁾ and their amendments;
 - (e) in or on civil aviation aircrafts as set out in Commission Regulation 748/2012 ⁽⁶⁾;
 - (f) in railway vehicle lighting as set out in Directive 2008/57/EC ⁽⁷⁾ and its amendments, as well as relevant Member State legislation;
 - (g) in marine equipment as set out in Council Directive 2014/90/EU ⁽⁸⁾ and its amendments or recasts;
 - (h) in medical devices as set out in Council Directive 93/42/EEC ⁽⁹⁾ and in vitro medical devices as set out in Directive 98/79/EC ⁽¹⁰⁾ and their amendments.

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 implementing acts, relevant Member State legislation, and/or relevant European or international standards, 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

¹ OJ L 96, 29.3.2014, p. 309-356 (the 'ATEX Directive')

² OJ L 96, 29.3.2014, p. 357-. (the 'Low Voltage Directive')

³ OJ L 172, 2.7.2009, p. 18-

⁴ OJ L 200, 31.7.2009, p.1-24

⁵ OJ L60, 2.3.2013, p. 52

⁶ OJ L 224, 21.8.2012, p. 1-85

⁷ OJ L 191, 18.7.2008, p.1-45.

⁸ OJ L 257, 28.8.2014, p. 146–185

⁹ OJ L 169, 12.7.1993, p. 1

¹⁰ OJ L331, 7.12.1998, p.1

- is placed on the market specifically for the mentioned operating condition or application, as evidenced at least by the technical documentation, and possibly by information on the packaging and/or in publicity.
2. In addition, this Regulation shall not apply to:
- (a) double capped fluorescent T5 light sources with power $P \leq 13 \text{ W}$;
 - (b) HID light sources with specific effective ultraviolet power $> 2 \text{ mW/klm}$;
 - (c) HID light sources with colour temperature $T_c > 7000 \text{ K}$;
 - (d) light sources with a beam angle of less than 10° ;
 - (e) electronic displays (e.g. televisions, computer monitors, notebooks, tablets, mobile phones, e-readers, game consoles), including but not limited to displays in scope of Commission Regulation (EU) No 617/2013 ⁽¹¹⁾, Commission Decision (EU) 2015/1402 ⁽¹²⁾, Commission Regulation (EC) No 642/2009 ⁽¹³⁾, Commission Decision (EU) 2016/1756 ⁽¹⁴⁾, European Commission COM(2015)178 ⁽¹⁵⁾;
 - (f) light sources and separate control gears in portable battery-operated products, including but not limited to e.g. torches, mobile phones with integrated torch light, toys including light sources, desk lamps operating only on batteries, armband lamps for cyclists, solar-powered garden lamps;
 - (g) light sources and separate control gears in bicycles and other non-motorized vehicles.
3. Any light source or separate control gear in scope of this Regulation shall be exempt from the requirements of Annex III, with the exception of the information requirements set out in Annex III point 3.5, if it has a specific technical design for its 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, photocopiers and video projectors);
 - (c) ambient temperatures below -30°C or above 120°C .

¹¹ OJ L 175, 27.6.2013, p. 13

¹² OJ L 217, 18.8.2015, p.9 (office equipment, computers)

¹³ OJ L 191, 23.7.2009, p.42 (televisions)

¹⁴ OJ L 268, 1.10.2016, p.90 (office equipment, displays)

¹⁵ COM(2015) 178 final, 22.4.2015 (related to self-regulatory initiative regarding game consoles)

ANNEX II – DEFINITIONS

In addition to the definitions in Article 2, the following definitions apply for the purposes of this Regulation:

- (1) ‘*mains light source (MLS)*’ means a light source that can be operated directly on the mains electricity supply.

Light sources that can operate both directly on the mains, and 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 but they are placed on the market without such control gear.

- (3) ‘*extra low voltage (ELV)*’ means an electricity supply of less than 120 V direct current, as further defined in relevant standards.

- (4) ‘*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°)

- (5) ‘*non-directional light source (NDLS)*’ means a light source that is not a directional light source.

- (6) ‘*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.’. To maintain the reference control settings the data-connection parts cannot be disconnected, switched-off or their power consumption minimised.

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 as a single product.

- (7) ‘*data-connection parts*’ means parts that perform one of the following functions:
- reception or transmission of wired or wireless data signals and the processing thereof (either used to control the light emission function or otherwise),
 - sensing and processing of the sensed signals (either used to control the light emission function or otherwise),
 - actuation by audio control (including voice control),
 - a combination of these.

- (8) ‘*colour-tuneable light source (CTLS)*’ means a connected light source (CLS) using LED or OLED technology, that can be set to emit light with a large variation of colours outside the range defined in article 2 (1)(a), but can also be set to emit white light inside the range defined in article 2 (1)(a) for which the light source is in scope of this Regulation.

The term does not include tuneable-white light sources that can only be set to emit light, with different colour temperatures, within the range defined in article 2 (1)(a).

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

- (9) ‘*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, 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 1275/2008¹⁶.

- (10) '*non-lighting parts*' means parts that are integrated in a light source or in a separate control gear, or physically separate 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 connected 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)
- (11) '*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°).
- (12) '*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 considered.
- For light sources with user-controllable beam angle, the beam angle corresponding to the 'reference control setting' shall be considered.
- (13) '*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.
- (14) '*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 disconnected from light sources, and, if applicable, from data-connection parts, lighting control parts and non-lighting

¹⁶ OJ L 339, 18.12.2008, p. 45 and later amendments.

parts. If these parts cannot be disconnected, they shall be switched off or their power consumption shall be minimized following the manufacturer's instructions.

- (15) '*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 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 minimized following manufacturer's instructions.
- (16) '*networked standby mode*' means the condition of a connected light source (CLS) where it is connected to the power supply but the light source is intentionally not emitting 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 and data-connection parts shall be in a state enabling the networked standby function. Non-lighting parts shall be disconnected or switched off or their power consumption shall be minimized following manufacturer's instructions.
- (17) '*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 lighting control signal can be internally generated or an external control signal 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.
- (18) '*control signal*' means an analogue or digital signal transmitted to 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.
- (19) '*remotely initiated trigger*' means a signal that comes from outside the light source or separate control gear via a network.
- (20) '*network*' means a communication infrastructure with a topology of links, an architecture, including the physical components, organisational principles, communication procedures and formats (protocols).
- (21) '*on-mode power*' (P_{on}), expressed in Watt, is 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 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.

- (22) '*no-load power*' (P_{no}), expressed in Watts, is the electric power consumption of a separate control gear in no-load mode.
- (23) '*standby power*' (P_{sb}), expressed in Watts, is the electric power consumption of a light source or of a separate control gear in standby mode.
- (24) '*networked standby power*' (P_{net}), expressed in Watts, is the electric power consumption of a connected light source in networked standby mode.
- (25) '*reference control settings*' 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, colour temperature, spectrum, and/or beam angle of the emitted light.

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 foresees 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.

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

- the light source is in scope of this Regulation according to Art.2(1) and none of the conditions for exemption of Annex I applies (if this is not possible, the light source is out-of-scope or exempted);
- the power consumption of lighting control parts and non-lighting parts is minimal (if these parts cannot be disconnected or switched-off);
- the full-load condition is obtained (maximum initial luminous flux given the other chosen settings);
- when the end-user opts to reset factory defaults, the reference control settings are obtained.

- (26) ‘*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 vaporized mercury operating at a partial pressure in excess of 100 kilopascals.
- (27) ‘*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.
- (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) physically integrated control gear.
- (30) ‘*T2*’, ‘*T5*’, ‘*T8*’, ‘*T9*’ and ‘*T12*’ means a tubular light source with diameter of approximately 7, 16, 26, 29 and 38 mm respectively, as defined in harmonised 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*' is a mains-voltage, double capped, linear halogen light source with a cap-diameter of 7 mm.
- (37) '*portable battery-operated product*' means a containing product that is not permanently fixed to its surroundings, that is intended to be carried around or to be frequently moved, whose position can be changed by a simple manual pick-and-place operation, and that operates only on direct current (DC) with a voltage of less than 24 V supplied from a source contained in the same product, without being connected directly or indirectly to the mains electricity supply.
- (38) '*second envelope*' means a second outer envelope on a 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.
- (39) '*non-clear envelope*' for a HID light source means a non-transparent outer envelope or outer tube in which the light producing arc tube is not visible.
- (40) '*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.
- (41) '*control gear efficiency*' is the output power divided by the input power of a separate control gear in conditions defined in measurement standards, with any lighting control parts and non-lighting parts disconnected, switched off or set to minimum power consumption according to manufacturer's instructions.
- (42) '*functionality after accelerated endurance testing*' means the functionality of a LED or OLED light source or of a separate control gear for LED or OLED light sources after accelerated endurance testing as defined in Annex V.
- (43) '*Pst LM*' is the metric for flicker used in this Regulation 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.
- (44) '*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.
- (45) '*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.

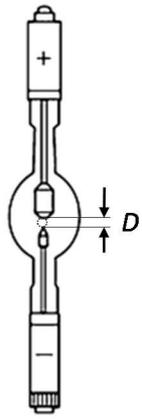
- (46) '*luminous intensity*' (candela or cd) means the quotient of the luminous flux leaving the source and propagated in the element of solid angle containing a given direction, by the element of solid angle.
- (47) '*colour temperature*' (T_c [K]) means the temperature of a Planckian (black body) radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions.
- (48) '*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 (c_x and c_y) declared by the manufacturer or the importer, expressed as the size (in steps) of the MacAdam ellipse formed around the chromaticity centre point (c_x and c_y).
- (49) '*displacement factor* ($\cos \phi_1$)' 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 manufacturer's instructions.

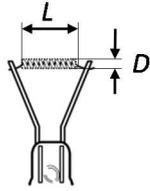
- (50) '*lumen maintenance factor*' (LMF) means the ratio of the luminous flux emitted by a light source at a given time in its life to the initial luminous flux.
- (51) '*survival factor*' (SF) means the defined fraction of the total number of light sources that continue to operate at a given time under defined conditions and switching frequency.
- (52) '*lifetime*' for LED and OLED light sources means the time in hours between the start of their use and the moment when 50% of a population of light sources have either abruptly failed (no light output anymore) or their light output has gradually degraded to a value below 70% of the initial luminous flux. This is also referred to as the $M_{70}F_{50}$ lifetime.
- (53) '*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.
- (54) '*end-user*' means a natural person buying or expected to buy a product for purposes which are outside his trade, business, craft or profession;
- (55) '*projected light-emitting surface area* (A)' is the surface area in mm^2 (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.

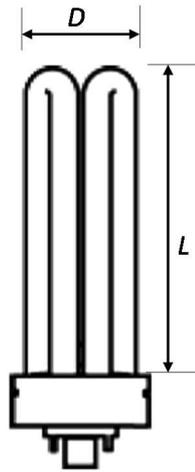
For light sources containing more than one light emitter, the smallest gross volume enveloping all emitters shall be taken as the light-emitting surface.



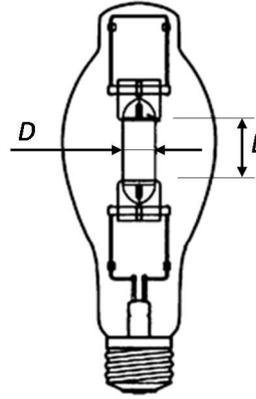
(a)
 $A = \frac{1}{4}\pi D^2$



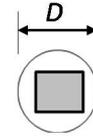
(b)
 $A = L \cdot D$



(c)
 $A = L \cdot D$



(d)
 $A = L \cdot D$



(e)
 $A = \frac{1}{4}\pi D^2$

ANNEX III – ECODESIGN REQUIREMENTS

1. ENERGY EFFICIENCY REQUIREMENTS

1.1. Light sources

The declared power consumption of a light source at full-load P_{on} shall not exceed the maximum allowed power P_{onmax} (in W), defined in function of the declared useful luminous flux Φ_{use} (in lm) and the declared colour rendering index CRI (in Ra) 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.
- 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)

<u>Light source description</u>	<u>η</u> [lm/W]	<u>L</u> [W]
LFL T5-HE	98,8	1,9
LFL T5-HO, $4000 \leq \Phi \leq 5000$ lm	83	1,9
LFL T5-HO, other lm output	79	1,9
FL T5 circular	79	1,9
FL T8 other than LFL 2-, 4- and 5-foot (incl. 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	50
HPS double-ended	78	47,7
MH \leq 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	1,5
HL R7s \leq 2700 lm	26	13
Other light sources in scope not mentioned above	120	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
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 $T_c > 5000 K$	C+0,1
FL with $CRI > 90 Ra$	C+0,1
HID with second envelope	C+0,1
MH NDLS $> 405 W$ with non-clear envelope	C+0,1
DLS with anti-glare shield	C+0,2
Colour-tuneable light source (CTLS)	C+0,1

Where applicable, bonuses on correction factor C are cumulative.

For CTLS (that in this Regulation per definition are CLS), the bonus on factor C applies together with the higher value for L.

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, CRI and/or colour temperature (T_c), and/or changing the DLS/NDLS status, shall be evaluated using the reference control settings, at full-load.

The standby power of a light source P_{sb} shall not exceed 0.5 W

The networked standby power of a connected light source P_{net} shall not exceed 0.5 W

1.2. Separate control gear

The minimum energy efficiency requirements given in Table 3 shall apply for separate control gear operating at full-load:

Table 3: Minimum 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 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>	

$P_{ls} \leq 30$	0,78
$30 < P_{ls} \leq 75$	0,85
$75 < P_{ls} \leq 105$	0,87
$105 < P_{ls} \leq 405$	0,90
$405 < P_{ls}$	0,92
<u>Control gear for LED or OLED light sources</u>	
$P_{cg} \leq 10$	0,70
$10 < P_{cg} \leq 25$	0,75
$25 < P_{cg} \leq 50$	0,83
$50 < P_{cg} \leq 100$	0,86
$100 < P_{cg} \leq 300$	0,88
$300 < P_{cg}$	0,90

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 of a separate control gear P_{no} shall not exceed 0.5 W.

The standby power of a separate control gear P_{sb} shall not exceed 0.5 W.

2. FUNCTIONAL REQUIREMENTS

2.1. Light sources

The functional requirements specified in Table 4 shall apply for light sources.

Table 4: Functional requirements for light sources

Colour rendering	$CRI \geq 80$ Ra (except for HID with $\Phi_{use} > 4$ 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 for LED and OLED MLS	No limit at $P \leq 2W$, $DF \geq 0.4$ at $2W < P \leq 5W$, $DF \geq 0.7$ at $5W < P \leq 25W$ $DF \geq 0.9$ at $25W < P$
Functionality after accelerated endurance testing for LED and OLED	as specified 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	$P_{st} LM \leq 1.0$ at full-load

2.2. **Separate control gears**

There are no functional requirements for separate control gears.

3. **INFORMATION REQUIREMENTS FOR MANUFACTURERS AND IMPORTERS**

3.1. **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 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 colour temperature shall be provided. If there is room for only one value, the useful luminous flux shall be provided.

3.2. **Information to be visibly displayed on the packaging**

3.2.1. *Light sources*

Light sources in scope of this Regulation are in scope of Commission Delegated Regulation (EU) .../... 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 Commission Delegated Regulation (EU) .../... .

3.2.2. *Separate control gears*

If a separate control gear is placed on the market in a packaging containing information to be visibly displayed to users, prior to their purchase, the following information shall also 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. If the value is zero, it may be omitted from the packaging but shall anyway 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 anyway be declared in the technical documentation and on websites;
- (f) 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;

- (g) a QR-code redirecting to a website optimized 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. In addition, it may be displayed in the form of graphs, drawings or symbols.

3.3. Information to be visibly displayed on a free-access website

3.3.1. Light sources

Light sources in scope of this Regulation are in scope of Commission Delegated Regulation (EU) .../... 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 Commission Delegated Regulation (EU) .../... in relation to the product database set out in Article 4 of Regulation (EU) 2017/1369.

Manufacturers and importers are not refrained from setting other free-access websites.

3.3.2. Separate control gears

If a separate control gear is placed on the market, the following information shall be displayed on at least one free-access website, including a website optimized for mobile devices linked to a QR-code on the packaging:

- (a) the information specified in point 3.2.2;
- (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 how to remove lighting control parts and non-lighting parts, if any, or how to switch them off or minimize their power consumption during control gear testing;
- (e) if it 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 for recycling in line with Directive 2012/19/EU ⁽¹⁷⁾.

The information does not need to use the exact wording on the list above. In addition, 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.

¹⁷ OJ L 197, 24.7.2012, p. 38.

The same information 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.

3.4. Technical documentation

Light sources in scope of this Regulation are in scope of Commission Delegated Regulation (EU) .../... supplementing Regulation (EU) 2017/1369 with regard to energy labelling for light sources. The technical documentation file drawn up for the purposes of conformity assessment pursuant to Article 8 of Directive 2009/125/EC shall contain the information set out in Annex V of Commission Delegated Regulation (EU) .../... in relation to the compliance part of the product database set out in Article 4 of Regulation (EU) 2017/1369 and the technical documentation pursuant to Article 3.3 of Regulation (EU) 2017/1369. The two technical documentations, for ecodesign and for energy labelling, can be combined in a single document.

3.5. Information for products specified in Annex I point 3

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

The technical documentation file drawn up for the purposes of conformity assessment in accordance with Article 8 of Directive 2009/125/EC shall list the technical parameters that make the product design specific to qualify for the exemption.

ANNEX IV – VERIFICATION PROCEDURES FOR MARKET SURVEILLANCE AUTHORITIES

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, for the requirements referred to in this Annex, the market surveillance authorities of the Member States shall apply the following procedure:

- (1) The Member State authorities shall verify a single unit of the model.
- (2) The Member State authorities shall assess whether:
 - (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.
- (3) If the results referred to in point 2(a) or (b) are not achieved, the model and all equivalent models shall be considered not to comply with this Regulation.
- (4) If the results referred to in point 2(a) and (b) are achieved, the Member States authorities shall test 10 units of the model. For light sources, if the acquisition costs for the 10 units would exceed 500 euros, Member State authorities may reduce the sample size to 3 units.
- (5) The model and all equivalent models shall be considered to comply with the applicable requirements if the determined values of the applicable parameters comply with the respective verification tolerances as given in Table 6, and the functionality after accelerated endurance testing meets the requirements of Annex V, if applicable. The determined values are assessed as follows:
 - (a) for each unit measure the applicable parameters from Table 6;
 - (b) calculate the determined value of each applicable parameter as the arithmetical mean of the measured values of the 10 units for that parameter.
- (6) If the results referred to in point 5 are not achieved, the model and all equivalent models shall be considered not to comply with this Regulation.
- (7) The Member State authorities shall provide all relevant information to the authorities of the other Member States and to the Commission without delay after a decision being taken on the non-compliance of the model according to points 3 and 6.

Member State authorities shall use reliable, accurate and reproducible measurement procedures, which take into account the generally recognised state-of-the-art measurement methods, including methods set out in documents whose reference numbers have been published for that purpose in the *Official Journal of the European Union*.

The Member State authorities shall only apply the verification tolerances that are set out in Table 6 and shall only use the procedure described in points 1 to 7 for the requirements referred to in this Annex. No other tolerances, such as those set out in harmonised standards or in any other measurement method, shall be applied.

In case light sources and/or control gears are placed on the market as parts inside a containing product or supplied with the product, the manufacturer or importer of this containing product shall facilitate market surveillance authorities verifying compliance of the light sources and/or control gears with this Regulation by providing, on request, the identification of the contained light source(s) and control gear(s), and detailed instructions to the market surveillance authorities on how to dismount light source(s) and/or control gear(s) for inspection without permanent mechanical damage.

If the containing product contains multiple identical light sources connected to one control gear, possibly each individually emitting less than 60 lm but in total emitting more than 60 lm, verification testing of the market surveillance authorities may be limited to a representative subset of the individual light sources and the results can be extrapolated.

The verification tolerances defined in this Annex relate only to the verification of the declared parameters by Member State authorities and shall not be used by the manufacturer 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.

Table 6: Verification tolerances

Parameter	Sample size	Verification tolerances
Full-load on-mode power P_{on} [W]:		
$P_{on} \leq 5W$	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 %.
$5W < P_{on} < 100W$	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 %.
$P_{on} \geq 100W$	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 %.
Power factor [0-1]		
	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 %.
Useful luminous flux Φ_{use} [lm]		
	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 %.
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 deviate from the declared value by more than 3.
	10	The determined value shall not deviate from the declared value by more than 2.

Flicker [<i>P_{st} LM</i>]	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 %.
Colour Consistency [<i>MacAdam ellips steps</i>]	3	The determined number of steps shall not exceed the declared number of steps.
	10	The determined number of steps shall not exceed the declared number of steps.
Control gear efficiency [%]		
$P_{out} \leq 5W$	10	The determined value shall not be less than 90% of the declared value.
$5W < P_{out} < 100W$	10	The determined value shall not be less than 95% of the declared value.
$P_{out} \geq 100W$	10	The determined value shall not be less than 97,5% of the declared value.
Luminous intensity [<i>cd</i>]	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 %.
Beam angle (<i>degrees</i>)	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 %.
Lumen Maintenance Factor (for FL and HID)	3	The determined value shall not be less than 90% of the declared value.
	10	The determined value shall not be less than 95% of the declared value.
Survival Factor (for FL and HID)	3	The determined value shall not be less than 0.65 (1 of 3 allowed to fail)
	10	The determined value shall not be less than 0.90 (1 of 10 allowed to fail).
M₇₀F₅₀ 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%

ANNEX V - FUNCTIONALITY AFTER ACCELERATED ENDURANCE TESTING

1. LED AND OLED LIGHT SOURCES

Models of LED- and OLED- light sources shall undergo accelerated endurance testing to verify their lumen maintenance and survival factor. This accelerated endurance testing shall consist of three single tests as specified below. Member States authorities shall test 10 units of the model for each test. If the acquisition costs for 10 units would exceed 500 euros, Member State authorities have the option to reduce the sample size to 3 units for each test.

- (1) A temperature cycling test as specified in relevant standards. Where no standard is available, the duration of this test shall be 1000h. The temperature is varied from -10°C to $+40^{\circ}\text{C}$ over 4h periods. A 4h period consists of 1h holding time at each end temperature and 1h transfer time with a rate of temperature change of $1^{\circ}\text{C}/\text{min}$ until the end temperature is reached. During the test the model is switched on for 17min and off for 17min.

At the end of the test, all 3 models (if sample size used is 3) or 9 of 10 models (if sample size used is 10) shall operate and have a luminous flux that is not less than 70% of the initial luminous flux for a period of at least 15 min, and show no physical effects of temperature cycling such as cracks or delamination.

- (2) A supply switching test as specified in relevant standards. Where no standard is available, at test voltage, current or power, the model shall be switched on and off for 30 seconds each. The number of switching cycles shall be equal to half the model's declared lifetime with a maximum of 1000h.

At the end of the test, all 3 models (if sample size used is 3) or 9 of 10 models (if sample size used is 10) shall operate and have a luminous flux that is not less than 70% of the initial luminous flux for a period of at least 15 min.

- (3) An accelerated operation life test as specified in relevant standards. Where no standard is available, the duration of this test shall be 1000h. The model shall be operated continuously without switching at a temperature corresponding to 10°C above the maximum specified operating temperature if declared by the manufacturer. If there is no declared value or the value is below 40°C , then the test shall be performed at 50°C . Any thermal protecting devices that would switch off the model or reduce its performance shall be bypassed.

At the end of this test, and after cooling down to room temperature and being stabilized, all 3 models (if sample size used is 3) or 9 of 10 models (if sample size used is 10) shall operate and have a luminous flux that is not less than 80% of the initial luminous flux for a period of at least 15 min.

2. SEPARATE CONTROL GEARS FOR LED AND OLED LIGHT SOURCES

Models of separate control gear for LED- and OLED- light sources shall undergo accelerated endurance testing according to relevant standards to test their survival factor. Member States authorities shall test 10 units of the model for each test.

At the end of each test, 9 of 10 models shall operate normally for a period of at least 15 min.

ANNEX VI – BENCHMARKS

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

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

Energy efficiency

The most efficient light sources have an energy efficiency (based on useful luminous flux) of:

- 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 most efficient separate control gears have an energy efficiency of 95%.

Mercury content

The most efficient light sources and separate control gears do not have any mercury content.