

## ANNEX I

Technical parameters covered and definitions for the purposes of Annexes II to IV

## 1. TECHNICAL PARAMETERS FOR ECODESIGN REQUIREMENTS

For the purposes of compliance and verification of compliance with the requirements of this Regulation, the parameters below shall be established by reliable, accurate and reproducible measurement procedures, which take into account the generally recognised state of the art measurement methods.

- (a) 'Lamp efficacy' ( $\eta_{\text{lamp}}$ ), which is the quotient of the luminous flux emitted ( $\Phi$ ) by the power consumed by the lamp ( $P_{\text{lamp}}$ ):  $\eta_{\text{lamp}} = \Phi / P_{\text{lamp}}$  (unit: lm/W). The power dissipated by non-integrated auxiliary equipment, such as ballasts, transformers or power supplies, is not included in the power consumed by the lamp;
- (b) 'Lamp lumen maintenance factor' (LLMF), which is the ratio of the luminous flux emitted by the lamp at a given time in its life to the initial (100 hour) luminous flux;
- (c) 'Lamp survival factor' (LSF), which is the defined fraction of the total number of lamps that continue to operate at a given time under defined conditions and switching frequency;
- (d) 'Lamp lifetime', which is the period of operation time after which the fraction of the total number of lamps which continue to operate corresponds to the lamp survival factor of the lamp, under defined conditions and switching frequency;
- (e) 'Chromaticity', which is the property of a colour stimulus defined by its chromaticity coordinates, or by its dominant or complementary wavelength and purity taken together;
- (f) 'Luminous flux' ( $\Phi$ ), which is a quantity derived from radiant flux (radiant power) by evaluating the radiation according to the spectral sensitivity of the human eye, measured after 100 hours of lamp running time;
- (g) 'Correlated colour temperature' ( $T_c$  [K]), which is 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;
- (h) 'Colour rendering' ( $R_a$ ), which is the effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant;
- (i) 'Specific effective radiant ultraviolet power', which is the effective power of the ultraviolet radiation of a lamp weighted according to the spectral correction factors and related to its luminous flux (unit: mW/klm);
- (j) 'Lamp start time', the time needed, after the supply voltage is switched on, for the lamp to start fully and remain alight;
- (k) 'Lamp warm-up time', which is the time needed for the lamp after start-up to emit a defined proportion of its stabilized luminous flux;
- (l) 'Power factor', which is the ratio of the absolute value of the active power to the apparent power under periodic conditions;

- (m) 'Luminance', which is the amount of light, per unit of apparent surface, that is emitted by or reflected by a particular area within a given solid angle (unit:  $\text{cd}/\text{m}^2$ );
- (n) 'Lamp mercury content', which is the mercury contained in the lamp and is measured according to the Annex to Commission Decision 2002/747/EC<sup>(1)</sup>.

## 2. DEFINITIONS

- (a) a 'rated value' is the value of a quantity used for specification purposes, established for a specified set of operating conditions of a product. Unless stated otherwise, all requirements are set in rated values;
- (b) a 'nominal value' is the value of a quantity used to designate and identify a product;
- (c) 'Second lamp envelope' is a second outer lamp envelope which 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, for protecting from ultraviolet radiation or for serving as a light diffuser;
- (d) 'Clear lamp' is a lamp (excluding compact fluorescent lamps) with a luminance above  $25\,000\text{ cd}/\text{m}^2$  for lamps having a luminous flux below  $2\,000\text{ lm}$  and above  $100\,000\text{ cd}/\text{m}^2$  for lamps having more luminous flux, equipped with only transparent envelopes in which the light producing filament, LED or discharge tube is clearly visible;
- (e) 'Non-clear lamp' is a lamp that does not comply with the specifications under point (d), including compact fluorescent lamps;
- (f) 'Switching cycle' is the sequence of switching on and switching off the lamp with defined intervals;
- (g) 'Premature failure' is when a lamp reaches its end of life after a period in operation which is less than the rated life time stated in the technical documentation;
- (h) 'Lamp cap' means that part of a lamp which provides connection to the electrical supply by means of a socket or lamp connector and, in most cases, also serves to retain the lamp in the socket;
- (i) 'Lamp holder' or 'socket' means a device which holds the lamp in position, usually by having the cap inserted in it, in which case it also provides the means of connecting the lamp to the electric supply.

## ANNEX II

### Ecodesign requirements for non-directional household lamps

#### 1. LAMP EFFICACY REQUIREMENTS

Incandescent lamps with S14, S15 or S19 caps shall be exempted from the efficacy requirements of Stages 1 to 4 as defined in Article 3 of this Regulation, but not from Stages 5 and 6.

The maximum rated power ( $P_{\text{max}}$ ) for a given rated luminous flux ( $\Phi$ ) is provided in Table 1.

The exceptions to these requirements are listed in Table 2 and the correction factors applicable to the maximum rated power are in Table 3.

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TABLE 1

Application date	Maximum rated power ( $P_{\max}$ ) for a given rated luminous flux ( $\Phi$ ) (W)	
	Clear lamps	Non-clear lamps
Stages 1 to 5	$0,8 * (0,88\sqrt{\Phi}+0,049\Phi)$	$0,24\sqrt{\Phi}+0,0103\Phi$
Stage 6	$0,6 * (0,88\sqrt{\Phi}+0,049\Phi)$	$0,24\sqrt{\Phi}+0,0103\Phi$

TABLE 2

Exceptions

Scope of the exception	Maximum rated power (W)
Clear lamps $60 \text{ lm} \leq \Phi \leq 950 \text{ lm}$ in Stage 1	$P_{\max} = 1,1 * (0,88\sqrt{\Phi}+0,049\Phi)$
Clear lamps $60 \text{ lm} \leq \Phi \leq 725 \text{ lm}$ in Stage 2	$P_{\max} = 1,1 * (0,88\sqrt{\Phi}+0,049\Phi)$
Clear lamps $60 \text{ lm} \leq \Phi \leq 450 \text{ lm}$ in Stage 3	$P_{\max} = 1,1 * (0,88\sqrt{\Phi}+0,049\Phi)$
Clear lamps with G9 or R7s cap in Stage 6	$P_{\max} = 0,8 * (0,88\sqrt{\Phi}+0,049\Phi)$

The correction factors in Table 3 are cumulative where appropriate and also applicable to the products covered by the exceptions of Table 2.

TABLE 3

Correction factors

Scope of the correction	Maximum rated power (W)
filament lamp requiring external power supply	$P_{\max}/1,06$
discharge lamp with cap GX53	$P_{\max}/0,75$
non-clear lamp with colour rendering index $\geq 90$ and $P \leq 0,5 * (0,88\sqrt{\Phi}+0,049\Phi)$	$P_{\max}/0,85$
discharge lamp with colour rendering index $\geq 90$ and $T_c \geq 5\,000 \text{ K}$	$P_{\max}/0,76$
non-clear lamp with second envelope and $P \leq 0,5 * (0,88\sqrt{\Phi}+0,049\Phi)$	$P_{\max}/0,95$
LED lamp requiring external power supply	$P_{\max}/1,1$

## 2. LAMP FUNCTIONALITY REQUIREMENTS

The lamp functionality requirements are set out in Table 4 for compact fluorescent lamps and in Table 5 for lamps excluding compact fluorescent lamps and LED lamps.

Where the rated lamp lifetime is higher than 2 000 h, the Stage 1 requirements for the parameters 'Rated lamp lifetime', 'Lamp Survival Factor' and 'Lumen maintenance' in Tables 4 and 5 are only applicable as from Stage 2.

For the purposes of testing the number of times the lamp can be switched on and off before failure, the switching cycle shall consist of periods comprising 1 minute on and 3 minutes off,

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while the other test conditions are defined according to Annex III. For the purposes of testing lamp lifetime, lamp survival factor, lumen maintenance and premature failure, the standard switching cycle according to Annex III shall be used.

TABLE 4

Functionality requirements for compact fluorescent lamps

<b>Functionality parameter</b>	<b>Stage 1</b>	<b>Stage 5</b>
Lamp survival factor at 6 000 h	$\geq 0,50$	$\geq 0,70$
Lumen maintenance	At 2 000 h: $\geq 85\%$ ( $\geq 80\%$ for lamps with second lamp envelope)	At 2 000 h: $\geq 88\%$ ( $\geq 83\%$ for lamps with second lamp envelope) At 6 000 h: $\geq 70\%$
Number of switching cycles before failure	$\geq$ half the lamp lifetime expressed in hours $\geq 10\,000$ if lamp starting time $> 0,3$ s	$\geq$ lamp lifetime expressed in hours $\geq 30\,000$ if lamp starting time $> 0,3$ s
Starting time	$< 2,0$ s	$< 1,5$ s if $P < 10$ W $< 1,0$ s if $P \geq 10$ W
Lamp warm-up time to 60 % $\Phi$	$< 60$ s or $< 120$ s for lamps containing mercury in amalgam form	$< 40$ s or $< 100$ s for lamps containing mercury in amalgam form
Premature failure rate	$\leq 2,0\%$ at 200 h	$\leq 2,0\%$ at 400 h
UVA + UVB radiation	$\leq 2,0$ mW/klm	$\leq 2,0$ mW/klm
UVC radiation	$\leq 0,01$ mW/klm	$\leq 0,01$ mW/klm
Lamp power factor	$\geq 0,50$ if $P < 25$ W $\geq 0,90$ if $P \geq 25$ W	$\geq 0,55$ if $P < 25$ W $\geq 0,90$ if $P \geq 25$ W
Colour rendering (Ra)	$\geq 80$	$\geq 80$

TABLE 5

Functionality requirements for lamps excluding compact fluorescent lamps and LED lamps

<b>Functionality parameter</b>	<b>Stage 1</b>	<b>Stage 5</b>
Rated lamp lifetime	$\geq 1\,000$ h	$\geq 2\,000$ h
Lumen maintenance	$\geq 85\%$ at 75 % of rated average lifetime	$\geq 85\%$ at 75 % of rated average lifetime
Number of switching cycles	$\geq$ four times the rated lamp life expressed in hours	$\geq$ four times the rated lamp life expressed in hours
Starting time	$< 0,2$ s	$< 0,2$ s
Lamp warm-up time to 60 % $\Phi$	$\leq 1,0$ s	$\leq 1,0$ s
Premature failure rate	$\leq 5,0\%$ at 100 h	$\leq 5,0\%$ at 200 h

UVA + UVB radiation	$\leq 2,0$ mW/klm	$\leq 2,0$ mW/klm
UVC radiation	$\leq 0,01$ mW/klm	$\leq 0,01$ mW/klm
Lamp power factor	$\geq 0,95$	$\geq 0,95$

### 3. PRODUCT INFORMATION REQUIREMENTS ON LAMPS

For non-directional household lamps, the following information shall be provided as from Stage 2, except where otherwise stipulated.

#### 3.1. Information to be visibly displayed prior to purchase to end-users on the packaging and on free access websites

The information does not need to be specified using the exact wording of the list below. It may be displayed using graphs, figures or symbols rather than text.

These information requirements do not apply to filament lamps not fulfilling the efficacy requirements of Stage 4.

- (a) When the nominal lamp power is displayed outside the energy label in accordance with Directive 98/11/EC, the nominal luminous flux of the lamp shall also be separately displayed in a font at least twice as large as the nominal lamp power display outside the label;
- (b) Nominal life time of the lamp in hours (not higher than the rated life time);
- (c) Number of switching cycles before premature lamp failure;
- (d) Colour temperature (also expressed as a value in Kelvins);
- (e) Warm-up time up to 60 % of the full light output (may be indicated as 'instant full light' if less than 1 second);
- (f) A warning if the lamp cannot be dimmed or can be dimmed only on specific dimmers;
- (g) If designed for optimal use in non-standard conditions (such as ambient temperature  $T_a \neq 25$  °C), information on those conditions;
- (h) Lamp dimensions in millimeters (length and diameter);
- (i) If equivalence with an incandescent lamp is claimed on the packaging, the claimed equivalent incandescent lamp power (rounded to 1 W) shall be that corresponding in Table 6 to the luminous flux of the lamp contained in the packaging.

The intermediate values of both the luminous flux and the claimed incandescent lamp power (rounded to 1W) shall be calculated by linear interpolation between the two adjacent values.

TABLE 6

Rated lamp luminous flux $\Phi$ [lm]			Claimed equivalent incandescent lamp power [W]
CFL	Halogen	LED and other lamps	

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125	119	136	15
229	217	249	25
432	410	470	40
741	702	806	60
970	920	1 055	75
1 398	1 326	1 521	100
2 253	2 137	2 452	150
3 172	3 009	3 452	200

- (j) The term ‘energy saving lamp’ or any similar product related promotional statement about lamp efficacy may only be used if the lamp complies with the efficacy requirements applicable to non-clear lamps in Stage 1 according to Tables 1, 2 and 3.

If the lamp contains mercury

- (k) Lamp mercury content as X,X mg;
- (l) Indication which website to consult in case of accidental lamp breakage to find instructions on how to clean up the lamp debris.

### 3.2. Information to be made publicly available on free-access websites

As a minimum, the following information shall be expressed at least as values.

- (a) The information specified in point 3.1;
- (b) Rated wattage (0,1 W precision);
- (c) Rated luminous flux;
- (d) Rated lamp life time;
- (e) Lamp power factor;
- (f) Lumen maintenance factor at the end of the nominal life;
- (g) Starting time (as X,X seconds);
- (h) Colour rendering.

If the lamp contains mercury

- (i) Instructions on how to clean up the lamp debris in case of accidental lamp breakage;
- (j) Recommendations on how to dispose of the lamp at its end of life.

## ANNEX III

### Verification procedure for market surveillance purposes

Member State authorities shall test a sample batch of minimum 20 lamps of the same model from the same manufacturer randomly selected.

The batch shall be considered to comply with the provisions set out in Annex II as applicable, of this Regulation if the average results of the batch do not vary from the limit, threshold or declared values by more than 10 %.

Otherwise, the model shall be considered not to comply.

For the purposes of checking conformity with the requirements, the authorities of the Member States shall use accurate and reliable state-of-the-art measurement methods which deliver reproducible results, including:

- where available, harmonised standards the reference numbers of which have been published for that purpose in the *Official Journal of the European Union* in accordance with Articles 9 and 10 of Directive 2005/32/EC,
- otherwise, the methods set out in the following documents:

Measured parameter	Organisation <sup>a</sup>	Reference	Title
Lamp mercury content	European Commission	Decision 2002/747/EC (Annex)	Commission Decision 2002/747/EC of 9 September 2002 establishing revised ecological criteria for the award of the Community eco-label to light bulbs and amending Decision 1999/568/EC
Luminous efficacy	Cenelec	EN 50285:1999	Energy efficiency of electric lamps for household use — Measurement methods
Lamp caps	Cenelec	EN 60061:1993 All amendments up to A40:2008	Lamp caps and holders together with gauges for the control of interchangeability and safety Part 1: Lamp caps
Lamp lifetime	Cenelec	EN 60064:1995 Amendments A2:2003 A3:2006 A4:2007 A11:2007	Tungsten filament lamps for domestic and similar general lighting purposes - Performance requirements

<sup>a</sup> Cenelec: rue de Stassart/De Stassartstraat 35, B-1050 Brussels, tel. (32-2) 519 68 71, fax (32-2) 519 69 19 (<http://www.cenelec.org>).  
International Commission on Illumination: CIE Central Bureau Kegelgasse 27 A-1030 Vienna AUSTRIA  
tel: +43 1714 31 87 0 fax: +43 1714 31 87 18 (<http://www.cie.co.at/>).

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	Cenelec	EN 60357:2003 Amendment A1:2008	Tungsten halogen lamps (non- vehicle) — Performance specifications
	Cenelec	EN 60969:1993 Amendments A1:1993 A2:2000	Self-ballasted lamps for general lighting services — Performance requirements
Lamp start time/ warmup time	Cenelec	EN 60969:1993 Amendments A1:1993 A2:2000	Self-ballasted lamps for general lighting services — Performance requirements
Power factor	Cenelec	EN 61000-3-2:2006	Electromagnetic compatibility (EMC) Part 3-2: Limits — Limits for harmonic current emissions (equipment input current $\leq 16$ A per phase)
Specific effective radiant UV power	Cenelec	EN 62471:2008	Photobiological safety of lamps and lamp systems
Colour rendering	International Commission on Illumination	CIE 13.3:1995	Method of Measuring and Specifying Colour Rendering Properties of Light Sources
Chromaticity Correlated Colour Temperature (Tc [K])	International Commission on Illumination	CIE 15:2004	Colorimetry
Luminance	International Commission on Illumination	CIE 18.2:1983	The Basis of Physical Photometry
Luminous flux	International Commission on Illumination	CIE 84:1989	The Measurement of Luminous Flux

**a** Cenelec: rue de Stassart/De Stassartstraat 35, B-1050 Brussels, tel. (32-2) 519 68 71, fax (32-2) 519 69 19 (<http://www.cenelec.org>).  
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Lamp Lumen Maintenance Factor (LLMF)	International Commission on Illumination	CIE 97:2005	Maintenance of indoor electric lighting systems
Lamp Survival Factor (LSF)			
<p><b>a</b> Cenelec: rue de Stassart/De Stassartstraat 35, B-1050 Brussels, tel. (32-2) 519 68 71, fax (32-2) 519 69 19 (<a href="http://www.cenelec.org">http://www.cenelec.org</a>).</p> <p>International Commission on Illumination: CIE Central Bureau Kegelgasse 27 A-1030 Vienna AUSTRIA tel: +43 1714 31 87 0 fax: +43 1714 31 87 18 (<a href="http://www.cie.co.at/">http://www.cie.co.at/</a>).</p>			

## ANNEX IV

Indicative benchmarks for non-directional household lamps(for information)

At the time of adoption of this Regulation, the best available technology on the market for the products concerned was identified as follows:

## 1. LAMP EFFICACY

The highest identified efficacy was 69 lm/W.

## 2. LAMP FUNCTIONALITY

TABLE 7

<b>Functionality parameter</b>	<b>Compact fluorescent lamps</b>
Rated lamp lifetime	20 000 h
Lumen maintenance	90 % at the rated lamp lifetime
Number of switching cycles	1 000 000
Starting time	< 0,1 s
Lamp warm-up time to 80 % $\Phi$	15 s, or 4 s for special mixed CFL/ halogen lamps
Lamp power factor	0,95

## 3. LAMP MERCURY CONTENT

The energy efficient compact fluorescent lamps with the lowest mercury content include not more than 1,23 mg mercury.

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(1) [OJ L 242, 10.9.2002, p. 44.](#)