

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 operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council (Text with EEA relevance)

ANNEX I

General exemptions

1. The following lamps shall be exempted from the provisions of this Regulation:
 - (a) lamps that are not white light sources as defined in Annex II; this exemption does not apply to high pressure sodium lamps;
 - (b) lamps that are directional light sources as defined in Annex II;
 - (c) lamps intended for use in other applications than general lighting and lamps incorporated into other products not providing a general lighting function;
 - (d) lamps having:
 - 6 % or more of total radiation of the range 250-780 nm in the range of 250-400 nm,
 - 11 % or more of total radiation of the range 250-780 nm in the range of 630-780 nm,
 - 5 % or more of total radiation of the range 250-780 nm in the range of 640-700 nm, and
 - the peak of the radiation between 315-400 nm (UVA) or 280-315 nm (UVB);
 - (e) double capped fluorescent lamps having:
 - a diameter of 7 mm (T2) and less,
 - a diameter of 16 mm (T5) and lamp power $P \leq 13$ W or $P > 80$ W,
 - a diameter of 38 mm (T12), lamp cap G-13 Medium BiPin base, ± 5 m (+magenta, -green) colour compensating filter value limit (cc). CIE coordinates $x=0,330$ $y=0,335$ and $x=0,415$ $y=0,377$, and
 - a diameter of 38 mm (T12) and equipped with an external ignition strip;
 - (f) single capped fluorescent lamps having a diameter of 16 mm (T5) 2G11 4 pin base, $T_c = 3\ 200$ K with chromaticity coordinates $x=0,415$ $y=0,377$ and $T_c = 5\ 500$ K with chromaticity coordinates $x=0,330$ $y=0,335$;
 - (g) high intensity discharge lamps with $T_c > 7\ 000$ K;
 - (h) high intensity discharge lamps having a specific effective UV output > 2 mW/klm; and
 - (i) high intensity discharge lamps not having lamp cap E27, E40, PGZ12.
2. The following luminaires shall be exempted:
 - (a) emergency lighting luminaires and emergency sign luminaires within the meaning of Council Directive 2006/95/EC of the European Parliament and of the Council⁽¹⁾;
 - (b) luminaires covered by the requirements of Directives 94/9/EC of the European Parliament and of the Council⁽²⁾, Directive 1999/92/EC of the European Parliament and of the Council⁽³⁾, Directive 2006/42/EC of the European Parliament and of the Council⁽⁴⁾, Council Directive 93/42/EEC⁽⁵⁾, Council Directive 88/378/EEC⁽⁶⁾ and luminaires integrated into equipment covered by these requirements.

ANNEX II

Technical parameters covered and definitions for the purposes of Annexes I and III to VII

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) ‘Luminous efficacy of a source’, ‘light source efficacy’ or ‘lamp efficacy’ (η_{source}), which means the quotient of the luminous flux emitted (Φ) by the power consumed by the source (P_{source}). $\eta_{\text{source}} = \Phi / P_{\text{source}}$. Unit: lm/W. The power dissipated by auxiliary equipment such as ballasts is not included in the power consumed by the source.
 - (b) ‘Lamp Lumen Maintenance Factor’ (LLMF), which means the ratio of the luminous flux emitted by the lamp at a given time in its life to the initial luminous flux.
 - (c) ‘Lamp Survival Factor’ (LSF), which means the fraction of the total number of lamps which continue to operate at a given time under defined conditions and switching frequency.
 - (d) ‘Ballast efficiency’ (η_{ballast}), which means the ratio between the lamp power (ballast output) and the input power of the lamp-ballast circuit with possible sensors, network connections and other auxiliary loads disconnected.
 - (e) ‘Chromaticity’, which means 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’, which means a quantity derived from radiant flux (radiant power) by evaluating the radiation according to the spectral sensitivity of the human eye.
 - (g) ‘Correlated Colour Temperature’ (T_c [K]), which means 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 means 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 UV power’, which means the effective power of the UV radiation of a lamp related to its luminous flux (unit: mW/klm).
 - (j) ‘Ingress protection grading’, which means a coding system to indicate the degree of protection provided by an enclosure against ingress of dust, solid objects and moisture and to give additional information in connection with such protection.
- ### 2. Technical parameters for indicative benchmarks
- (a) ‘Lamp mercury content’, which means the amount of mercury contained in the lamp.
 - (b) ‘Luminaire Maintenance Factor’ (LMF), which means the ratio of the light output ratio of a luminaire at a given time to the initial light output ratio.

- (c) ‘Utilisation Factor’ (UF) of an installation for a reference surface, which means the ratio of the luminous flux received by the reference surface to the sum of the individual total fluxes of the lamps of the installation.

3. Definitions

- (a) ‘Directional Light Source’ (DLS) means light sources having at least 80 % light output within a solid angle of π sr (corresponding to a cone with angle of 120 °).
- (b) ‘White light source’ means a light source having chromaticity coordinates that satisfy the following requirement:
- $0,270 < x < 0,530$
 - $-2,3172 x^2 + 2,3653 x - 0,2199 < y < -2,3172 x^2 + 2,3653 x - 0,1595$
- (c) A ‘rated’ value means a quantity value for a characteristic of a product for operating conditions specified in this Regulation or in applicable standards. Unless stated otherwise, all product parameter limits are expressed in rated values.
- (d) A ‘nominal’ value means an approximate quantity value used to designate or identify a product.
- (e) ‘Light pollution’ means the sum of all adverse impacts of artificial light on the environment, including the impact of obtrusive light.
- (f) ‘Obtrusive light’ means the part of the light from a lighting installation that does not serve the purpose for which the installation was designed. It includes:
- light improperly falling outside the area to be lit,
 - diffused light in the neighbourhood of the lighting installation,
 - sky glow, which is the brightening of the night sky that results from the direct and indirect reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter) in the direction of observation.
- (g) ‘Efficiency Base ballast’ (EBb) means the relationship between the rated lamp power (P_{lamp}) and the ballast efficiency.

For ballasts for single and double capped fluorescent lamps, the EBb_{FL} is calculated as follows:

$$\text{When } P_{\text{lamp}} \leq 5 \text{ W : } EBb_{\text{FL}} = 0,71$$

$$\text{When } 5 \text{ W} < P_{\text{lamp}} < 100 \text{ W : } EBb_{\text{FL}} = P_{\text{lamp}} / (2 * \sqrt{P_{\text{lamp}} / 36} + 38 / 36 * P_{\text{lamp}} + 1)$$

$$\text{When } P_{\text{lamp}} \geq 100 \text{ W : } EBb_{\text{FL}} = 0,91$$

- (h) ‘Second lamp envelope’ means 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. In determining the presence of a second lamp envelope, the arc tubes of high intensity discharge lamps shall not count as a lamp envelope.
- (i) ‘Light source control gear’ means one or more components between the supply and one or more light sources which may serve to transform the supply voltage, limit the current of the lamp(s) to the required value, provide starting voltage and preheating current, prevent cold starting, correct power factor or reduce radio interference. Ballasts, halogen convertors and transformers and Light Emitting Diode (LED) drivers are examples of light source control gears.

- (j) ‘High-pressure mercury (vapour) lamp’ means a high intensity discharge lamp in which the major portion of light is produced, directly or indirectly, by radiation from mercury operating at a partial pressure in excess of 100 kilopascals.
- (k) ‘High-pressure sodium (vapour) lamp’ means a high intensity discharge lamp in which the light is produced mainly by radiation from sodium vapour operating at a partial pressure of the order of 10 kilopascals.
- (l) ‘Metal halide lamp’ means a high intensity discharge lamp 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.
- (m) ‘Electronic or high frequency ballast’ means a mains supplied a.c. to a.c. inverter, including stabilising elements for starting and operating one or more tubular fluorescent lamps, generally at high frequency.
- (n) ‘Clear lamp’ means a high-intensity discharge lamp with a transparent outer envelope or outer tube in which the light producing arc tube is clearly visible (e.g. clear glass lamp).

ANNEX III

Ecodesign requirements for fluorescent and high intensity discharge lamps and ballasts and luminaires able to operate such lamps

For each ecodesign requirement, the moment from which it applies is specified below. Unless a requirement is superseded or this is otherwise specified, it shall continue to apply together with the requirements introduced at later stages.

1. REQUIREMENTS FOR FLUORESCENT LAMPS WITHOUT INTEGRATED BALLAST AND FOR HIGH INTENSITY DISCHARGE LAMPS

1.1. Lamp efficacy requirements

A. First stage requirements

One year after the entry into force of this Regulation:

Double capped fluorescent lamps of 16 mm and 26 mm diameter (T5 and T8 lamps) shall have at least the rated luminous efficacies as specified in Table 1 at 25 °C.

In case the nominal wattages are different from those listed in Table 1, lamps must reach the luminous efficacy of the nearest equivalent in terms of wattage, except T8 lamps above 50 W, which must reach a luminous efficacy of 83 lm/W. If the nominal wattage is at equal distance from the two nearest wattages in the table, it shall conform to the higher efficacy of the two. If the nominal wattage is higher than the highest wattage in the table, it shall conform to the efficacy of that highest wattage.

TABLE 1

Rated minimum efficacy values for T8 and T5 lamps

T8 (26 mm Ø)	T5 (16 mm Ø)High Efficiency	T5 (16 mm Ø)High Output
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Status: This is the original version (as it was originally adopted).

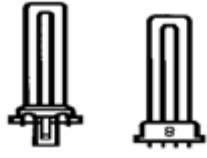
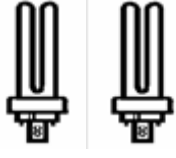
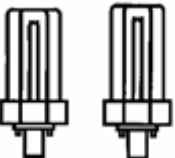
Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value	Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value	Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value
15	63	14	86	24	73
18	75	21	90	39	79
25	76	28	93	49	88
30	80	35	94	54	82
36	93			80	77
38	87				
58	90				
70	89				

Single capped fluorescent lamps shall have the following rated luminous efficacies at 25 °C.

In case the nominal wattages or lamp shapes are different from those listed in tables 2 to 5: lamps must reach the luminous efficacy of the nearest equivalent in terms of wattage and shape. If the nominal wattage is at equal distance from two wattages in the table, it shall conform to the higher efficacy of the two. If the nominal wattage is higher than the highest wattage in the table, it shall conform to the efficacy of that highest wattage.

TABLE 2

Rated minimum efficacy values for single capped fluorescent lamps working on electromagnetic and electronic ballast

Small single parallel tube, lamp cap G23 (2 pin) or 2G7 (4 pin)		Double parallel tubes, lamp cap G24d (2 pin) or G24q (4 pin)		Triple parallel tubes, lamp cap GX24d (2 pin) or GX24q (4 pin)	
					
Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value	Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value	Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value
5	50	10	60	13	69
7	57	13	69	18	67
9	67	18	67	26	66
11	82	26	66	32	75

	42	76
	57	75
	70	74

TABLE 3

Rated minimum efficacy values for single capped fluorescent lamps, working only on electronic ballast

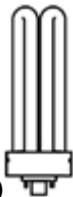
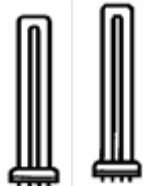


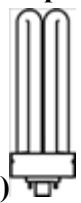
Four parallel tubes, lamp cap GX24q (4 pin)		Long single parallel tube, lamp cap 2G11 (4 pin)		4 legs in one plane, lamp cap 2G10 (4 pin)	
					
Nominal wattage(W)	Rated luminous efficacy (lm/W), 100 h initial value	Nominal wattage(W)	Rated luminous efficacy (lm/W), 100 h initial value	Nominal wattage(W)	Rated luminous efficacy (lm/W), 100 h initial value
57	75	18	67	18	61
70	74	24	75	24	71
		34	82	36	78
		36	81		
		40	83		
		55	82		
		80	75		

TABLE 4

Rated minimum efficacy values for single capped fluorescent lamps with square shape or (very) high output


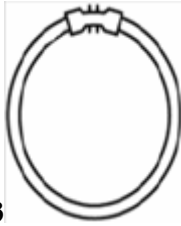
Single flat plane tube, lamp cap GR8 (2 pin), GR10q (4 pin) or GRY10q3 (4 pin)		Four or three parallel T5 tubes, lamp cap 2G8 (4 pin)	
			
Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value	Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value
10	65	60	67

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16	66	82	75
21	64	85	71
28	73	120	75
38	71		
55	71		

TABLE 5

Rated minimum efficacy values for T9 and T5 Circular lamps

T9 Circular, tube diameter 29 mm with  base G10q		T5 Circular, tube diameter 16 mm with  base 2GX13	
Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value	Nominal wattage (W)	Rated luminous efficacy (lm/W), 100 h initial value
22	52	22	77
32	64	40	78
40	70	55	75
60	60	60	80

Corrections applicable to both single and double capped fluorescent lamps

The required luminous efficacy at 25 °C may be lower than required in the tables above in the following cases:

TABLE 6

Deduction percentages for rated minimum efficacy values for fluorescent lamps with high colour temperature, high colour rendering and/or second lamp envelope

Lamp parameter	Deduction from luminous efficacy at 25 °C
$T_c \geq 5\ 000\ K$	-10 %
$95 > Ra > 90$	-20 %
$Ra > 95$	-30 %
Second lamp envelope	-10 %

The indicated deductions are cumulative.

Single and double capped fluorescent lamps that do not have their optimum temperature at 25 °C must still comply at their optimum temperature with the luminous efficacy requirements as set out in the tables above.

B. Second stage requirements

Three years after the entry into force of this Regulation, the following efficacy requirements shall apply to fluorescent lamps without integrated ballast and high-intensity discharge lamps.

Double capped fluorescent lamps

The requirements applicable to double capped fluorescent lamps 26 mm in diameter (T8) during the first stage shall apply to all double capped fluorescent lamps of other diameters than those covered in the first stage.

These lamps must conform to the minimum efficacy of the T8 lamp which is their nearest equivalent with regards to wattage. If the nominal wattage is higher than the highest wattage in the table, it shall conform to the efficacy of that highest wattage.

The corrections defined for the first stage (Table 6) shall continue to apply.

High-intensity discharge lamps

Lamps with $T_c \geq 5\,000\text{ K}$ or equipped with a second lamp envelope shall fulfil at least 90 % of the applicable lamp efficacy requirements in tables 7, 8 and 9.

High Pressure Sodium lamps with $R_a \leq 60$ shall have at least the rated luminous efficacies in Table 7:

TABLE 7

Rated minimum efficacy values for high pressure sodium lamps

Nominal Lamp wattage [W]	Rated Lamp Efficacy [lm/W] — Clear lamps	Rated Lamp Efficacy [lm/W] — Not clear lamps
$W \leq 45$	≥ 60	≥ 60
$45 < W \leq 55$	≥ 80	≥ 70
$55 < W \leq 75$	≥ 90	≥ 80
$75 < W \leq 105$	≥ 100	≥ 95
$105 < W \leq 155$	≥ 110	≥ 105
$155 < W \leq 255$	≥ 125	≥ 115
$255 < W \leq 605$	≥ 135	≥ 130

The requirements in Table 7 shall apply to high pressure sodium retrofit lamps designed to operate on high pressure mercury vapour lamp control gear only 6 years after the entry into force of this Regulation.

Metal halide lamps with $R_a \leq 80$ and high pressure sodium lamps with $R_a > 60$ shall have at least the rated luminous efficacies in Table 8:

TABLE 8

Rated minimum efficacy values for Metal Halide Lamps

Nominal Lamp Wattage [W]	Rated Lamp Efficacy [lm/W] — Clear lamps	Rated Lamp Efficacy [lm/W] — Not clear lamps
$W \leq 55$	≥ 60	≥ 60

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$55 < W \leq 75$	≥ 75	≥ 70
$75 < W \leq 105$	≥ 80	≥ 75
$105 < W \leq 155$	≥ 80	≥ 75
$155 < W \leq 255$	≥ 80	≥ 75
$255 < W \leq 405$	≥ 85	≥ 75

Six years after the entry into force of this Regulation, other high intensity discharge lamps shall have at least the rated luminous efficacies in Table 9:

TABLE 9

Rated minimum efficacy values for other high intensity discharge lamps

Nominal Lamp wattage [W]	Rated Lamp Efficacy [lm/W]
$W \leq 40$	50
$40 < W \leq 50$	55
$50 < W \leq 70$	65
$70 < W \leq 125$	70
$125 < W$	75

C. Third stage requirements

Eight years after the entry into force of this Regulation:

Fluorescent lamps without integrated ballast shall be designed to operate with ballasts of energy efficiency class at least A2 according to Annex III.2.2.

Metal halide lamps shall have at least the rated luminous efficacies in Table 10:

TABLE 10

Rated minimum efficacy values for metal halide lamps (third stage)

Nominal Lamp wattage (W)	Rated Lamp Efficacy (lm/W) — Clear lamps	Rated Lamp Efficacy (lm/W) — Not clear lamps
$W \leq 55$	≥ 70	≥ 65
$55 < W \leq 75$	≥ 80	≥ 75
$75 < W \leq 105$	≥ 85	≥ 80
$105 < W \leq 155$	≥ 85	≥ 80
$155 < W \leq 255$	≥ 85	≥ 80
$255 < W \leq 405$	≥ 90	≥ 85

Lamps equipped with $T_c \geq 5\,000$ K or with a second lamp envelope shall fulfil at least 90 % of the applicable lamp efficacy requirements.

1.2. Lamp performance requirements

Status: This is the original version (as it was originally adopted).

A. First stage requirements

One year after the entry into force of this Regulation:

Fluorescent lamps without integrated ballast covered by the requirements of Annex III.1.1.A shall have a colour rendering index (Ra) of at least 80.

B. Second stage requirements

Three years after the entry into force of this Regulation:

Fluorescent lamps without integrated ballast shall have a colour rendering index (Ra) of at least 80. They shall have at least the lamp lumen maintenance factors in Table 11:

TABLE 11

Lamp lumen maintenance factors for single and double-capped fluorescent lamps — Stage 2

Lamp lumen maintenance factor	Burning hours			
	Lamp types	2 000	4 000	8 000
Double-Capped Fluorescent lamps operating on non-high frequency ballasts	0,95	0,92	0,9	—
Double-Capped Fluorescent lamps on high frequency ballast with warmstart	0,97	0,95	0,92	0,9
Single-Capped Fluorescent lamps operating on non-high frequency ballasts	0,95	0,9	0,8	—
Single-Capped Fluorescent lamps on high frequency ballast with warmstart	0,97	0,9	0,8	—

Fluorescent lamps without integrated ballast shall have at least the lamp survival factors in Table 12:

TABLE 12

Lamp survival factors for single and double-capped fluorescent lamps — Stage 2

Status: This is the original version (as it was originally adopted).

Lamp survival factor	Burning hours			
	2 000	4 000	8 000	16 000
Double-Capped Fluorescent lamps operating on non-high frequency ballasts	0,99	0,97	0,9	—
Double-Capped Fluorescent lamps on high frequency ballast with warmstart	0,99	0,97	0,92	0,9
Single-Capped Fluorescent lamps operating on non-high frequency ballasts	0,95	0,92	0,5	—
Single-Capped Fluorescent lamps on high frequency ballast with warmstart	0,95	0,9	0,87	—

High pressure sodium lamps shall have at least the lamp lumen maintenance factors and lamp survival factors in Table 13:

TABLE 13

Lamp lumen maintenance factors and lamp survival factors for high pressure sodium lamps — Stage 2

Burning hours	Lamp lumen maintenance factor	Lamp survival factor
12 000 ($P \leq 75$ W)	> 0,80	> 0,90
16 000 ($P > 75$ W)	> 0,85	> 0,90

C. Third stage requirements

Eight years after the entry into force of this Regulation:

Metal halide lamps shall have at least the lamp lumen maintenance factors and lamp survival factors in Table 14:

TABLE 14

Lamp lumen maintenance factors and lamp survival factors for metal halide lamps — Stage 3

Burning hours	Lamp lumen maintenance factor	Lamp survival factor
12 000	> 0,80	> 0,80

1.3. Product information requirements on lamps

One year after the entry into force of this Regulation, manufacturers shall provide at least the following information on free-access websites and in other forms they deem appropriate for each of their fluorescent lamps without integrated ballast and each of their high intensity discharge lamps. That information shall also be contained in the technical documentation file drawn up for the purposes of conformity assessment pursuant to Article 8 of Directive 2005/32/EC.

- (a) Nominal and rated lamp wattage.
- (b) Nominal and rated lamp luminous flux.
- (c) Rated lamp efficacy at 100 h in standard conditions (25 °C, for T5 lamps at 35 °C). For fluorescent lamps both at 50 Hz (mains frequency) operation (where applicable) and at High Frequency (> 50 Hz) operation (where applicable) for the same rated luminous flux in all cases, indicating for High Frequency operation the calibration current of the test conditions and/or the rated voltage of the HF generator with the resistance. It shall be stated in a conspicuous manner that the power dissipated by auxiliary equipment such as ballasts is not included in the power consumed by the source.
- (d) Rated lamp Lumen Maintenance Factor at 2 000 h, 4 000 h, 6 000 h, 8 000 h, 12 000 h, 16 000 h and 20 000 h (up to 8 000 h only for new lamps on the market where no data is yet available), indicating which operation mode of the lamp was used for the test if both 50 Hz and High Frequency operation are possible.
- (e) Rated lamp Survival Factor at 2 000 h, 4 000 h, 6 000 h, 8 000 h, 12 000 h, 16 000 h and 20 000 h (up to 8 000 h only for new lamps on the market where no data is yet available), indicating which operation mode of the lamp was used for the test if both 50 Hz and High Frequency operation are possible.
- (f) lamp mercury content as X.X mg.
- (g) Colour Rendering Index (Ra) of the lamp.
- (h) Colour temperature of the lamp.
- (i) Ambient temperature at which the lamp was designed to maximise its luminous flux. If the lamp does not fulfil at least 90 % of the respective luminous efficacy requirement in Annex III.1.1 at an ambient temperature of 25 °C (100 % for T5 lamps), it shall be stated that the lamp is not suitable for indoor use at standard room temperatures.

2. REQUIREMENTS ON BALLASTS FOR FLUORESCENT LAMPS WITHOUT INTEGRATED BALLAST AND BALLASTS FOR HIGH INTENSITY DISCHARGE LAMPS

2.1. Ballast energy performance requirements

Multiwattage ballasts shall comply with the requirements below according to each wattage on which they operate.

A. First stage requirements

One year after this Regulation comes into force:

The minimum energy efficiency index class shall be B2 for ballasts covered by table 17 in Annex III.2.2, A3 for the ballasts covered by table 18, and A1 for dimmable ballasts covered by table 19.

At the dimming position corresponding to 25 % of the lumen output of the operated lamp, the input power (P_{in}) of the lamp-ballast circuit shall not exceed:

$$P_{in} < 50 \% * P_{Lrated} / \eta_{ballast}$$

Where P_{Lrated} is the rated lamp power and $\eta_{ballast}$ is the minimum energy efficiency limit of the respective EEI class.

The power consumption of the fluorescent lamp ballasts shall not exceed 1,0 W when operated lamps do not emit any light in normal operating conditions and when other possible connected components (network connections, sensors etc.) are disconnected. If they cannot be disconnected, their power shall be measured and deducted from the result.

B. Second stage requirements

Three years after the implementing measure comes into force:

Ballasts for high intensity discharge lamps shall have the efficiency described in Table 15.

TABLE 15

Minimum efficiency for ballasts for high intensity discharge lamps — Stage 2

Nominal lamp wattage (P)W	Minimum ballast efficiency ($\eta_{ballast}$)%
$P \leq 30$	65
$30 < P \leq 75$	75
$75 < P \leq 105$	80
$105 < P \leq 405$	85
$P > 405$	90

The power consumption of ballasts used with fluorescent lamps without integrated ballast shall not exceed 0,5 W when operated lamps do not emit any light in normal operating conditions. This requirement shall apply to ballasts when other possible connected components (network connections, sensors etc.) are disconnected. If they cannot be disconnected, their power shall be measured and deducted from the result.

C. Third stage requirements

Eight years after this Regulation comes into force:

Ballasts for fluorescent lamps without integrated ballast shall have the efficiency:

$$\eta_{ballast} \geq EBbFL$$

where EBbFL is defined in Annex II.3.g

Ballasts for high intensity discharge lamps shall have the efficiency described in Table 16.

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TABLE 16

Minimum efficiency for ballasts for high intensity discharge lamps — Stage 3

Nominal lamp wattage (P)W	Minimum ballast efficiency (η_{ballast})%
$P \leq 30$	78
$30 < P \leq 75$	85
$75 < P \leq 105$	87
$105 < P \leq 405$	90
$P > 405$	92

2.2. Product information requirements on ballasts

Manufacturers of ballasts shall provide at least the following information on free-access websites and in other forms they deem appropriate for each of their ballast models. That information shall also be affixed in a distinct and durable form to the ballast. It shall also be contained in the technical documentation file drawn up for the purposes of conformity assessment pursuant to Article 8 of Directive 2005/32/EC.

A. First stage requirements

One year after the entry into force of this Regulation:

for ballasts for fluorescents lamps, an energy efficiency index (EEI) class shall be provided as defined below.

‘Energy efficiency index’ (EEI) means a classification system of ballasts for fluorescent lamps without integrated ballasts in classes according to efficiency limit values. The classes for non-dimmable ballasts are (in descending order of efficiency) A2 BAT, A2, A3, B1, B2 and for dimmable ballasts A1 BAT and A1.

Table 17 contains the EEI classes for ballasts which are designed to operate the lamps mentioned in the table or other lamps which are designed to be operated by the same ballasts as the lamps mentioned in the table (meaning that the data of the reference ballast is equal).

TABLE 17

Energy efficiency index requirements for non-dimmable ballasts for fluorescent lamps

LAMP DATA					BALLAST EFFICIENCY (Plamp/ Pinput)				
Lamp type	Nominal Wattage	ILCOS CODE	Rated/typical wattage		Non-dimmable				
			50 Hz	HF	A2 BAT	A2	A3	B1	B2
			W	W					
T8	15	FD-15-E-G13-26/450	15	13,5	87,8 %	84,4 %	75,0 %	67,9 %	62,0 %

Status: This is the original version (as it was originally adopted).

T8	18	FD-18-E-G13-26/600	18	16	87,7 %	84,2 %	76,2 %	71,3 %	65,8 %
T8	30	FD-30-E-G13-26/900	30	24	82,1 %	77,4 %	72,7 %	79,2 %	75,0 %
T8	36	FD-36-E-G13-26/1200	36	32	91,4 %	88,9 %	84,2 %	83,4 %	79,5 %
T8	38	FD-38-E-G13-26/1050	38,5	32	87,7 %	84,2 %	80,0 %	84,1 %	80,4 %
T8	58	FD-58-E-G13-26/1500	58	50	93,0 %	90,9 %	84,7 %	86,1 %	82,2 %
T8	70	FD-70-E-G13-26/1800	69,5	60	90,9 %	88,2 %	83,3 %	86,3 %	83,1 %
TC-L	18	FSD-18-E-2G11	18	16	87,7 %	84,2 %	76,2 %	71,3 %	65,8 %
TC-L	24	FSD-24-E-2G11	24	22	90,7 %	88,0 %	81,5 %	76,0 %	71,3 %
TC-L	36	FSD-36-E-2G11	36	32	91,4 %	88,9 %	84,2 %	83,4 %	79,5 %
TCF	18	FSS-18-E-2G10	18	16	87,7 %	84,2 %	76,2 %	71,3 %	65,8 %
TCF	24	FSS-24-E-2G10	24	22	90,7 %	88,0 %	81,5 %	76,0 %	71,3 %
TCF	36	FSS-36-E-2G10	36	32	91,4 %	88,9 %	84,2 %	83,4 %	79,5 %
TC-D / DE	10	FSQ-10-E-G24q=1 FSQ-10-I-G24d=1	10	9,5	89,4 %	86,4 %	73,1 %	67,9 %	59,4 %
TC-D / DE	13	FSQ-13-E-G24q=1 FSQ-13-I-G24d=1	13	12,5	91,7 %	89,3 %	78,1 %	72,6 %	65,0 %
TC-D / DE	18	FSQ-18-E-G24q=2	18	16,5	89,8 %	86,8 %	78,6 %	71,3 %	65,8 %

		FSQ-18-I-G24d=2							
TC-D / DE	26	FSQ-26-E-G24q=1 FSQ-26-I-G24d=1	26	24	91,4 %	88,9 %	82,8 %	77,2 %	72,6 %
TC-T / TE	13	FSM-13-E-GX24q=1 FSM-13-I-GX24d=1	13	12,5	91,7 %	89,3 %	78,1 %	72,6 %	65,0 %
TC-T / TE	18	FSM-18-E-GX24q=2 FSM-18-I-GX24d=2	18	16,5	89,8 %	86,8 %	78,6 %	71,3 %	65,8 %
TC-T / TC-TE	26	FSM-26-E-GX24q=3 FSM-26-I-GX24d=3	26,5	24	91,4 %	88,9 %	82,8 %	77,5 %	73,0 %
TC-DD / DDE	10	FSS-10-E-GR10q FSS-10-L/P/H-GR10q	10,5	9,5	86,4 %	82,6 %	70,4 %	68,8 %	60,5 %
TC-DD / DDE	16	FSS-16-E-GR10q FSS-16-I-GR10q FSS-10-L/P/H-GR10q	16	15	87,0 %	83,3 %	75,0 %	72,4 %	66,1 %
TC-DD / DDE	21	FSS-21-E-GR10q FSS-21-I-GR10q	21	19	89,4 %	86,4 %	79,2 %	73,9 %	68,8 %

Status: This is the original version (as it was originally adopted).

		FSS-21-L/P/H-GR10q							
TC-DD / DDE	28	FSS-28-E-GR10q FSS-28-I-GR10q FSS-28-L/P/H-GR10q	28	26	89,7 %	86,7 %	81,3 %	78,2 %	73,9 %
TC-DD / DDE	38	FSS-38-E-GR10q FSS-38-L/P/H-GR10q	38,5	36	92,3 %	90,0 %	85,7 %	84,1 %	80,4 %
TC	5	FSD-5-I-G23 FSD-5-E-2G7	5,4	5	72,7 %	66,7 %	58,8 %	49,3 %	41,4 %
TC	7	FSD-7-I-G23 FSD-7-E-2G7	7,1	6,5	77,6 %	72,2 %	65,0 %	55,7 %	47,8 %
TC	9	FSD-9-I-G23 FSD-9-E-2G7	8,7	8	78,0 %	72,7 %	66,7 %	60,3 %	52,6 %
TC	11	FSD-11-I-G23 FSD-11-E-2G7	11,8	11	83,0 %	78,6 %	73,3 %	66,7 %	59,6 %
T5	4	FD-4-E-G5-16/150	4,5	3,6	64,9 %	58,1 %	50,0 %	45,0 %	37,2 %
T5	6	FD-6-E-G5-16/225	6	5,4	71,3 %	65,1 %	58,1 %	51,8 %	43,8 %
T5	8	FD-8-E-G5-16/300	7,1	7,5	69,9 %	63,6 %	58,6 %	48,9 %	42,7 %
T5	13	FD-13-E-G5-16/525	13	12,8	84,2 %	80,0 %	75,3 %	72,6 %	65,0 %

T9-C	22	FSC-22- E- G10q-29/200	22	19	89,4 %	86,4 %	79,2 %	74,6 %	69,7 %
T9-C	32	FSC-32- E- G10q-29/300	32	30	88,9 %	85,7 %	81,1 %	80,0 %	76,0 %
T9-C	40	FSC-40- E- G10q-29/400	40	32	89,5 %	86,5 %	82,1 %	82,6 %	79,2 %
T2	6	FDH-6- L/P- W4.3x8.5d-7/220		5	72,7 %	66,7 %	58,8 %		
T2	8	FDH-8- L/P- W4.3x8.5d-7/320		7,8	76,5 %	70,9 %	65,0 %		
T2	11	FDH-11- L/P- W4.3x8.5d-7/420		10,8	81,8 %	77,1 %	72,0 %		
T2	13	FDH-13- L/P- W4.3x8.5d-7/520		13,3	84,7 %	80,6 %	76,0 %		
T2	21	FDH-21- L/P- W4.3x8.5d-7/		21	88,9 %	85,7 %	79,2 %		
T2	23	FDH-23- L/P- W4.3x8.5d-7/		23	89,8 %	86,8 %	80,7 %		
T5-E	14	FDH-14- G5-L/ P-16/550		13,7	84,7 %	80,6 %	72,1 %		
T5-E	21	FDH-21- G5-L/ P-16/850		20,7	89,3 %	86,3 %	79,6 %		
T5-E	24	FDH-24- G5-L/ P-16/550		22,5	89,6 %	86,5 %	80,4 %		
T5-E	28	FDH-28- G5-L/ P-16/1150		27,8	89,8 %	86,9 %	81,8 %		
T5-E	35	FDH-35- G5-L/ P-16/1450		34,7	91,5 %	89,0 %	82,6 %		
T5-E	39	FDH-39- G5-L/ P-16/850		38	91,0 %	88,4 %	82,6 %		

Status: This is the original version (as it was originally adopted).

T5-E	49	FDH-49- G5-L/ P-16/1450	49,3	91,6 %	89,2 %	84,6 %		
T5-E	54	FDH-54- G5-L/ P-16/1150	53,8	92,0 %	89,7 %	85,4 %		
T5-E	80	FDH-80- G5-L/ P-16/1150	80	93,0 %	90,9 %	87,0 %		
T5-E	95	FDH-95- G5-L/ P-16/1150	95	92,7 %	90,5 %	84,1 %		
T5-E	120	FDH-120- G5-L/ P-16/1450	120	92,5 %	90,2 %	84,5 %		
T5-C	22	FSCH-22- L/ P-2GX13-16/225	22,3	88,1 %	84,8 %	78,8 %		
T5-C	40	FSCH-40- L/ P-2GX13-16/300	39,9	91,4 %	88,9 %	83,3 %		
T5-C	55	FSCH-55- L/ P-2GX13-16/300	55	92,4 %	90,2 %	84,6 %		
T5-C	60	FSCH-60- L/ P-2GX13-16/375	60	93,0 %	90,9 %	85,7 %		
TC-LE	40	FSDH-40- L/ P-2G11	40	91,4 %	88,9 %	83,3 %		
TC-LE	55	FSDH-55- L/ P-2G11	55	92,4 %	90,2 %	84,6 %		
TC-LE	80	FSDH-80- L/ P-2G11	80	93,0 %	90,9 %	87,0 %		
TC-TE	32	FSMH-32- L/ P-2GX24q=3	32	91,4 %	88,9 %	82,1 %		
TC-TE	42	FSMH-42- L/ P-2GX24q=4	43	93,5 %	91,5 %	86,0 %		
TC-TE	57	FSM6H-57- L/ P-2GX24q=5	56	91,4 %	88,9 %	83,6 %		

Status: This is the original version (as it was originally adopted).

		FSM8H-57- L/ P-2GX24q=5						
TC-TE	70	FSM6H-70- L/ P-2GX24q=6 FSM8H-70- L/ P-2GX24q=6	70	93,0 %	90,9 %	85,4 %		
TC-TE	60	FSM6H-60- L/ P-2G8=1	63	92,3 %	90,0 %	84,0 %		
TC-TE	62	FSM8H-62- L/ P-2G8=2	62	92,2 %	89,9 %	83,8 %		
TC-TE	82	FSM8H-82- L/ P-2G8=2	82	92,4 %	90,1 %	83,7 %		
TC-TE	85	FSM6H-85- L/ P-2G8=1	87	92,8 %	90,6 %	84,5 %		
TC-TE	120	FSM6H-120- L/ P-2G8=1 FSM8H-120- L/ P-2G8=1	122	92,6 %	90,4 %	84,7 %		
TC-DD	55	FSSH-55- L/P- GR10q	55	92,4 %	90,2 %	84,6 %		

In addition, non-dimmable ballasts not included in table 17 shall be assigned an EEI depending on their efficiency as described in Table 18:

TABLE 18

Energy efficiency index requirements for non-dimmable ballasts for fluorescent lamps not included in Table 17

η_{ballast}	Energy Efficiency Index
$\geq 0,94 * \text{EBb}_{\text{FL}}$	A3
$\geq \text{EBb}_{\text{FL}}$	A2
$\geq 1-0,75*(1-\text{EBb}_{\text{FL}})$	A2 BAT

Where EBb_{FL} is defined in Annex II.3.g.

Furthermore, dimmable fluorescent lamp ballasts receive EEI classes according to the class into which the ballast would fall when it is operated at the 100 % lumen output, as described in Table 19.

TABLE 19

Energy efficiency index requirements for dimmable ballasts for fluorescent lamps

Complied class at 100 % lumen output	Energy Efficiency Index of dimmable ballast
A3	A1
A2	A1 BAT

Multi-wattage ballasts shall either be classified according to their efficiency under the lowest (worst) efficiency, or a relevant class shall be indicated for each operated lamp.

B. Second stage requirements

Three years after the entry into force of this Regulation:

for ballasts for high intensity discharge lamps, the efficiency of the ballast as defined in Annex II.1.d shall be indicated.

3. REQUIREMENTS FOR LUMINAIRES FOR FLUORESCENT LAMPS WITHOUT INTEGRATED BALLAST AND FOR LUMINAIRES FOR HIGH INTENSITY DISCHARGE LAMPS

3.1. Luminaire energy performance requirements

A. First stage requirements

One year after this Regulation comes into force:

the power consumption of luminaires for fluorescent lamps without integrated ballast shall not exceed the sum of the power consumption of the incorporated ballasts when the lamps they are normally operating do not emit any light when other possible connected components (network connections, sensors etc.) are disconnected. If they cannot be disconnected, their power shall be measured and deducted from the result.

B. Second stage requirements

Three years after this Regulation comes into force:

Luminaires for fluorescent lamps without integrated ballast and for high intensity discharge lamps shall be compatible with ballasts complying with the third stage requirements, except luminaires with ingress protection grade at least IP4X.

The power consumption of luminaires for high intensity discharge lamps shall not exceed the sum of the power consumption of the incorporated ballasts when the lamps they are normally operating do not emit any light when other possible connected components (network connections, sensors etc.) are disconnected. If they cannot be disconnected, their power shall be measured and deducted from the result.

C. Third stage requirements

Eight years after this Regulation comes into force:

All luminaires for fluorescent lamps without integrated ballast and for high intensity discharge lamps shall be compatible with ballasts complying with the third stage requirements.

3.2. Product information requirements on luminaires

A. First stage requirements

18 months after this Regulation comes into force:

Manufacturers of luminaires for fluorescent lamps without integrated ballast with total lamp lumen above 2 000 lumen shall provide at least the following information on free-access websites and in other forms they deem appropriate for each of their luminaire models. That information shall also be contained in the technical documentation file drawn up for the purposes of conformity assessment pursuant to Article 8 of Directive 2005/32/EC:

- (a) if the luminaire is placed on the market together with the ballast, information on the efficiency of the ballast according to Annex III.2.2, in accordance with the ballast manufacturer's data;
- (b) if the luminaire is placed on the market together with the lamp, lamp efficacy (lm/W) of the lamp, in accordance with the lamp manufacturer's data;
- (c) if the ballast or the lamp are not placed on the market together with the luminaire, references used in manufacturers' catalogues must be provided on the types of lamps or ballasts compatible with the luminaire (e.g. ILCOS code for the lamps);
- (d) maintenance instructions to ensure that the luminaire maintains, as far as possible, its original quality throughout its lifetime;
- (e) disassembly instructions.

B. Second stage requirements

Three years after this Regulation comes into force:

the information provision requirements of the first stage shall also apply to luminaires for high intensity discharge lamps with total lamp lumen above 2 000 lumen. In addition, all luminaires for high intensity discharge lamps shall indicate that they are designed for either clear and/or coated lamps within the meaning of Annex II.

ANNEX IV

Verification procedure for market surveillance purposes

When performing the market surveillance checks referred to in Article 3(2) of Directive 2005/32/EC, the authorities of the Member States shall apply the following verification procedure for the requirements set out in Annex III.

For lamps

Member State authorities shall test a sample batch of minimum twenty 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 III Part 1, as applicable, to 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 ballasts and luminaires

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Member State authorities shall test one single unit.

The model shall be considered to comply with the provisions set out in Annex III Parts 2 and 3, as applicable, to this Regulation if the results do not exceed the limit values.

Otherwise, three more units shall be tested. The model shall be considered to comply with this Regulation if the average of the results of the latter three tests does not exceed the limit values.

Otherwise, the model shall be considered not to comply.

ANNEX V

Indicative benchmarks for fluorescent and high intensity discharge products (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 and lamp life

For single and double capped fluorescent lamps, the benchmark values are the best values included in the tables in Annex III Parts 1.1 and 1.2.

For high-intensity discharge lamps

Metal Halide Lamps (clear and frosted):

TABLE 20

Indicative rated efficacy and performance values for metal halide lamps (benchmark level)

	Ra ≥ 80	80 > Ra ≥ 60
Nominal Lamp Wattage [W]	Rated Lamp Efficacy [lm/W]	Rated Lamp Efficacy [lm/W]
$W \leq 55$	≥ 80	≥ 95
$55 < W \leq 75$	≥ 90	≥ 113
$75 < W \leq 105$	≥ 90	≥ 116
$105 < W \leq 155$	≥ 98	≥ 117
$155 < W \leq 255$	≥ 105	
$255 < W \leq 405$	≥ 105	
Burning Hours	Lamp Lumen Maintenance Factor	Lamp Survival Factor
12 000	> 0,8	> 0,8

High-pressure sodium lamps (clear and frosted):

TABLE 21

Indicative rated efficacy and performance values for high pressure sodium lamps (benchmark level)

Nominal Lamp Wattage [W]	Rated Lamp Efficacy [lm/W]
---------------------------------	-----------------------------------

Status: This is the original version (as it was originally adopted).

$W \leq 55$	≥ 88
$55 < W \leq 75$	≥ 91
$75 < W \leq 105$	≥ 107
$105 < W \leq 155$	≥ 110
$155 < W \leq 255$	≥ 128
$255 < W \leq 405$	≥ 138
Burning Hours	Lamp Lumen Maintenance Factor
16 000	> 0,94
	Lamp Survival Factor
	> 0,92

2. Lamp mercury content

The energy efficient fluorescent lamps with the lowest mercury content include not more than 1,4 mg mercury and the energy efficient high-intensity discharge lamps with the lowest mercury content include not more than 12 mg of mercury.

3. Ballast performance

For applications where dimming is beneficial, the benchmarks are as follows:

Fluorescent lamp ballasts with energy efficiency index A1 BAT that are continuously dimmable down to 10 % light output.

Ballasts for dimmable high intensity discharge lamps which can be dimmed down to 40 % light output having ballast efficiency of 0,9 (best known result, actual dimming possibilities may depend on the HID lamp type used with the ballast).

4. Luminaire product information

The following product information is provided on free-access websites and in other forms the manufacturers deem appropriate for benchmark luminaires in addition to the provisions in Annex III.3.2:

CEN flux code of the luminaire or the complete photometric file.

ANNEX VI

Indicative benchmarks for products meant to be installed as office lighting(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 BENCHMARKS

1.1. Lamp performance

Lamps have an efficacy according to Annex V.

These lamps have the lamp lumen maintenance factors (LLMF) and lamp survival factors (LSF) in Table 22:

TABLE 22

Indicative LLMF and LSF for office lighting lamps (benchmark level)

Burning hours	2 000	4 000	8 000	16 000
LLMF	0,97	0,93	0,9	0,9
LSF	0,99	0,99	0,98	0,93

In addition, these lamps are dimmable to 10 % or less of their light output.

1.2. Product information for lamps

The following information is provided on free-access websites and in other forms the manufacturers deem appropriate for lamps:

The information required by Annex III.1.3, as applicable.

2. LIGHT SOURCE CONTROL GEAR BENCHMARKS

2.1. Light source control gear performance

Fluorescent lamp ballasts have an energy efficiency index of at least A1 (BAT) according to Annex III.2.2 and are dimmable.

High intensity discharge lamp ballasts have an efficiency of 88 % (\leq 100 W lamp power) and else 90 % and are dimmable if the sum of lamp powers operated on the same ballast is above 50 W.

Any other types of light source control gear have an efficiency of 88 % (\leq 100 W input power) and else 90 % when measured according to the applicable measurement standards and are dimmable for lamps above total input power 55 W.

2.2. Product information for light source control gear

The following information is provided on free-access websites and in other forms the manufacturers deem appropriate for light source control gear:

Information on the efficiency of the ballast or the applicable type of light source control gear.

3. LUMINAIRE BENCHMARKS

3.1. Luminaire performance

Luminaires have a luminaire maintenance factor $LMF > 0,95$ in normal office pollution degrees with a cleaning cycle of 4 years.

If they are fluorescent or HID lamp luminaires, they are compatible with at least one lamp type complying with the benchmarks of Annex V.

In addition, these luminaires are compatible with lighting control systems offering the following features:

- presence detection,
- light responsive dimming (for daylight and/or room reflectance variations),
- dimming to accompany changes in illumination requirements (during the working day, over a longer period or due to changes in functionality),
- dimming to compensate for: luminaire pollution, changes in lamp lumen output over its life time and changes in lamp efficacy when the lamp is replaced.

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The compatibility can also be ensured by incorporating the appropriate components in the luminaires themselves.

The compatibility or the features offered by the incorporated components is indicated in the luminaire's product documentation.

3.2. Product information on luminaires

The following information is provided on free-access websites and in other forms the manufacturers deem appropriate for each of the luminaire models:

The information required by Annex III.3.2 and Annex V, as applicable.

In addition, for all luminaires, excluding luminaires with bare lamps and no optics, applicable luminaire maintenance factor (LMF) value data is provided with cleaning instructions if needed up to 4 years, using a similar table:

TABLE 23

Indicative luminaire maintenance factor values (benchmark level)

LMF values							
Environment	cleaning intervals in years						
	1,0	1,5	2,0	2,5	3,0	3,5	4,0
Very Clean							
Clean							
Normal (optional)							
Dirty (optional)							

The table is accompanied by a disclaimer that it contains only indicative values that may not reflect the achievable maintenance values in a particular installation.

For luminaires for directional light sources such as reflector lamps or LEDs, only the applicable information is provided, e.g. LLMF × LMF instead of simply the LMF.

ANNEX VII

Indicative benchmarks for products meant to be installed as public street lighting (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 BENCHMARKS

1.1. Lamp performance

Lamps have an efficacy according to Annex V.

These lamps have the lamp lumen maintenance factors (LLMF) and lamp survival factors (LSF) in Table 24:

TABLE 24

Indicative LLMF and LSF for public street lighting lamps (benchmark level)

Burning hours	2 000	4 000	8 000	16 000
LLMF	0,98	0,97	0,95	0,92
LSF	0,99	0,98	0,95	0,92

In addition, these lamps are dimmable to at least 50 % of their light output when the rated lamp lumen output is above 9 000 lumen.

1.2. Product information for lamps

The following information is provided on free-access websites and in other forms the manufacturers deem appropriate for lamps:

The information required by Annex III.1.3, as applicable.

2. LIGHT SOURCE CONTROL GEAR BENCHMARKS

2.1. Light source control gear performance

Fluorescent lamp ballasts have an energy efficiency index of at least A1 BAT according to Annex III.2.2 and are dimmable.

High intensity discharge lamp ballasts have an efficiency of above 87 % (≤ 100 W lamp power) and else above 89 % measured according to Annex II and are dimmable if the sum of lamp powers operated on the same ballast is above or equal to 55 W.

Any other types of light source control gear have an efficiency of above 87 % (≤ 100 W input power) and else above 89 % when measured according to the applicable measurement standards and are dimmable for lamps equal or above total input power 55 W.

2.2. Product information for light source control gear

The following information is provided on free-access websites and in other forms the manufacturers deem appropriate for light source control gear:

Information on the efficiency of the ballast or the applicable type of light source control gear.

3. LUMINAIRE BENCHMARKS

3.1. Luminaire performance

Luminaires have an optical system that has an ingress protection rating as follows:

- IP65 for road classes ME1 to ME6 and MEW1 to MEW6
- IP5x for road classes CE0 to CE5, S1 to S6, ES, EV and A

The proportion of the light emitted by an optimally installed luminaire going above the horizon should be limited to:

Status: This is the original version (as it was originally adopted).

TABLE 25

Indicative maximum Upward Light Output Ratio (ULOR) values per road class for street lighting luminaires (at benchmark level)

Road classes ME1 to ME6 and MEW1 to MEW6, all lumen outputs	3 %
Road classes CE0 to CE5, S1 to S6, ES, EV and A:	
— 12 000 lm ≤ light source	5 %
— 8 500 lm ≤ light source < 12 000 lm	10 %
— 3 300 lm ≤ light source < 8 500 lm	15 %
— light source < 3 300 lm	20 %

In areas where light pollution is of concern, the maximum proportion of the light going above the horizon is not more than 1 % for all road classes and lumen outputs.

Luminaires are designed so that they avoid emitting obtrusive light to the maximum extent. However, any improvement of the luminaire aiming at reducing the emission of obtrusive light is not to the detriment of the overall energy efficiency of the installation for which it is designed.

If they are luminaires for fluorescent or high-intensity discharge lamps, they are compatible with at least one lamp type complying with the benchmarks of Annex V.

Luminaires are compatible with installations equipped with appropriate dimming and control systems that take account of daylight availability, traffic and weather conditions, and also compensate for the variation over time in surface reflection and for the initial dimensioning of the installation due to the lamp lumen maintenance factor.

3.2. Product information on luminaires

The following information is provided on free-access websites and in other forms the manufacturers deem appropriate for the relevant models:

- (a) the information required by Annex III.3.2 and Annex V, as applicable;
- (b) Utilisation Factor values for standard road conditions in tabular form for the defined road class. The table contains the most energy efficient UF values for different road widths, different pole heights, maximum pole distances, luminaire overhang and inclination, as appropriate for the given road class and luminaire design;
- (c) installation instructions for optimising the Utilisation Factor;
- (d) additional installation recommendations to minimise obtrusive light (if not conflicting with UF optimisation and safety);
- (e) for all luminaires, excluding luminaires with bare lamps and no optics, applicable luminaire maintenance factor (LMF) value data is provided according using a similar table:

Status: This is the original version (as it was originally adopted).

TABLE 26

Indicative luminaire maintenance factor values (benchmark level)

LMF values							
Pollution category	Exposure time in years						
	1,0	1,5	2,0	2,5	3,0	3,5	4,0
High							
Medium							
Low							

For luminaires for directional light sources such as reflector lamps or LEDs, only the applicable information is provided, e.g. LLMF × LMF instead of simply the LMF.

Status: This is the original version (as it was originally adopted).

- (1) Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (codified version) ([OJ L 374, 27.12.2006, p. 10](#)).
- (2) Directive 94/9/EC of the European Parliament and of the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres ([OJ L 100, 19.4.1994, p. 1](#)).
- (3) Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres ([OJ L 23, 28.1.2000, p. 57](#)).
- (4) Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) ([OJ L 157, 9.6.2006, p. 24](#)).
- (5) Council Directive 93/42/EEC of 14 June 1993 concerning medical devices ([OJ L 169, 12.7.1993, p. 1](#)).
- (6) Council Directive 88/378/EEC of 3 May 1988 on the approximation of the laws of the Member States concerning the safety of toys ([OJ L 187, 16.7.1988, p. 1](#)).