

TEST REPORT**COMMISSION REGULATION (EU) 2019/2020****of 1 October 2019**

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

COMMISSION DELEGATED REGULATION (EU) 2019/2015**of 11 March 2019**

supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of light sources and repealing Commission Delegated Regulation (EU) No 874/2012

Report Reference No...... : AOC210427001ER**Compiled by (print+ signature)**..... : Vic Tan**Approved by (print+ signature)**..... : Robin Liu**Date of issue**..... : 2021-04-27

Lab Supervisor

Testing Laboratory..... : Shenzhen AOCE Electronic Technology Service Co., Ltd**Address**..... : Room 202, 2nd Floor, No.12th Building of Xinhe Tongfuyu Industrial Park, Fuhai Street, Baoan District, Shenzhen, Guangdong, China**Testing location/address**..... : Same as above**Applicant's name**..... : ZhongShan LUMIO Lighting Co., Ltd**Address**..... : The 4th floor ,Building B, No.5, XingTai North 3rd Road, GuZhen Town, ZhongShan City, Guangdong Province, China**Manufacturer name**..... : ZhongShan LUMIO Lighting Co., Ltd**Address**..... : The 4th floor ,Building B, No.5, XingTai North 3rd Road, GuZhen Town, ZhongShan City, Guangdong Province, China**Trade Mark**..... : LUMIO**Model / Type reference**..... : 1415**Ratings**..... : 85-265 V~, 50/60 Hz, 100 W, 5000 K**Test specification:****Standard**..... : COMMISSION REGULATION (EU) 2019/2020 ; (EU) 2019/2015**Test procedure**..... : Test report**Non-standard test method**..... : N/A**Test Report Form No.**..... : IEC EE TRF (EU) 2019/2020**Test Report Form(s) Originator**..... : AOCE**Master TRF**..... : 2019-11-30

Summary of Testing:	
Tests performed (name of test and test clause):	Testing location:
The sample(s) tested complies with the requirements of COMMISSION REGULATION (EU) 2019/2020 When determining the test conclusion. The Measurement Uncertainty of test has been considered.	Shenzhen AOCE Electronic Technology Service Co., Ltd Room 202, 2nd Floor, No.12th Building of Xinhe Tongfuyu Industrial Park, Fuhai Street, Baoan District, Shenzhen, Guangdong, China
Summary of Compliance with National Differences:	
N/A	
Copy of Marking Plate:	
N/A	

Test Item Particulars:	
Product type.....	☒ Light source ☐ Separate control gears
Control gear.....	☐ Internal ☐ External ☒ None
Light source type.....	☒ LED ☐ OLED ☐ Other
	☒ DLS ☐ NDLS
	☒ MLS ☐ NMLS
	☐ Industrial applications ☒ Outdoor applications
Type and size of cap.....	N/A
Lamp dimension (mm).....	525×185×52 mm
Rated voltage (V).....	85-265 V~
Rated frequency (Hz)	50/60Hz
Rated Power (W).....	100 W
Rated luminous (lm).....	10000 lm
Rated color temperature (CCT).....	5000 K
Rated color rendering (CRI).....	80
Rated life (h).....	50000
Rated power factor.....	0.97PF
Rated beam angle.....	70°
Possible Test Case Verdicts:	
Test case does not apply to the test object.....	N/A (Not Applicable)
Test object does meet the requirement.....	P (Pass)
Test object does not meet the requirement.....	F (Fail)
Testing:	
Ambient temperature of tested.....	25.0 °C
Test inputs.....	230 V, 50 Hz
Sample size for tested	10 pcs
Date of receipt of test item.....	2020-09-11
Date (s) of performance of tests.....	2020-09-11 to 2021-04-27
General Remarks:	
Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or use in part without prior written consent from Shenzhen AOCE Electronic Technology Service Co., Ltd	
General Product Information:	
N/A	

(EU) 2019/2020			
Clause	Requirement + Test	Result – Remark	Verdict

ANNEX II	ECODESIGN REQUIREMENTS		-																																			
1	ENERGY EFFICIENCY REQUIREMENTS		-																																			
(a)	From 1 September 2021, the declared power consumption of a light source P_{on} shall not exceed the maximum allowed power P_{onmax} (in W), defined as a function of the declared useful luminous flux Φ_{use} (in lm) and the declared colour rendering index CRI (-) as follows: $P_{onmax} = C \times (L + \Phi_{use}/(F \times \eta)) \times R$;	$P_{onmax} = 125.19$	P																																			
	- The values for threshold efficacy (η in lm/W) and end loss factor (L in W) are specified in Table 1, depending on the light source type. They are constants used for computations and do not reflect true parameters of light sources. The threshold efficacy is not the minimum required efficacy; the latter can be computed by dividing the useful luminous flux by the computed maximum allowed power.		P																																			
	- 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.		P																																			
	- 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)		P																																			
	- CRI factor (R) is: 0,65 for $CRI \leq 25$; (CRI+80)/160 for $CRI > 25$, rounded to two decimals.		P																																			
Table 1	Table 1 Threshold efficacy (η) and end loss factor (L) <table><tr><th rowspan="2">Light source description</th><th>η</th><th>L</th></tr><tr><th>[lm/W]</th><th>[W]</th></tr><tr><td>LFL T5-HE</td><td>98,8</td><td>1,9</td></tr><tr><td>LFL T5-HO, $4\,000 \leq \Phi \leq 5\,000\text{ lm}$</td><td>83,0</td><td>1,9</td></tr><tr><td>LFL T5-HO, other lm output</td><td>79,0</td><td>1,9</td></tr><tr><td>FL T5 circular</td><td>79,0</td><td>1,9</td></tr><tr><td>FL T8 (including FL T8 U-shaped)</td><td>89,7</td><td>4,5</td></tr><tr><td>From 1 September 2023, for FL T8 of 2-, 4- and 5-foot</td><td>120,0</td><td>1,5</td></tr><tr><td>Magnetic induction light source, any length/flux</td><td>70,2</td><td>2,3</td></tr><tr><td>CFLni</td><td>70,2</td><td>2,3</td></tr><tr><td>FL T9 circular</td><td>71,5</td><td>6,2</td></tr><tr><td>HPS single-ended</td><td>88,0</td><td>50,0</td></tr></table>	Light source description	η	L	[lm/W]	[W]	LFL T5-HE	98,8	1,9	LFL T5-HO, $4\,000 \leq \Phi \leq 5\,000\text{ lm}$	83,0	1,9	LFL T5-HO, other lm output	79,0	1,9	FL T5 circular	79,0	1,9	FL T8 (including FL T8 U-shaped)	89,7	4,5	From 1 September 2023, for FL T8 of 2-, 4- and 5-foot	120,0	1,5	Magnetic induction light source, any length/flux	70,2	2,3	CFLni	70,2	2,3	FL T9 circular	71,5	6,2	HPS single-ended	88,0	50,0		-
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	<table><tr><td>HPS double-ended</td><td>78,0</td><td>47,7</td></tr><tr><td>MH ≤ 405 W single-ended</td><td>84,5</td><td>7,7</td></tr><tr><td>MH > 405 W single-ended</td><td>79,3</td><td>12,3</td></tr><tr><td>MH ceramic double-ended</td><td>84,5</td><td>7,7</td></tr><tr><td>MH quartz double-ended</td><td>79,3</td><td>12,3</td></tr><tr><td>Organic light-emitting diode (OLED)</td><td>65,0</td><td>1,5</td></tr><tr><td>Until 1 September 2023: HL G9, G4 and GY6.35</td><td>19,5</td><td>7,7</td></tr><tr><td>HL R7s ≤ 2 700 lm</td><td>26,0</td><td>13,0</td></tr><tr><td>Other light sources in scope not mentioned above</td><td>120,0</td><td>1,5 (*)</td></tr><tr><td colspan="3">(*) For connected light sources (CLS) a factor L = 2,0 shall be applied.</td></tr></table>	HPS double-ended	78,0	47,7	MH ≤ 405 W single-ended	84,5	7,7	MH > 405 W single-ended	79,3	12,3	MH ceramic double-ended	84,5	7,7	MH quartz double-ended	79,3	12,3	Organic light-emitting diode (OLED)	65,0	1,5	Until 1 September 2023: HL G9, G4 and GY6.35	19,5	7,7	HL R7s ≤ 2 700 lm	26,0	13,0	Other light sources in scope not mentioned above	120,0	1,5 (*)	(*) For connected light sources (CLS) a factor L = 2,0 shall be applied.				
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Table 2	<table><tr><td colspan="2">Table 2 Correction factor C depending on light source characteristics</td></tr><tr><td>Light source type</td><td>Basic C value</td></tr><tr><td>Non-directional (NDLS) not operating on mains (NMLS)</td><td>1,00</td></tr><tr><td>Non-directional (NDLS) operating on mains (MLS)</td><td>1,08</td></tr><tr><td>Directional (DLS) not operating on mains (NMLS)</td><td>1,15</td></tr><tr><td>Directional (DLS) operating on mains (MLS)</td><td>1,23</td></tr><tr><td>Special light source feature</td><td>Bonus on C</td></tr><tr><td>FL or HID with CCT > 5 000 K</td><td>+0,10</td></tr><tr><td>FL with CRI > 90</td><td>0,10</td></tr><tr><td>HID with second envelope</td><td>+0,10</td></tr><tr><td>MH NDLS > 405 W with non-clear envelope</td><td>+0,10</td></tr><tr><td>DLS with anti-glare shield</td><td>+0,20</td></tr><tr><td>Colour-tunable light source (CTLs)</td><td>+0,10</td></tr><tr><td>High luminance light sources (HLLS)</td><td>+0,0058 • Luminance-HLLS - 0,0167</td></tr></table>	Table 2 Correction factor C depending on light source characteristics		Light source type	Basic C value	Non-directional (NDLS) not operating on mains (NMLS)	1,00	Non-directional (NDLS) operating on mains (MLS)	1,08	Directional (DLS) not operating on mains (NMLS)	1,15	Directional (DLS) operating on mains (MLS)	1,23	Special light source feature	Bonus on C	FL or HID with CCT > 5 000 K	+0,10	FL with CRI > 90	0,10	HID with second envelope	+0,10	MH NDLS > 405 W with non-clear envelope	+0,10	DLS with anti-glare shield	+0,20	Colour-tunable light source (CTLs)	+0,10	High luminance light sources (HLLS)	+0,0058 • Luminance-HLLS - 0,0167		-		
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	Where applicable, bonuses on correction factor C are cumulative.		N/A																														
	Light sources that allow the end-user to adapt the spectrum and/or the beam angle of the emitted light, thus changing the values for useful luminous flux, colour rendering index (CRI) and/or correlated colour temperature (CCT), and/or changing the directional/non-directional status of the light source, shall be evaluated using the reference control settings.		N/A																														
	The standby power P _{sb} of a light source shall not exceed 0,5 W.		N/A																														
	The networked standby power P _{net} of a connected light source shall not exceed 0,5 W.		N/A																														
	The allowable values for P _{sb} and P _{net} shall not be added together.		N/A																														
(b)	From 1 September 2021, the values set in Table 3 for the minimum energy efficiency requirements of a separate control gear operating at full-load shall apply:		P																														

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Clause	Requirement + Test	Result – Remark	Verdict																															
Table 3	Table 3 Minimum energy efficiency for separate control gear at full-load <table><tr><th>Declared output power of the control gear (P_{cg}) or declared power of the light source (P_{in}) in W, as applicable</th><th>Minimum energy efficiency</th></tr><tr><td colspan="2"><u>Control gear for HL light sources</u></td></tr><tr><td>all wattages P_{cg}</td><td>0,91</td></tr><tr><td colspan="2"><u>Control gear for FL light sources</u></td></tr><tr><td>$P_{in} \leq 5$</td><td>0,71</td></tr><tr><td>$5 < P_{in} \leq 100$</td><td>$P_{in}/(2 \times \sqrt{(P_{in}/36)} + 38/36 \times P_{in}+1)$</td></tr><tr><td>$100 < P_{in}$</td><td>0,91</td></tr><tr><td colspan="2"><u>Control gear for HID light sources</u></td></tr><tr><td>$P_{in} \leq 30$</td><td>0,78</td></tr><tr><td>$30 < P_{in} \leq 75$</td><td>0,85</td></tr><tr><td>$75 < P_{in} \leq 105$</td><td>0,87</td></tr><tr><td>$105 < P_{in} \leq 405$</td><td>0,90</td></tr><tr><td>$405 < P_{in}$</td><td>0,92</td></tr><tr><td colspan="2"><u>Control gear for LED or OLED light sources</u></td></tr><tr><td>all wattages P_{cg}</td><td>$P_{cg}^{0,81}/(1,09 \times P_{cg}^{0,81} + 2,10)$</td></tr></table>		Declared output power of the control gear (P_{cg}) or declared power of the light source (P_{in}) in W, as applicable	Minimum energy efficiency	<u>Control gear for HL light sources</u>		all wattages P_{cg}	0,91	<u>Control gear for FL light sources</u>		$P_{in} \leq 5$	0,71	$5 < P_{in} \leq 100$	$P_{in}/(2 \times \sqrt{(P_{in}/36)} + 38/36 \times P_{in}+1)$	$100 < P_{in}$	0,91	<u>Control gear for HID light sources</u>		$P_{in} \leq 30$	0,78	$30 < P_{in} \leq 75$	0,85	$75 < P_{in} \leq 105$	0,87	$105 < P_{in} \leq 405$	0,90	$405 < P_{in}$	0,92	<u>Control gear for LED or OLED light sources</u>		all wattages P_{cg}	$P_{cg}^{0,81}/(1,09 \times P_{cg}^{0,81} + 2,10)$		-
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all wattages P_{cg}	$P_{cg}^{0,81}/(1,09 \times P_{cg}^{0,81} + 2,10)$																																	
	Multi-wattage separate control gears shall comply with the requirements in Table 3 according to the maximum declared power on which they can operate.		N/A																															
	The no-load power P_{no} of a separate control gear shall not exceed 0,5 W.		N/A																															
	The standby power P_{sb} of a separate control gear shall not exceed 0,5 W.		N/A																															
	The networked standby power P_{net} of a connected separate control gear shall not exceed 0,5 W. The allowable values for P_{sb} and P_{net} shall not be added together.		N/A																															
2	Functional requirements		-																															
	From 1 September 2021, the functional requirements specified in Table 4 shall apply for light sources:		P																															

(EU) 2019/2020																		
Clause	Requirement + Test	Result – Remark	Verdict															
Table 4	Table 4 Functional requirements for light sources <table><tr><td>Colour rendering</td><td>CRI ≥ 80 (except for HID with Φ_{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)</td></tr><tr><td>Displacement factor (DF, cos φ_i) at power input P_{on} for LED and OLED MLS</td><td>No limit at P_{on} ≤ 5 W, DF ≥ 0,5 at 5 W < P_{on} ≤ 10 W, DF ≥ 0,7 at 10 W < P_{on} ≤ 25 W DF ≥ 0,9 at 25 W < P_{on}</td></tr><tr><td>Lumen maintenance factor (for LED and OLED)</td><td>The lumen maintenance factor X_{LMF}% after endurance testing according to Annex V shall be at least X_{LMF,MIN} % calculated as follows: $X_{LMF,MIN} \% = 100 \times e^{\frac{(3000 \times \ln(0.7))}{L_{70}}}$where L₇₀ is the declared L₇₀B₅₀ lifetime (in hours) If the calculated value for X_{LMF,MIN} exceeds 96,0 %, an X_{LMF,MIN} value of 96,0 % shall be used</td></tr><tr><td>Survival factor (for LED and OLED)</td><td>Light sources should be operational as specified in row 'Survival factor (for LED and OLED)' of Annex IV, Table 6, following the endurance testing given in Annex V.</td></tr><tr><td>Colour consistency for LED and OLED light sources</td><td>Variation of chromaticity coordinates within a six-step MacAdam ellipse or less.</td></tr><tr><td>Flicker for LED and OLED MLS</td><td>P_{st} LM ≤ 1,0 at full-load</td></tr><tr><td>Stroboscopic effect for LED and OLED MLS</td><td>SVM ≤ 0,4 at full-load (except for HID with Φ_{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)</td></tr></table>		Colour rendering	CRI ≥ 80 (except for HID with Φ _{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 φ _i) at power input P _{on} for LED and OLED MLS	No limit at P _{on} ≤ 5 W, DF ≥ 0,5 at 5 W < P _{on} ≤ 10 W, DF ≥ 0,7 at 10 W < P _{on} ≤ 25 W DF ≥ 0,9 at 25 W < P _{on}	Lumen maintenance factor (for LED and OLED)	The lumen maintenance factor X _{LMF} % after endurance testing according to Annex V shall be at least X _{LMF,MIN} % calculated as follows: $X_{LMF,MIN} \% = 100 \times e^{\frac{(3000 \times \ln(0.7))}{L_{70}}}$ where L ₇₀ is the declared L ₇₀ B ₅₀ lifetime (in hours) If the calculated value for X _{LMF,MIN} exceeds 96,0 %, an X _{LMF,MIN} value of 96,0 % shall be used	Survival factor (for LED and OLED)	Light sources should be operational as specified in row 'Survival factor (for LED and OLED)' of Annex IV, Table 6, following the endurance testing given in Annex V.	Colour consistency for LED and OLED light sources	Variation of chromaticity coordinates within a six-step MacAdam ellipse or less.	Flicker for LED and OLED MLS	P _{st} LM ≤ 1,0 at full-load	Stroboscopic effect for LED and OLED MLS	SVM ≤ 0,4 at full-load (except for HID with Φ _{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)		-
	Colour rendering	CRI ≥ 80 (except for HID with Φ _{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)																
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	Flicker for LED and OLED MLS	P _{st} LM ≤ 1,0 at full-load																
	Stroboscopic effect for LED and OLED MLS	SVM ≤ 0,4 at full-load (except for HID with Φ _{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)																
3	Information requirements		-															
	From 1 September 2021 the following information requirements shall apply:		P															
(a)	Information to be displayed on the light source itself		P															
	For all light sources, except CTLS, LFL, CFLni, ther FL, and HID, the value and physical unit of the useful luminous flux (lm) and correlated colour temperature (K) shall be displayed in a legible font on the surface if, after the inclusion of safety-related information, there is sufficient space available for it without unduly obstructing the light emission.		P															
	For directional light sources, the beam angle (°) shall also be indicated.		N/A															
	If there is room for only two values, the useful luminous flux and the correlated colour temperature shall be displayed. If there is room for only one value, the useful		P															

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Clause	Requirement + Test	Result – Remark	Verdict
	luminous flux shall be displayed.		
(b)	Information to be visibly displayed on the packaging		P
-(1)	Light source placed on the market, not in a containing product		P
--(a)	the useful luminous flux (Φ_{use}) in a font at least twice as large as the display of the on-mode power (P_{on}), clearly indicating if it refers to the flux in a sphere (360°), in a wide cone (120°) or in a narrow cone (90°);		P
--(b)	the correlated colour temperature, rounded to the nearest 100 K, also expressed graphically or in words, or the range of correlated colour temperatures that can be set;		P
--(c)	the beam angle in degrees (for directional light sources), or the range of beam angles that can be set;		N/A
--(d)	electrical interface details, e.g. cap- or connector-type, type of power supply (e.g. 230 V AC 50 Hz, 12 V DC);		P
--(e)	the L70B50 lifetime for LED and OLED light sources, expressed in hours;		P
--(f)	the on-mode power (P_{on}), expressed in W;		P
--(g)	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;		P
--(h)	the networked standby power (P_{net}) for CLS, expressed in W and rounded to the second decimal. If the value is zero, it may be omitted from the packaging;		N/A
--(i)	the colour rendering index, rounded to the nearest integer, or the range of CRI-values that can be set;		P
--(j)	if $CRI < 80$, and the light source is intended for use in outdoor applications, industrial applications or other applications where lighting standards allow a $CRI < 80$, a clear indication to this effect. For HID light sources with useful luminous flux $> 4\,000\text{ lm}$, this indication is not mandatory;		N/A
--(k)	if the light source is designed for optimum use in non-standard conditions (such as ambient temperature $T_a \neq 25^\circ\text{C}$ or specific thermal management is necessary): information on those conditions;		N/A
--(l)	a warning if the light source cannot be dimmed or can be dimmed only with specific dimmers or with specific wired or wireless dimming methods. In the latter cases a list of compatible dimmers and/or methods shall be provided on the manufacturer's website;		N/A
--(m)	if the light source contains mercury: a warning of this, including the mercury content in mg rounded to the first		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
	decimal place;		
--(n)	if the light source is within the scope of Directive 2012/19/EU, without prejudice to marking obligations pursuant to Article 14(4) of Directive 2012/19/EU, or contains mercury: a warning that it shall not be disposed of as unsorted municipal waste.		N/A
	Items (a) to (d) shall be displayed on the packaging in the direction meant to face prospective buyer; for other items this is also recommended, if space permits.		P
	For light sources that can be set to emit light with different characteristics, the information shall be reported for the reference control settings. In addition, a range of obtainable values may be indicated.		N/A
	The information does not need to use the exact wording on the list above. Alternatively, it may be displayed in the form of graphs, drawings or symbols.		P
-(2)	Separate control gears:		N/A
	If a separate control gear is placed on the market as a stand-alone product and not as a part of a containing product, in a packaging containing information to be visibly displayed to potential buyers, prior to their purchase, the following information shall be clearly and prominently displayed on the packaging:		N/A
--(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);		N/A
--(b)	the type of light source(s) for which it is intended;		N/A
--(c)	the efficiency in full-load, expressed in percentage;		N/A
--(d)	the no-load power (P_{no}), expressed in W and rounded to the second decimal, or the indication that the gear is not intended to operate in no-load mode. If the value is zero, it may be omitted from the packaging but shall nonetheless be declared in the technical documentation and on websites;		N/A
--(e)	the standby power (P_{sb}), expressed in W and rounded to the second decimal. If the value is zero, it may be omitted from the packaging but shall nonetheless be declared in the technical documentation and on websites;		N/A
--(f)	the on-mode power (P_{on}), expressed in W;		N/A
--(g)	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;		N/A
--(h)	the networked standby power (P_{net}) for CLS, expressed in		N/A

(EU) 2019/2020			
Clause	Requirement + Test	Result – Remark	Verdict
	W and rounded to the second decimal. If the value is zero, it may be omitted from the packaging;		
(c)	Information to be visibly displayed on a free-access website of the manufacturer, importer or authorised representative		N/A
-(1)	Separate control gears:		N/A
	For any separate control gear that is placed on the EU market, the following information shall be displayed on at least one free-access website:		N/A
--(a)	the information specified in point 3(b)(2), except 3(b)(2)(h);		N/A
--(b)	the outer dimensions in mm;		N/A
--(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;		N/A
--(d)	instructions on how to remove lighting control parts and non-lighting parts, if any, or how to switch them off or minimise their power consumption during control-gear testing for market surveillance purposes;		N/A
--(e)	if the control gear can be used with dimmable light sources, a list of minimum characteristics that the light sources should have to be fully compatible with the control gear during dimming, and possibly a list of compatible dimmable light sources;		N/A
--(f)	recommendations on how to dispose of it at the end of its life in line with Directive 2012/19/EU.		N/A
	The information does not need to use the exact wording in the list above. Alternatively, it may be displayed in the form of graphs, drawings or symbols.		N/A
(d)	Technical documentation		N/A
-(1)	Separate control gears:		N/A
	The information specified in point 3(c)(2) of this Annex shall also be contained in the technical documentation file drawn up for the purposes of conformity assessment pursuant to Article 8 of Directive 2009/125/EC.		N/A
(e)	Information for products specified in point 3 of Annex III		N/A
	For the light sources and separate control gears specified in point 3 of Annex III the intended purpose shall be stated in the technical documentation for compliance assessment as per Article 5 of this Regulation and on all forms of packaging, product information and advertisement, together with an explicit indication that the light source or		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
	separate control gear is not intended for use in other applications.		
	The technical documentation file drawn up for the purposes of conformity assessment, in accordance with Article 5 of this Regulation shall list the technical parameters that make the product design specific to qualify for the exemption.		N/A
	In particular for light sources indicated in point 3(p) of Annex III it shall be stated: 'This light source is only for use by photo sensitive patients. Use of this light source will lead to increased energy cost compared to an equivalent more energy efficient product.'		N/A
ANNEX III	Exemptions		-
1	This Regulation shall not apply to light sources and separate control gears specifically tested and approved to operate:		N/A
(a)	in potentially explosive atmospheres, as defined in Directive 2014/34/EU of the European Parliament and of the Council ⁽¹⁾ ;		N/A
(b)	for emergency use, as set out in Directive 2014/35/EU of the European Parliament and of the Council ⁽²⁾ ;		N/A
(c)	in radiological and nuclear medicine installations, as defined in Article 3 of Council Directive 2009/71/EURATOM ⁽³⁾ ;		N/A
(d)	in or on military or civil defence establishments, equipment, ground vehicles, marine equipment or aircraft, as set out in Member States' regulations or in documents issued by the European Defence Agency;		N/A
(e)	in or on motor vehicles, their trailers and systems, interchangeable towed equipment, components and separate technical units as set out in Regulation (EC) No 661/2009 ⁽⁴⁾ , (EU) No 167/2013 ⁽⁵⁾ and (EU) No 168/2013 of the European Parliament and of the Council ⁽⁶⁾ ;		N/A
(f)	in or on non-road mobile machinery as set out in Regulation (EU) 2016/1628 of the European Parliament and of the Council ⁽⁷⁾ and in or on their trailers;		N/A
(g)	in or on interchangeable equipment as set out in Directive 2006/42/EC of the European Parliament and of the Council ⁽⁸⁾ intended to be towed or to be mounted and fully raised from the ground or that cannot articulate around a vertical axis when the vehicle to which it is attached is in use on a road by vehicles as set out in Regulation (EU) No 167/2013;		N/A
(h)	in or on civil aviation aircraft, as set out in Commission Regulation (EU) No 748/2012 ⁽⁹⁾ ;		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
(i)	in railway vehicle lighting, as set out in Directive 2008/57/EC of the European Parliament and of the Council ⁽¹⁰⁾ ;		N/A
(j)	in marine equipment, as set out in Directive 2014/90/EU of the European Parliament and of the Council ⁽¹¹⁾ ;		N/A
(k)	in medical devices, as set out in Council Directive 93/42/EEC ⁽¹²⁾ or Regulation (EU) 2017/745 of the European Parliament and of the Council ⁽¹³⁾ and in vitro medical devices as set out in Directive 98/79/EC of the European Parliament and of the Council ⁽¹⁴⁾ .		N/A
	For the purpose of this point, 'specifically tested and approved' means that the light source or separate control gear:		N/A
	— has been specifically tested for the mentioned operating condition or application, according to the European legislation mentioned or related implementing measures, or relevant European or international standards, or, in the absence of these, according to relevant Member States legislation; and		N/A
	— is accompanied by evidence, to be included in the technical documentation, in the form of a certificate, a type approval mark, a test report, that the product has been specifically approved for the mentioned operating condition or application; and		N/A
	— is placed on the market specifically for the mentioned operating condition or application, as evidenced at least by the technical documentation, and except for point (d), information on the packaging and any advertising or marketing materials.		N/A
2	In addition, this Regulation shall not apply to:		-
(a)	double-capped fluorescent T5 light sources with power $P \leq 13$ W;		N/A
(b)	electronic displays (e.g. televisions, computer monitors, notebooks, tablets, mobile phones, e-readers, game consoles), including displays within the scope of Commission Regulation (EU) 2019/2021 ⁽¹⁵⁾ , and Commission Regulation (EU) No 617/2013 ⁽¹⁶⁾ ;		N/A
(c)	light sources and separate control gears in battery-operated products, including but not limited to e.g. torches, mobile phones with an integrated torch light, toys including light sources, desk lamps operating only on batteries, armband lamps for cyclists, solar-powered garden lamps;		N/A
(d)	light sources for spectroscopy and photometric applications, such as for example UV-VIS spectroscopy, molecular spectroscopy, atomic absorption spectroscopy,		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
	nondispersive infrared (NDIR), fourier-transform infrared (FTIR), medical analysis, ellipsometry, layer thickness measurement, process monitoring or environmental monitoring;		
(e)	light sources and separate control gears on bicycles and other non-motorised vehicles.		N/A
3	Any light source or separate control gear within the scope of this Regulation shall be exempt from the requirements of this Regulation, with the exception of the information requirements set out in point 3(e) of Annex II, if they are specifically designed and marketed for their intended use in at least one of the following applications:		-
(a)	signalling (including, but not limited to, road-, railway-, marine- or air traffic- signalling, traffic control or airfield lamps);		N/A
(b)	image capture and image projection (including, but not limited to, photocopying, printing (directly or in pre-processing), lithography, film and video projection, holography);		N/A
(c)	light sources with specific effective ultraviolet power > 2 mW/klm and intended for use in applications requiring high UV-content;		N/A
(d)	light sources with a peak radiation around 253,7 nm and intended for germicidal use (destruction of DNA);		N/A
(e)	light sources emitting 5 % or more of total radiation power of the range 250-800 nm in the range of 250-315 nm and/or 20 % or more of total radiation power of the range 250-800 nm in the range of 315-400 nm, and intended for disinfection or fly trapping;		N/A
(f)	light sources with the primary purpose of emitting radiation around 185,1 nm and intended to be used for the generation of ozone;		N/A
(g)	light sources emitting 40 % or more of total radiation power of the range 250-800 nm in the range of 400-480 nm, and intended for coral zooxanthellae symbioses;		N/A
(h)	FL light sources emitting 80 % or more of total radiation power of the range 250-800 nm in the range of 250-400 nm, and intended for sun-tanning;		N/A
(i)	HID light sources emitting 40 % or more of total radiation power of the range 250-800 nm in the range of 250-400 nm, and intended for sun-tanning;		N/A
(j)	light sources with a photosynthetic efficacy > 1,2 µmol/J, and/or emitting 25 % or more of total radiation power of the range 250-800 nm in the range of 700-800 nm, and intended for use in horticulture;		N/A

(EU) 2019/2020												
Clause	Requirement + Test	Result – Remark	Verdict									
(k)	HID light sources with correlated colour temperature CCT > 7 000 K and intended for use in applications requiring such a high CCT;		N/A									
(l)	light sources with a beam angle of less than 10° and intended for spot-lighting applications requiring a very narrow light beam;		N/A									
(m)	halogen light sources with cap-type G9.5, GX9.5, GY9.5, GZ9.5, GZX9.5, GZY9.5, GZZ9.5, K39d, G9.5HPL, G16d, GES/E40 (low voltage (24V) silver crown only), GX16, GX16d, GY16, G22, G38, GX38, GX38Q, P28s, P40s, PGJX28, PGJX 36, PGJX50, R7s with a luminous flux > 12 000 lm, QXL, designed and marketed specifically for scene-lighting use in film studios, TV studios, and photographic studios, or for stage-lighting use in theatres, discos and during concerts or other entertainment events;		N/A									
(n)	colour-tuneable light sources that can be set to at least the colours listed in this point and which have for each of these colours, measured at the dominant wavelength, a minimum excitation purity of: <table><tr><td>Blue</td><td>440nm — 490nm</td><td>90 %</td></tr><tr><td>Green</td><td>520nm — 570nm</td><td>65 %</td></tr><tr><td>Red</td><td>610nm — 670nm</td><td>95 %</td></tr></table> and are intended for use in applications requiring high-quality coloured light;	Blue	440nm — 490nm	90 %	Green	520nm — 570nm	65 %	Red	610nm — 670nm	95 %		N/A
Blue	440nm — 490nm	90 %										
Green	520nm — 570nm	65 %										
Red	610nm — 670nm	95 %										
(o)	light sources accompanied by an individual calibration certificate detailing the exact radiometric flux and/or spectrum under specified conditions, and intended for use in photometric calibration (of e.g. wavelength, flux, colour temperature, colour rendering index), or for laboratory use or quality control applications for the evaluation of coloured surfaces and materials under standard viewing conditions (e.g. standard illuminants);		N/A									
(p)	light sources provided specifically for use by photosensitive patients, to be sold in pharmacies and other authorised selling points (e.g. suppliers of disability products), upon presentation of a medical prescription;		N/A									
(q)	incandescent light sources (not including halogen light sources) fulfilling all of the following conditions: power ≤ 40 W, length ≤ 60 mm, diameter ≤ 30 mm, declared suitable for operation at ambient temperature ≥ 300 °C, and intended for use in high temperature applications such as ovens;		N/A									
(r)	halogen light sources fulfilling all of the following conditions: cap-type G4, GY6.35 or G9, power ≤ 60 W, declared suitable for operation at ambient temperature ≥ 300 ° C, and intended for use in high temperature		N/A									

(EU) 2019/2020			
Clause	Requirement + Test	Result – Remark	Verdict
	applications such as ovens;		
(s)	halogen light sources with blade contact-, metal lug-, cable-, litz wire- or non-standard customised electrical interface, specifically designed and marketed for industrial or professional electro-heating equipment (e.g. stretch blow-moulding process in PET-Industry, 3D-printing, gluing, inks, paint and coating hardening);		N/A
(t)	halogen light sources fulfilling all of the following conditions: R7s cap, CCT $\leq 2\,500\text{ K}$, length not in the ranges 75-80 mm and 110-120 mm, specifically designed and marketed for industrial or professional electro-heating equipment (e.g. stretch blow-moulding process in PET-Industry, 3D-printing, gluing, inks, paint and coating hardening);		N/A
(u)	single capped fluorescent lamps (CFLni) having a diameter of 16 mm (T5), 2G11 4 pin base, with CCT = 3 200 K and chromaticity coordinates $x = 0,415$ $y = 0,377$, or with CCT = 5 500 K and chromaticity coordinates $x = 0,330$ $y = 0,335$, specifically designed and marketed for studio and video applications for traditional filmmaking;		N/A
(v)	LED or OLED light sources, complying with the definition of 'original works of art' as defined in Directive 2001/84/EC of the European Parliament and of the Council (17), made by the artist him/herself in a limited number below 10 pieces;		N/A
(w)	white light sources which		N/A
-(1)	are designed and marketed specifically for scene-lighting use in film-studios, TV-studios and locations, and photographic-studios and locations, or for stage-lighting use in theatres, during concerts or other entertainment events;		N/A
-(2)	provide two or more of the following specifications:		N/A
--(a)	LED with high CRI > 90;		N/A
--(b)	GES/E40, K39d socket with changeable Colour Temperature down to 1 800 K (undimmed), used with low voltage power supply;		N/A
--(c)	LED rated at 180W and greater and arranged to direct output to an area smaller than the light emitting surface;		N/A
--(d)	DWE lamp type which is a tungsten lamp defined by its wattage (650 W) voltage (120 V) and terminal type (pressure screw terminal);		N/A
--(e)	white bi-colour LED sources;		N/A
--(f)	fluorescent tubes: Min BI Pin T5 and Bi Pin T12 with CRI ≥ 85 and CCT 2 900, 3 000, 3 200, 5 600 or 6 500 K.		N/A

(EU) 2019/2020			
Clause	Requirement + Test	Result – Remark	Verdict
4	CLS and CSCG designed and marketed specifically for scene-lighting use in film-studios, TV-studios and locations, and photographic studios and locations, or for stage-lighting use in theatres, discos and during concerts or other entertainment events, for connection to high speed control networks (utilising signalling rates of 250 000 bits per second and higher) in always-listening mode, shall be exempt from the requirements on standby (Psb) and on networked standby (Pnet) of points 1(a) and 1(b) of Annex II.		-
ANNEX IV	Verification procedure for market surveillance purposes		N/A
ANNEX V	Functionality after endurance testing		-
	Models of LED- and OLED- light sources shall undergo endurance testing to verify their lumen maintenance and survival factor. This endurance testing consists of the test method outlined below. The authorities of a Member State shall test 10 units of the model for this test.		P
	The endurance test for LED and OLED light sources shall be conducted as follows:		P
(a)	Ambient conditions and test setup:		P
-(i)	The switching cycles are to be conducted in a room with an ambient temperature of 25 ± 10 °C and an average air velocity of less than 0,2 m/s.		P
-(ii)	The switching cycles on the sample shall be conducted in free air in a vertical base-up position. However, if a manufacturer or importer has declared the light source suitable for use in a specific orientation only, then the sample shall be mounted in that orientation.		P
-(iii)	The applied voltage during the switching cycles shall have a tolerance within 2 %. The total harmonic content of the supply voltage shall not exceed 3 %. Standards provide guidance on the supply voltage source. Light sources designed to be operated on mains voltage shall be tested at 230 V, 50 Hz supply, even if the products are able to be operated on variable supply conditions.		P
(b)	Endurance test method:		P
-(i)	Initial flux measurement: measure the luminous flux of the light source prior to starting the endurance test switching cycle.		P
-(ii)	Switching cycles: operate the light source for 1 200 cycles of repeated, continuous switching cycles without interruption. One complete switching cycle consists of 150 minutes of the light source switched ON at full power followed by 30 minutes of the light source switched OFF. The hours of operation recorded (i.e. 3 000 hours) include only the periods of the switching cycle when the light source was switched ON, i.e. the total test time is 3 600		P

(EU) 2019/2020			
Clause	Requirement + Test	Result – Remark	Verdict
	hours.		
-(iii)	Final flux measurement: at the end of the 1 200 switching cycles, note if any light sources have failed (see 'Survival factor' in Annex IV, Table 6 of this Regulation) and measure the luminous flux of the light sources that have not failed.		P
-(iv)	For each of the units in the sample which have not failed, divide the measured final flux by the measured initial flux. Average the resulting values over all the units that did not fail to compute the determined value for the lumen maintenance factor XLMF %.		P
ANNEX VI	Benchmarks		-
	For the environmental aspects that were considered significant and are quantifiable, the best available technology on the market, at the time of entry into force of this Regulation, is indicated below.		P
	The best available technology on the market for light sources in terms of their efficacy based on useful luminous flux was identified as follows:		P
	— Mains voltage non-directional light sources: 120-140 lm/W		P
	— Mains voltage directional light sources: 90-100 lm/W		P
	— Directional light sources not operating on the mains: 85- 95 lm/W		P
	— Linear light sources (tubes): 140-160 lm/W		P
	The best available technology on the market for separate control gears has an energy efficiency of 95 %.		P
	Features required in certain applications, e.g. a high colour rendering, might prevent products offering those features from achieving these benchmarks.		P
	The best available technology on the market for light sources and separate control gears do not have any mercury content.		P

(EU) 2019/2020			
Clause	Requirement + Test	Result – Remark	Verdict

Table

Table 1

Sample No.	$P_{on}(W)$	No-load power $P_{no}(W)$	Standby power $P_{sb}(W)$	Networked standby power $P_{net}(W)$	Displacement factor
200911-001-01	100.6	/	/	/	0.97
200911-001-02	100.4	/	/	/	0.97
200911-001-03	100.4	/	/	/	0.97
200911-001-04	100.4	/	/	/	0.97
200911-001-05	100.5	/	/	/	0.98
200911-001-06	100.4	/	/	/	0.97
200911-001-07	100.4	/	/	/	0.97
200911-001-08	100.4	/	/	/	0.98
200911-001-09	100.4	/	/	/	0.97
200911-001-10	100.4	/	/	/	0.97
Average value	100.4	/	/	/	0.97

Table 2

Sample No.	CRI	SDCM	CCT(K)	Beam angle(°)	Pst	SVM
200911-001-01	81.1	/	5049	/	0.062	0
200911-001-02	81.1	/	5040	/	0.062	0
200911-001-03	81.9	/	5049	/	0.062	0
200911-001-04	81.1	/	5054	/	0.062	0
200911-001-05	81.8	/	5040	/	0.062	0
200911-001-06	81.1	/	5040	/	0.062	0
200911-001-07	81.9	/	5049	/	0.062	0
200911-001-08	81.1	/	5054	/	0.062	0
200911-001-09	81.1	/	5063	/	0.062	0
200911-001-10	80.1	/	5025	/	0.062	0
Average value	81.2	/	5046	/	0.062	0

Table 3

Sample No.	Useful luminous flux Φ_{use} (lm) at 0h	Useful luminous flux Φ use (lm) at 3600h	Lumen maintenance factor	Survival factor
200911-001-01	10143.5	9940.6	98%	100%
200911-001-02	10173.5	9970.1	98%	100%
200911-001-03	10173.5	10071.8	99%	100%
200911-001-04	10123.3	9920.9	98%	100%
200911-001-05	10183.7	9980.0	98%	100%
200911-001-06	10123.3	9920.9	98%	100%
200911-001-07	10173.5	9970.1	98%	100%

Table

200911-001-08	10123.3	10022.1	98%	100%
200911-001-09	10123.3	9920.9	98%	100%
200911-001-10	10173.5	9970.1	98%	100%
Average value	10151.5	9968.7	98%	100%

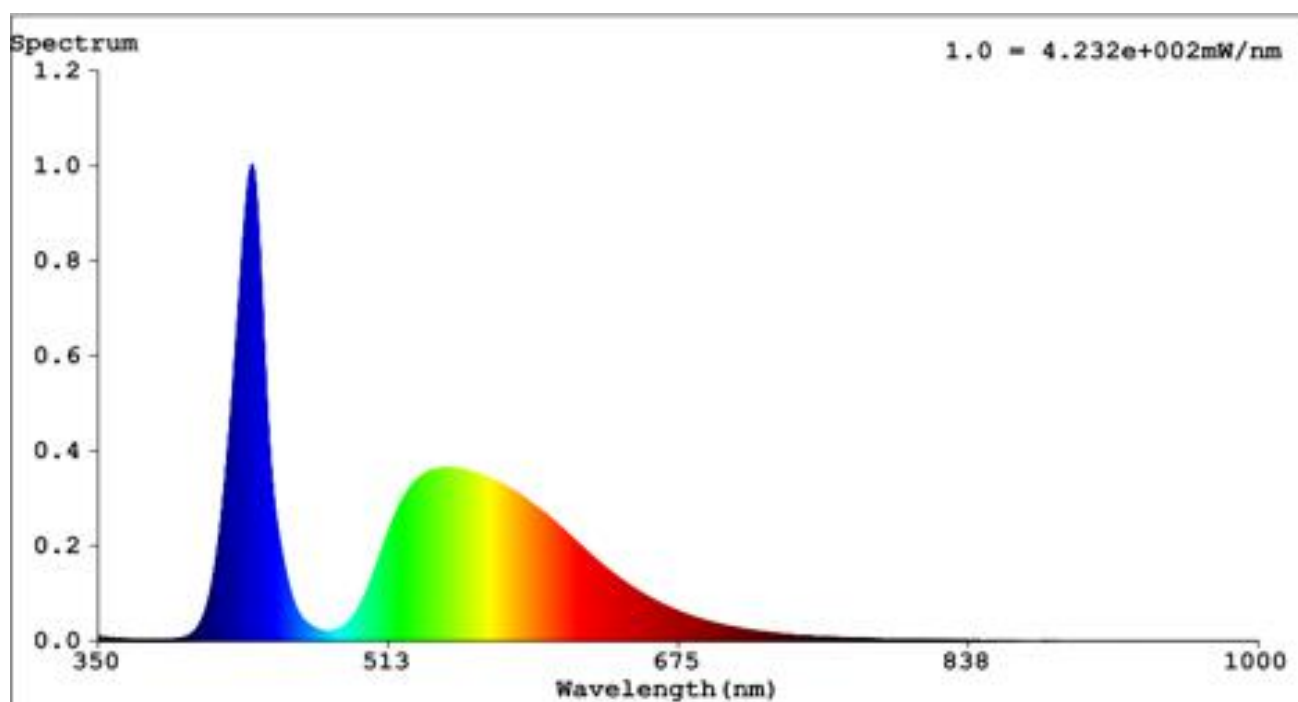
Remark: All lamps were operated for 2 cycles to simulate 120 cycles

Table 4

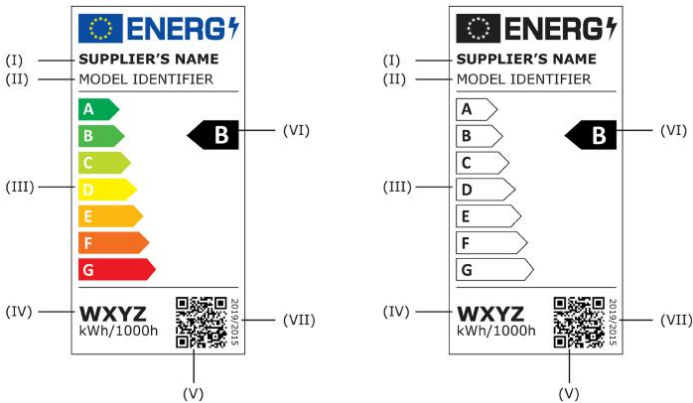
Flicker Pst LM (≤ 1.0)	Stroboscopic Effect VM (≤ 0.4)
0.062	0

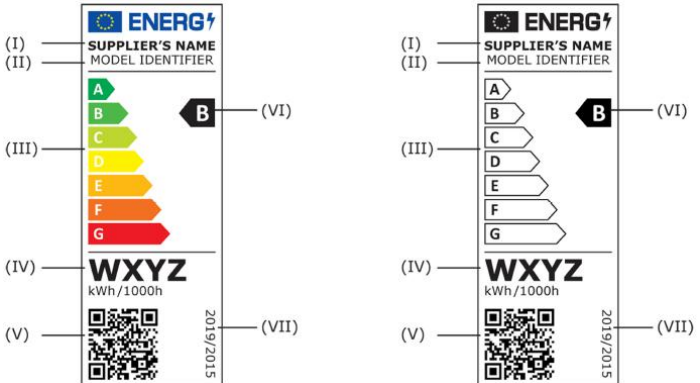
Table 5

Sample No.	Control gear efficiency
-	-
-	-
-	-
Average value	-



(EU) 2019/2015																			
Clause	Requirement + Test	Result – Remark	Verdict																
ANNEX II	Energy efficiency classes and calculation method		-																
	The energy efficiency class of light sources shall be determined as set out in Table 1, on the basis of the total mains efficacy η_{TM} , which is calculated by dividing the declared useful luminous flux Φ_{use} (expressed in lm) by the declared on-mode power consumption P_{on} (expressed in W) and multiplying by the applicable factor F_{TM} of Table 2, as follows:		P																
	$\eta_{TM} = (\Phi_{use}/P_{on}) \times F_{TM}$ (lm/W).	(10151.5/100.4) ×1.0=101.1	P																
Table 1	<table><tr><th>Energy efficiency class</th><th>Total mains efficacy η_{TM} (lm/W)</th></tr><tr><td>A</td><td>$210 \leq \eta_{TM}$</td></tr><tr><td>B</td><td>$185 \leq \eta_{TM} < 210$</td></tr><tr><td>C</td><td>$160 \leq \eta_{TM} < 185$</td></tr><tr><td>D</td><td>$135 \leq \eta_{TM} < 160$</td></tr><tr><td>E</td><td>$110 \leq \eta_{TM} < 135$</td></tr><tr><td>F</td><td>$85 \leq \eta_{TM} < 110$</td></tr><tr><td>G</td><td>$\eta_{TM} < 85$</td></tr></table>	Energy efficiency class	Total mains efficacy η_{TM} (lm/W)	A	$210 \leq \eta_{TM}$	B	$185 \leq \eta_{TM} < 210$	C	$160 \leq \eta_{TM} < 185$	D	$135 \leq \eta_{TM} < 160$	E	$110 \leq \eta_{TM} < 135$	F	$85 \leq \eta_{TM} < 110$	G	$\eta_{TM} < 85$	Class F	P
Energy efficiency class	Total mains efficacy η_{TM} (lm/W)																		
A	$210 \leq \eta_{TM}$																		
B	$185 \leq \eta_{TM} < 210$																		
C	$160 \leq \eta_{TM} < 185$																		
D	$135 \leq \eta_{TM} < 160$																		
E	$110 \leq \eta_{TM} < 135$																		
F	$85 \leq \eta_{TM} < 110$																		
G	$\eta_{TM} < 85$																		
Table 2	<table><tr><th colspan="2">Factors F_{TM} by light source type</th></tr><tr><th>Light source type</th><th>Factor F_{TM}</th></tr><tr><td>Non-directional (NDLS) operating on mains (MLS)</td><td>1,000</td></tr><tr><td>Non-directional (NDLS) not operating on mains (NMLS)</td><td>0,926</td></tr><tr><td>Directional (DLS) operating on mains (MLS)</td><td>1,176</td></tr><tr><td>Directional (DLS) not operating on mains (NMLS)</td><td>1,089</td></tr></table>	Factors F_{TM} by light source type		Light source type	Factor F_{TM}	Non-directional (NDLS) operating on mains (MLS)	1,000	Non-directional (NDLS) not operating on mains (NMLS)	0,926	Directional (DLS) operating on mains (MLS)	1,176	Directional (DLS) not operating on mains (NMLS)	1,089		-				
Factors F_{TM} by light source type																			
Light source type	Factor F_{TM}																		
Non-directional (NDLS) operating on mains (MLS)	1,000																		
Non-directional (NDLS) not operating on mains (NMLS)	0,926																		
Directional (DLS) operating on mains (MLS)	1,176																		
Directional (DLS) not operating on mains (NMLS)	1,089																		
ANNEX III	Label for light sources		-																
1	LABEL		-																
	If the light source is intended to be marketed through a point of sale, a label produced in the format and containing information as set out in this Annex is printed on the individual packaging.		P																
	Suppliers shall choose a label format between point 1.1 and point 1.2 of this Annex.		P																
	The label shall be:																		
	— for the standard-sized label at least 36 mm wide and		N/A																

(EU) 2019/2015			
Clause	Requirement + Test	Result – Remark	Verdict
	75 mm high;		
	— for the small-sized label (width less than 36 mm) at least 20 mm wide and 54 mm high.		P
	The packaging shall not be smaller than 20 mm wide and 54 mm high.		P
	Where the label is printed in a larger format, its content shall nevertheless remain proportionate to the specifications above. The small-sized label shall not be used on packaging with a width of 36 mm or more.		P
	The label and the arrow indicating the energy efficiency class may be printed in monochrome as specified in points 1.1 and 1.2, only if all other information, including graphics, on the packaging is printed in monochrome.		P
	If the label is not printed on the part of the packaging meant to face the prospective customer, an arrow containing the letter of the energy efficiency class shall be displayed as hereafter, with the colour of the arrow matching the letter and the colour of the energy class. The size shall be such that the label is clearly visible and legible. The letter in the energy efficiency class arrow shall be Calibri Bold and positioned in the centre of the rectangular part of the arrow, with a border of 0,5 pt in 100 % black placed around the arrow and the letter of the efficiency class.		N/A
	Figure 1 Coloured/monochrome left/right arrow for the part of the packaging facing the prospective customer 		N/A
1.1	Standard-sized label:		N/A
			N/A

(EU) 2019/2015			
Clause	Requirement + Test	Result – Remark	Verdict
1.2	Small-sized label:		P
			P
1.3	The following information shall be included in the label for light sources:		P
	I. supplier's name or trade mark;		P
	II. supplier's model identifier;		P
	III. scale of energy efficiency classes from A to G;		P
	IV. the energy consumption, expressed in kWh of electricity consumption per 1 000 hours, of the light source in on-mode;		P
	V. QR-code;		P
	VI. the energy efficiency class in accordance with Annex II;		P
	VII. the number of this Regulation that is '2019/2015'.		P

Table

Table 6	Energy efficiency class			
Model	1415			
$P_{on}(W)$	Useful luminous flux $\Phi_{use} (lm)$ at 0h	Factor F_{TM}	Total mains efficacy $\eta_{TM} (lm/W)$	Energy Efficiency Class
100.4	10151.5	1.0	101.1	F

*Table***Test Equipment List**

Equipment Name	Manufacturer	Model No.	Equipment No.	Calibration Due Date
2m Integrating Sphere	SENSING	SL-300	AOC-S-126	2021-10-12
Horizontal Distribution Photometer	SENSING	GMS1800D	AOC-S-124	2021-10-12
Standard Lamp	SENSING	110V/200W	AOC-S-128	2021-11-02
Standard Lamp	SENSING	110V/300W	AOC-S-127	2021-11-02
Digital power meter	HENGHE	WT310E	AOC-S-012	2021-05-19
Digital power meter	SENSING	UI2008	AOC-S-123	2021-10-12
Variable frequency power supply	WOSEN	BP6005	AOC-S-129	2021-10-12
Variable frequency power supply	AIPUSI	KDF-500	AOC-S-130	2021-10-12
Oscilloscope	TEKTRONIX	MDO3012	AOC-S-028	2021-05-19

Product Photo



Fig. Overall view

-- End of Report --

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