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# Test Report

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Report No.: AGC05443220425SS01


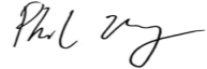

**PRODUCT DESIGNATION** : Spool garland light decoration  
**BRAND NAME** : N/A  
**MODEL NAME** : MO6611  
**CLIENT** : MID OCEAN BRANDS B.V  
**DATE OF ISSUE** : Apr.18,2022  
**STANDARD(S)** : EN 62471:2008  
**REPORT VERSION** : V1.0

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| <b>TEST REPORT</b><br><b>EN 62471</b><br><b>Photobiological safety of lamps and lamp systems</b> |   |
|--|---|
| Report reference No.....   | AGC05443220425SS01  |
| Tested by (+ signature).....   | Mody Mo    |
| Reviewed by (+ signature).....   | Phil Zhang   |
| Approved by (+ signature) .....  | Matte He<br>(Authorized officer )                      |
| Date of issue .....  | Apr.18,2022   |
| Contents .....   | Total 16 pages  |
| <b>Testing laboratory</b>  |   |
| Name .....   | Attestation of Global Compliance (Shenzhen) Co., Ltd.   |
| Address .....  | 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao 'an District, Shenzhen, Guangdong, China |
| Test location .....  | Same as above   |
| <b>Applicant</b>   |   |
| Name .....   | MID OCEAN BRANDS B.V  |
| Address .....  | 7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong   |
| <b>Manufacturer</b>  |   |
| Name .....   | MID OCEAN BRANDS B.V  |
| Address .....  | 7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong   |
| <b>Factory</b>   |   |
| Name .....   | MID OCEAN BRANDS B.V  |
| Address .....  | 7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong   |
| <b>Test specification</b>  |   |
| Standard .....   | EN 62471:2008   |
| Test procedure .....   | Type test   |
| Non-standard test method.....  | N/A   |
| <b>Test Report Form/blank test report</b>  |   |
| Test Report Form No.....   | AGC62471A1  |
| TRF originator .....   | AGC   |
| Master TTRF.....   | Dated 2009-06   |

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|   |   |             |               |                 |
|---|---|-------------|---------------|-----------------|
| <b>Test item</b>  |   |             |               |                 |
| Product designation.....: Spool garland light decoration  |   |             |               |                 |
| Brand name .....: N/A   |   |             |               |                 |
| Test model .....: MO6611  |   |             |               |                 |
| Series models.....: N/A   |   |             |               |                 |
| Rating(s) .....: 1.5V AA battery *3   |   |             |               |                 |
| <b>Test item Particulars</b>  |   |             |               |                 |
| Tested lamp .....: <input checked="" type="checkbox"/> continuous wave lamps <input type="checkbox"/> pulsed lamp   |   |             |               |                 |
| Lamp classification group .....: <input checked="" type="checkbox"/> exempt <input type="checkbox"/> risk 1 <input type="checkbox"/> risk 2 <input type="checkbox"/> risk 3 |   |             |               |                 |
| Lamp cap.....: N/A  |   |             |               |                 |
| Bulb .....: N/A   |   |             |               |                 |
| Used measurement instrument .....: SPECTRORADIOMETER  |   |             |               |                 |
| Temperature by measurement .....: 26.3°C  |   |             |               |                 |
| Information for safety use .....: N/A   |   |             |               |                 |
| <b>Test case verdicts</b>   |   |             |               |                 |
| Test case does not apply to the test object ...: N(/A)  |   |             |               |                 |
| Test item does meet the requirement .....: P(ass)   |   |             |               |                 |
| Test item does not meet the requirement .....: F(ail)   |   |             |               |                 |
| <b>Testing</b>  |   |             |               |                 |
| Date of receipt of test item.....: Apr.14,2022  |   |             |               |                 |
| Date(s) of performance of test.....: Apr.18,2022  |   |             |               |                 |
| <b>Attachments</b>  |   |             |               |                 |
| Attachment A .....: Photos of product   |   |             |               |                 |
| <b>General remarks</b>  |   |             |               |                 |
| This report shall not be reproduced except in full without the written approval of the testing laboratory.  |   |             |               |                 |
| The test results presented in this report relate only to the item tested.   |   |             |               |                 |
| “(see remark #)” refers to a remark appended to the report.   |   |             |               |                 |
| “(see Annex #)” refers to an annex appended to the report.  |   |             |               |                 |
| Throughout this report a comma is used as the decimal separator.  |   |             |               |                 |
| Report Revise Record:   |   |             |               |                 |
| Report Version  | Revise Time                             | Issued Date | Valid Version | Notes           |
| V1.0  | /                                       | Apr.18,2022 | Valid         | Initial release |
| <b>General product information</b>  |   |             |               |                 |
| The LED package specification as follows:   |   |             |               |                 |
| Model   | Manufacturer                            | Vf(V)       | CCT(K)        |                 |
| OS-XD-1   | Taizhou Yilang Optoelectronics Co., Ltd | 2.8-2.9     | 2700-3000     |                 |

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| EN 62471 |  |                |         |
|----------|--|----------------|---------|
| Clause   | Requirement – Test   | Result         | Verdict |
| 4        | Exposure Limits  |                | P       |
| 4.1      | General  |                | P       |
|          | The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure  |                | P       |
|          | Detailed spectral data of a light source are generally required only if the luminance of the source exceeds $10^4 \text{ cd}\cdot\text{m}^{-2}$  | see clause 4.3 | N       |
| 4.3      | Hazard exposure limits   |                | P       |
| 4.3.1    | Actinic UV hazard exposure limit for the skin and eye  |                | P       |
|          | The exposure limit for effective radiant exposure is $30 \text{ J}\cdot\text{m}^{-2}$ within any 8-hour period   |                | P       |
|          | To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broadband source, the effective integrated spectral irradiance, $E_s$ , of the light source shall not exceed the levels defined by:   |                | P       |
|          | $E_s \cdot t = \sum_{200}^{400} \sum_1 E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J}\cdot\text{m}^{-2}$   |                | P       |
|          | The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:   |                | P       |
|          | $t_{\max} = \frac{30}{E_s} \quad \text{s}$   |                | P       |
| 4.3.2    | Near-UV hazard exposure limit for eye  |                | P       |
|          | For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed $10000 \text{ J}\cdot\text{m}^{-2}$ for exposure times less than 1000 s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, $E_{UVA}$ , shall not exceed $10 \text{ W}\cdot\text{m}^{-2}$ . |                | P       |
|          | The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:  |                | N       |
|          | $t_{\max} \leq \frac{10000}{E_{UVA}} \quad \text{s}$   |                | N       |
| 4.3.3    | Retinal blue light hazard exposure limit   |                | P       |

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| Clause   | Requirement – Test   | Result                                  | Verdict |
|          | To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, $B(\lambda)$ , i.e., the blue-light weighted radiance, $L_B$ , shall not exceed the levels defined by: |   | P       |
|          | $L_B \cdot t = \sum_{300}^{700} \sum_l L_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 10^6 \text{ J}\cdot\text{m}^{-2}\cdot\text{sr}^{-1}$  |   | N       |
|          | $L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \text{ W}\cdot\text{m}^{-2}\cdot\text{sr}^{-1}$  |   | P       |
| 4.3.4    | Retinal blue light hazard exposure limit - small source  |   | N       |
|          | Thus the spectral irradiance at the eye $E_\lambda$ , weighted against the blue-light hazard function $B(\lambda)$ shall not exceed the levels defined by:   |   | N       |
|          | $E_B \cdot t = \sum_{300}^{700} \sum_l E_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \text{ J}\cdot\text{m}^{-2}$  |   | N       |
|          | $E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \text{ W}\cdot\text{m}^{-2}$   |   | N       |
| 4.3.5    | Retinal thermal hazard exposure limit  |   | P       |
|          | To protect against retinal thermal injury, the integrated spectral radiance of the light source, $L_\lambda$ , weighted by the burn hazard weighting function $R(\lambda)$ (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:   |   | P       |
|          | $L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50000}{\alpha \cdot t^{0.25}} \text{ W}\cdot\text{m}^{-2}\cdot\text{sr}^{-1}$   | (10 $\mu\text{s}$ $\leq$ t $\leq$ 10 s) | P       |
| 4.3.6    | Retinal thermal hazard exposure limit – weak visual stimulus   |   | N       |
|          | For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, $L_{IR}$ , as viewed by the eye for exposure times greater than 10 s shall be limited to:                  |   | N       |
|          | $L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6000}{\alpha} \text{ W}\cdot\text{m}^{-2}\cdot\text{sr}^{-1}$  | t > 10 s                                | N       |
| 4.3.7    | Infrared radiation hazard exposure limits for the eye  |   | P       |
|          | The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis), ocular exposure to infrared radiation, $E_{IR}$ , over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:                                  |   | N       |

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| Clause   | Requirement – Test  | Result                  | Verdict |
|          | $E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 18000 \cdot t^{0,75} \text{ W}\cdot\text{m}^{-2}$  | $t \leq 1000 \text{ s}$ | N       |
|          | For times greater than 1000 s the limit becomes:  |                         | P       |
|          | $E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \text{ W}\cdot\text{m}^{-2}$   | $t > 1000 \text{ s}$    | P       |
| 4.3.8    | Thermal hazard exposure limit for the skin  |                         | P       |
|          | Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:  |                         | P       |
|          | $E_H \cdot t = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta\lambda \leq 20000 \cdot t^{0,25} \text{ J}\cdot\text{m}^{-2}$ |                         | P       |

|       |  |  |   |
|-------|--|--|---|
| 5     | <b>MEASUREMENT OF LAMPS AND LAMP SYSTEMS</b>   |  | P |
| 5.1   | Measurement conditions   |  | P |
|       | Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.                                  |  | P |
| 5.1.1 | Lamp ageing (seasoning)  |  | P |
|       | Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.   |  | N |
| 5.1.2 | Test environment   |  | P |
|       | For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations. |  | P |
| 5.1.3 | Extraneous radiation   |  | P |
|       | Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.                          |  | P |
| 5.1.4 | Lamp operation   |  | N |
|       | Operation of the test lamp shall be provided in accordance with:   |  | N |
|       | the appropriate EN lamp standard, or   |  | N |
|       | the manufacturer's recommendation  |  | N |
| 5.1.5 | Lamp system operation  |  | P |
|       | The power source for operation of the test lamp shall be provided in accordance with:  |  | P |
|       | the appropriate EN standard, or  |  | N |

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|----------|--|---------------|---------|
| Clause   | Requirement – Test   | Result        | Verdict |
|          | the manufacturer' s recommendation   |               | P       |
| 5.2      | Measurement procedure  |               | P       |
| 5.2.1    | Irradiance measurements  |               | P       |
|          | Minimum aperture diameter 7mm.   |               | P       |
|          | Maximum aperture diameter 50 mm.   |               | P       |
|          | The measurement shall be made in that position of the beam giving the maximum reading.   |               | P       |
|          | The measurement instrument is adequate calibrated.   |               | P       |
| 5.2.2    | Radiance measurements  |               | P       |
| 5.2.2.1  | Standard method  |               | P       |
|          | The measurements made with an optical system.  |               | P       |
|          | The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument. |               | P       |
| 5.2.2.2  | Alternative method   |               | N       |
|          | Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.            |               | N       |
| 5.2.3    | Measurement of source size   |               | P       |
|          | The determination of $\alpha$ , the angle subtended by a source, requires the determination of the 50% emission points of the source.  |               | P       |
| 5.2.4    | Pulse width measurement for pulsed sources   |               | N       |
|          | The determination of $\Delta t$ , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.                 |               | N       |
| 5.3      | Analysis methods   |               | P       |
| 5.3.1    | Weighting curve interpolations   |               | P       |
|          | To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.                             | see table 4.1 | P       |
| 5.3.2    | Calculations   |               | P       |
|          | The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.                       |               | P       |
| 5.3.3    | Measurement uncertainty  |               | P       |

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| Clause   | Requirement – Test   | Result                  | Verdict |
|          | The quality of all measurement results must be quantified by an analysis of the uncertainty. | see Annex C in the norm | P       |

|       |   |               |   |
|-------|---|---------------|---|
| 6     | <b>LAMP CLASSIFICATION</b>  |               | P |
|       | For the purposes of this standard it was decided that the values shall be reported as follows:  | see table 6.1 | P |
|       | for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm |               | P |
|       | for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm   |               | N |
| 6.1   | Continuous wave lamps   |               | P |
| 6.1.1 | Except Group  |               | P |
|       | In the except group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:   |               | P |
|       | – an actinic ultraviolet hazard ( $E_S$ ) within 8-hours exposure (30000 s), nor  |               | P |
|       | – a near-UV hazard ( $E_{UVA}$ ) within 1000 s, (about 16 min), nor   |               | P |
|       | – a retinal blue-light hazard ( $L_B$ ) within 10000 s (about 2,8 h), nor   |               | P |
|       | – a retinal thermal hazard ( $L_R$ ) within 10 s, nor   |               | P |
|       | – an infrared radiation hazard for the eye ( $E_{IR}$ ) within 1000 s   |               | P |
| 6.1.2 | Risk Group 1 (Low-Risk)   |               | N |
|       | In this group are lamps, which exceeds the limits for the except group but that does not pose:  |               | N |
|       | – an actinic ultraviolet hazard ( $E_S$ ) within 10000 s, nor   |               | N |
|       | – a near ultraviolet hazard ( $E_{UVA}$ ) within 300 s, nor   |               | N |
|       | – a retinal blue-light hazard ( $L_B$ ) within 100 s, nor   |               | N |
|       | – a retinal thermal hazard ( $L_R$ ) within 10 s, nor   |               | N |
|       | – an infrared radiation hazard for the eye ( $E_{IR}$ ) within 100 s  |               | N |
|       | Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal   |               | N |

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|----------|--|--------|---------|
| Clause   | Requirement – Test   | Result | Verdict |
|          | hazard ( $L_{IR}$ ), within 100 s are in Risk Group 1.   |        |         |
| 6.1.3    | Risk Group 2 (Moderate-Risk)   |        | N       |
|          | This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:  |        | N       |
|          | – an actinic ultraviolet hazard ( $E_S$ ) within 1000 s exposure, nor  |        | N       |
|          | – a near ultraviolet hazard ( $E_{UVA}$ ) within 100 s, nor  |        | N       |
|          | – a retinal blue-light hazard ( $L_B$ ) within 0,25 s (aversion response), nor   |        | N       |
|          | – a retinal thermal hazard ( $L_R$ ) within 0,25 s (aversion response), nor  |        | N       |
|          | – an infrared radiation hazard for the eye ( $E_{IR}$ ) within 10 s  |        | N       |
|          | Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard ( $L_{IR}$ ), within 10 s are in Risk Group 2.  |        | N       |
| 6.1.4    | Risk Group 3 (High-Risk)   |        | N       |
|          | Lamps which exceed the limits for Risk Group 2 are in Group 3.   |        | N       |
| 6.2      | Pulsed lamps   |        | N       |
|          | Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.  |        | N       |
|          | A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.   |        | N       |
|          | The risk group determination of the lamp being tested shall be made as follows:  |        | N       |
|          | – a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)  |        | N       |
|          | – for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group   |        | N       |
|          | – for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission |        | N       |

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|-----------|--------------------|--------|---------|
| Clause    | Requirement – Test | Result | Verdict |

| Table 4.1 Spectral weighting function for assessing ultraviolet hazards for skin and eye |   |                              | P                                    |
|--|---|------------------------------|--------------------------------------|
| Wavelength <sup>1</sup><br>$\lambda$ , nm  | UV hazard function<br>$S_{uv}(\lambda)$ | Wavelength<br>$\lambda$ , nm | UV hazard function $S_{uv}(\lambda)$ |
| 200  | 0,030                                   | 313*                         | 0,006                                |
| 205  | 0,051                                   | 315                          | 0,003                                |
| 210  | 0,075                                   | 316                          | 0,0024                               |
| 215  | 0,095                                   | 317                          | 0,0020                               |
| 220  | 0,120                                   | 318                          | 0,0016                               |
| 225  | 0,150                                   | 319                          | 0,0012                               |
| 230  | 0,190                                   | 320                          | 0,0010                               |
| 235  | 0,240                                   | 322                          | 0,00067                              |
| 240  | 0,300                                   | 323                          | 0,00054                              |
| 245  | 0,360                                   | 325                          | 0,00050                              |
| 250  | 0,430                                   | 328                          | 0,00044                              |
| 254*   | 0,500                                   | 330                          | 0,00041                              |
| 255  | 0,520                                   | 333*                         | 0,00037                              |
| 260  | 0,650                                   | 335                          | 0,00034                              |
| 265  | 0,810                                   | 340                          | 0,00028                              |
| 270  | 1,000                                   | 345                          | 0,00024                              |
| 275  | 0,960                                   | 350                          | 0,00020                              |
| 280*   | 0,880                                   | 355                          | 0,00016                              |
| 285  | 0,770                                   | 360                          | 0,00013                              |
| 290  | 0,640                                   | 365*                         | 0,00011                              |
| 295  | 0,540                                   | 370                          | 0,000093                             |
| 297*   | 0,460                                   | 375                          | 0,000077                             |
| 300  | 0,300                                   | 380                          | 0,000064                             |
| 303*   | 0,120                                   | 385                          | 0,000053                             |
| 305  | 0,060                                   | 390                          | 0,000044                             |
| 308  | 0,026                                   | 395                          | 0,000036                             |
| 310  | 0,015                                   | 400                          | 0,000030                             |

<sup>1</sup> Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.  
\* Emission lines of a mercury discharge spectrum.

| Table 4.2 Spectral weighting functions for assessing retinal hazards from broadband optical sources |  |                                      | P |
|---|--|--------------------------------------|---|
| Wavelength<br>nm  | Blue-light hazard function<br>$B(\lambda)$ | Burn hazard function<br>$R(\lambda)$ |   |
| 300   | 0,01                                       |                                      |   |
| 305   | 0,01                                       |                                      |   |
| 310   | 0,01                                       |                                      |   |
| 315   | 0,01                                       |                                      |   |
| 320   | 0,01                                       |                                      |   |

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| IEC 62471 |                    |                           |                                     |
|-----------|--------------------|---------------------------|-------------------------------------|
| Clause    | Requirement – Test | Result                    | Verdict                             |
| 325       |                    | 0,01                      |                                     |
| 330       |                    | 0,01                      |                                     |
| 335       |                    | 0,01                      |                                     |
| 340       |                    | 0,01                      |                                     |
| 345       |                    | 0,01                      |                                     |
| 350       |                    | 0,01                      |                                     |
| 355       |                    | 0,01                      |                                     |
| 360       |                    | 0,01                      |                                     |
| 365       |                    | 0,01                      |                                     |
| 370       |                    | 0,01                      |                                     |
| 375       |                    | 0,01                      |                                     |
| 380       |                    | 0,01                      | 0,1                                 |
| 385       |                    | 0,013                     | 0,13                                |
| 390       |                    | 0,025                     | 0,25                                |
| 395       |                    | 0,05                      | 0,5                                 |
| 400       |                    | 0,10                      | 1,0                                 |
| 405       |                    | 0,20                      | 2,0                                 |
| 410       |                    | 0,40                      | 4,0                                 |
| 415       |                    | 0,80                      | 8,0                                 |
| 420       |                    | 0,90                      | 9,0                                 |
| 425       |                    | 0,95                      | 9,5                                 |
| 430       |                    | 0,98                      | 9,8                                 |
| 435       |                    | 1,00                      | 10,0                                |
| 440       |                    | 1,00                      | 10,0                                |
| 445       |                    | 0,97                      | 9,7                                 |
| 450       |                    | 0,94                      | 9,4                                 |
| 455       |                    | 0,90                      | 9,0                                 |
| 460       |                    | 0,80                      | 8,0                                 |
| 465       |                    | 0,70                      | 7,0                                 |
| 470       |                    | 0,62                      | 6,2                                 |
| 475       |                    | 0,55                      | 5,5                                 |
| 480       |                    | 0,45                      | 4,5                                 |
| 485       |                    | 0,40                      | 4,0                                 |
| 490       |                    | 0,22                      | 2,2                                 |
| 495       |                    | 0,16                      | 1,6                                 |
| 500-600   |                    | $10^{[(450-\lambda)/50]}$ | 1,0                                 |
| 600-700   |                    | 0,001                     | 1,0                                 |
| 700-1050  |                    |                           | $10^{[(700-\lambda)/500]}$          |
| 1050-1150 |                    |                           | 0,2                                 |
| 1150-1200 |                    |                           | $0,2 \cdot 10^{0,02(1150-\lambda)}$ |
| 1200-1400 |                    |                           | 0,02                                |

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| IEC 62471 |                    |        |         |
|-----------|--------------------|--------|---------|
| Clause    | Requirement – Test | Result | Verdict |

| Table 5.4 Summary of the ELs for the surface of the skin or cornea (irradiance based values) |   |                     |                         |                             | P   |
|--|---|---------------------|-------------------------|-----------------------------|---|
| Hazard Name  | Relevant equation   | Wavelength range nm | Exposure duration sec   | Limiting aperture rad (deg) | EL in terms of constant irradiance $W \cdot m^{-2}$ |
| Actinic UV skin & eye  | $E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$ | 200 – 400           | < 30000                 | 1,4 (80)                    | 30/t  |
| Eye UV-A   | $E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$              | 315 – 400           | $\leq 1000$<br>$> 1000$ | 1,4 (80)                    | 10000/t<br>10                                       |
| Blue-light small source  | $E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$ | 300 – 700           | $\leq 100$<br>$> 100$   | < 0,011                     | 100/t<br>1,0  |
| Eye IR   | $E_{IR} = \sum E_\lambda \cdot \Delta\lambda$               | 780 – 3000          | $\leq 1000$<br>$> 1000$ | 1,4 (80)                    | 18000/t <sup>0,75</sup><br>100                      |
| Skin thermal   | $E_H = \sum E_\lambda \cdot \Delta\lambda$                  | 380 – 3000          | < 10                    | 2π sr                       | 20000/t <sup>0,75</sup>                             |

| Table 5.5 Summary of the ELs for the retina (radiance based values) |  |                     |  |  | P  |
|---|--|---------------------|--|--|--|
| Hazard Name   | Relevant equation  | Wavelength range nm | Exposure duration sec                            | Field of view radians  | EL in terms of constant radiance $W \cdot m^{-2} \cdot sr^{-1}$    |
| Blue light  | $L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$    | 300 – 700           | 0,25 – 10<br>10-100<br>100-10000<br>$\geq 10000$ | $0,011 \cdot \sqrt{t/10}$<br>0,011<br>$0,0011 \cdot \sqrt{t}$<br>0,1 | $10^6/t$<br>$10^6/t$<br>$10^6/t$<br>100                            |
| Retinal thermal   | $L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$    | 380 – 1400          | < 0,25<br>0,25 – 10                              | 0,0017<br>$0,011 \cdot \sqrt{t/10}$                                  | $50000/(\alpha \cdot t^{0,25})$<br>$50000/(\alpha \cdot t^{0,25})$ |
| Retinal thermal (weak visual stimulus)                              | $L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$ | 780 – 1400          | > 10   | 0,011  | 6000/α   |

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| IEC 62471   |  |           |                                |                      |        |                |        |                |         |
|---|--|-----------|--------------------------------|----------------------|--------|----------------|--------|----------------|---------|
| Clause  | Requirement – Test                                       |           |                                |                      | Result |                |        |                | Verdict |
| <b>Table 6.1</b>  | Emission limits for risk groups of continuous wave lamps |           |                                |                      |        |                |        |                | N       |
| Risk  | Action spectrum  | Symbol    | Units                          | Emission Measurement |        |                |        |                |         |
|   |  |           |                                | Exempt               |        | Low risk       |        | Mod risk       |         |
|   |  |           |                                | Limit                | Result | Limit          | Result | Limit          | Result  |
| Actinic UV  | $S_{UV}(\lambda)$  | $E_s$     | $W \cdot m^{-2}$               | 0.001                | --     | 0,003          | --     | 0,03           | --      |
| Near UV   |  | $E_{UVA}$ | $W \cdot m^{-2}$               | 10                   | --     | 33             | --     | 100            | --      |
| Blue light  | $B(\lambda)$   | $L_B$     | $W \cdot m^{-2} \cdot sr^{-1}$ | 100                  | --     | 10000          | --     | 4000000        | --      |
| Blue light, small source  | $B(\lambda)$   | $E_B$     | $W \cdot m^{-2}$               | 1.0*                 | --     | 1,0            | --     | 400            | --      |
| Retinal thermal   | $R(\lambda)$   | $L_R$     | $W \cdot m^{-2} \cdot sr^{-1}$ | $28000/\alpha$       | --     | $28000/\alpha$ | --     | $71000/\alpha$ | --      |
| Retinal thermal, weak visual stimulus**   | $R(\lambda)$   | $L_{IR}$  | $W \cdot m^{-2} \cdot sr^{-1}$ | $6000/\alpha$        | --     | $6000/\alpha$  | --     | $6000/\alpha$  | --      |
| IR radiation, eye   |  | $E_{IR}$  | $W \cdot m^{-2}$               | 100                  | --     | 570            | --     | 3200           | --      |
| * Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian.<br>** Involves evaluation of non-GLS source |  |           |                                |                      |        |                |        |                |         |

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| EN 62471 |  |  |     |
|----------|--|--|-----|
|          | <b>CENELEC COMMON MODIFICATIONS (EN)</b>   |  | P   |
| 4        | EXPOSURE LIMITS  |  | P   |
|          | Contents of the whole Clause 4 of IEC 62471:2006 moved into a new informative Annex ZB                                       |  | --- |
|          | Clause 4 replaced by the following:  |  | P   |
|          | Limits of the Artificial Optical Radiation Directive (2006/25/EC) have been applied instead of those fixed in IEC 62471:2006 |  | P   |
| 4.1      | General  |  | P   |
|          | First paragraph deleted  |  | --- |

| Table 6.1                               |                   | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) |                             |  |           |                |        |                |        | P |
|---|-------------------|---|-----------------------------|--|-----------|----------------|--------|----------------|--------|---|
| Risk                                    | Action spectrum   | Symbol  | Units                       | Emission Measurement                                     |           |                |        |                |        |   |
|   |                   |   |                             | Exempt   |           | Low risk       |        | Mod risk       |        |   |
|   |                   |   |                             | Limit  | Result    | Limit          | Result | Limit          | Result |   |
| Actinic UV                              | $S_{UV}(\lambda)$ | $E_s$   | $W \cdot m^{-2}$            | 0.001  | 0.000E+00 | 0.003          | --     | 0.03           | --     |   |
| Near UV                                 |                   | $E_{UVA}$   | $W \cdot m^{-2}$            | 0.33   | 0.000E+00 | 33             | --     | 100            | --     |   |
| Blue light                              | $B(\lambda)$      | $L_B$   | $\frac{W \cdot m^{-2}}{sr}$ | 100  | 7.377E-01 | 10000          | --     | 4000000        | --     |   |
| Blue light, small source                | $B(\lambda)$      | $E_B$   | $W \cdot m^{-2}$            | 0.01*  | --        | 1,0            | --     | 400            | --     |   |
| Retinal thermal                         | $R(\lambda)$      | $L_R$   | $\frac{W \cdot m^{-2}}{sr}$ | $28000/\alpha$   | 1.767E+02 | $28000/\alpha$ | --     | $71000/\alpha$ | --     |   |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$      | $L_{IR}$  | $\frac{W \cdot m^{-2}}{sr}$ | $545000$<br>$0,0017 \leq \alpha \leq 0,011$              | --        |                |        |                |        |   |
|   |                   |   |                             | $6000/\alpha =$<br>$6.000E+040,011 \leq \alpha \leq 0,1$ | 0         |                |        |                |        |   |
| IR radiation, eye                       |                   | $E_{IR}$  | $W \cdot m^{-2}$            | 100  | --        | 570            | --     | 3200           | --     |   |

\* Small source defined as one with  $\alpha < 0,011$  radian. Averaging field of view at 10000 s is 0,1 radian.  
 \*\* Involves evaluation of non-GLS source

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**Attachment A  
Photos of product**

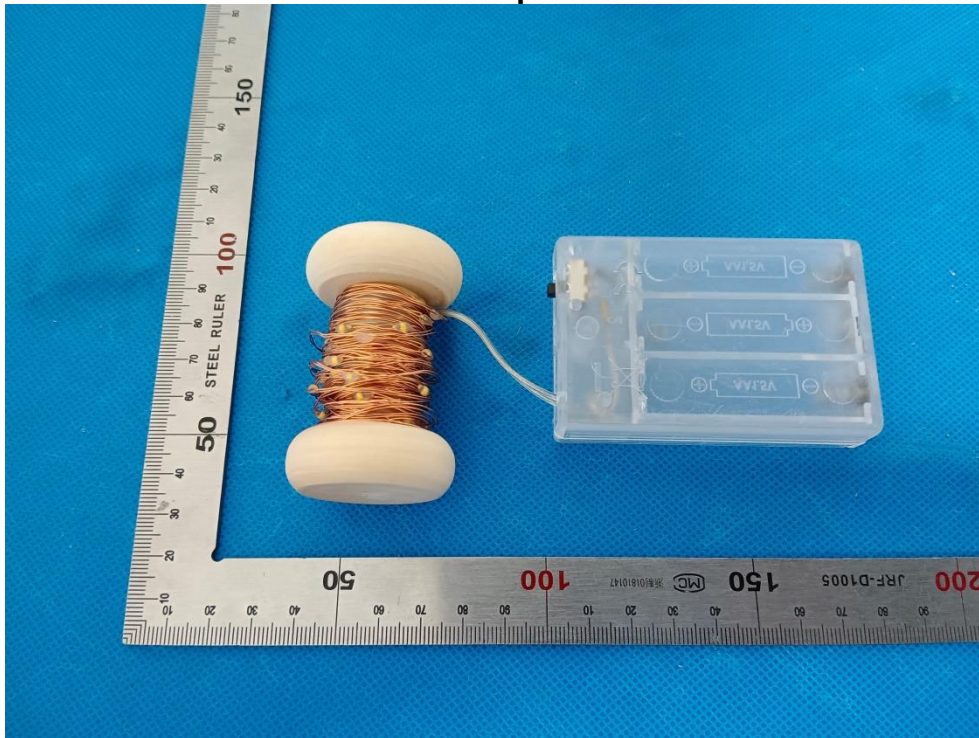


Fig.1– Overall view of product



Fig.2– Overall view of product

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Fig.3– LED view of product

----- **End of Report** -----

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## Conditions of Issuance of Test Reports

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3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
6. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
7. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.
9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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