

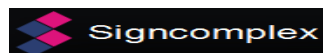
## Test Report

Applicant: Signcomplex Limited

Address: Yijia Industrial Park, Fuqian Road, Guanlan Town, Bao'an, Shenzhen, Guangdong, China

Product: LED Strips

Trademark:



Model No: SC-IG3-WW, SC-IG3-X-Y, SC-5050IP-X-Y, SC-5050IP-X2-Y, SC-IE-PX-Y, SC-IE2-PX-Y, SC-IE3-PX-Y, SC-IG-PX-Y, SC-IG2-PX-Y, SC-IG3-PX-Y, SC-DID-RGB2812-30A/60A, SC-DID-RGB2-943-Y, SC-YID3-W+WW-Y, SC-OID2-X-Y, SC-OID3-X-Y, SC-OID4-X-Y, SC-YID-1-A-Y, SC-YID-W+WW-Y, SC-YID2-W+WW-Y, SC-IG3-X-Y(X represents the color(W,NW,WW), Y represents the input voltage(blank,12,12V,24,24V))

Test report form no.: EN60598\_2\_21A

Rev: No.0/201601

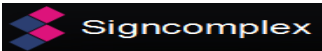
Test laboratory: Most Technology Service Co., Limited  
No.5, 2nd Langshan Road, North District, Hi-tech Industry Park, Nanshan, Shenzhen, Guangdong, China

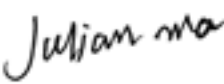
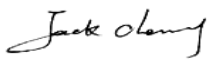
Phone: 86-755-86026850

Fax: 86-755-26013350

Website: [http:// www.szmost.com](http://www.szmost.com)

**The safety testing has been performed on the submitted samples and found in compliance with the EN60598\_2\_21A.**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TEST REPORT</b><br><b>EN 60598-2-21</b><br><b>Luminaires</b><br><b>Part 2: Particular requirements</b><br><b>Section 21: Rope Lights</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                             |
| <b>Report Number..... :</b> MTS/JNM/S16080897<br><b>Date of issue..... :</b> 2016-09-21<br><b>Total number of pages .....</b> 57 pages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                             |
| <b>Name of Testing Laboratory preparing the Report .....</b> Most Technology Service Co., Limited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                             |
| <b>Applicant's name .....</b> Signcomplex Limited<br><b>Address..... :</b> Yijia Industrial Park, Fuqian Road, Guanlan Town, Bao'an, Shenzhen, Guangdong, China                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                             |
| <b>Test specification:</b><br><b>Standard .....</b> EN 60598-2-21:2015 used in conjunction with EN 60598-1:2015<br><b>Test procedure .....</b> LVD<br><b>Non-standard test method .....</b> N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                             |
| <b>Test Report Form No. .... :</b> IEC60598_2_21A<br><b>Test Report Form(s) Originator .... :</b> DEKRA Certification B.V.<br><b>Master TRF .....</b> 2016-01<br><b>Copyright © 2014 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved.</b><br>This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. |                                                                                                                                                             |
| <b>Test item description..... :</b><br><b>Trade Mark..... :</b><br><b>Manufacturer .....</b><br><b>Model/Type reference .....</b><br><b>Ratings..... :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | LED Strips<br><br>Same as applicant<br>SC-IG3-WW<br>12/24VDC, 86.4W Max |

|                                                                                                   |                                                 |                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b> |                                                 |                                                                                                                                                                                                                                                            |
| <input checked="" type="checkbox"/>                                                               | <b>Testing Laboratory:</b>                      | Most Technology Service Co., Limited                                                                                                                                                                                                                       |
| <b>Testing location/ address.....:</b>                                                            |                                                 | No.5, 2nd Langshan Road, North District, Hi-tech Industry Park, Nanshan, Shenzhen, Guangdong, China                                                                                                                                                        |
| <input type="checkbox"/>                                                                          | <b>Associated Testing Laboratory:</b>           |                                                                                                                                                                                                                                                            |
| <b>Testing location/ address.....:</b>                                                            |                                                 |                                                                                                                                                                                                                                                            |
| <b>Tested by (name, function, signature) .....</b>                                                |                                                 | Julian Ma                                                                                                                                                                                                                                                  |
| <b>Approved by (name, function, signature)....:</b>                                               |                                                 | Jack Cheng                                                                                                                                                                                                                                                 |
|                                                                                                   |                                                 |    |
|                                                                                                   |                                                 |                                                                                                                                                                                                                                                            |
| <input type="checkbox"/>                                                                          | <b>Testing procedure: TMP/CTF Stage 1:</b>      |                                                                                                                                                                                                                                                            |
| <b>Testing location/ address.....:</b>                                                            |                                                 |                                                                                                                                                                                                                                                            |
| <b>Tested by (name, function, signature) .....</b>                                                |                                                 |                                                                                                                                                                                                                                                            |
| <b>Approved by (name, function, signature)....:</b>                                               |                                                 |                                                                                                                                                                                                                                                            |
|                                                                                                   |                                                 |                                                                                                                                                                                                                                                            |
| <input type="checkbox"/>                                                                          | <b>Testing procedure: WMT/CTF Stage 2:</b>      |                                                                                                                                                                                                                                                            |
| <b>Testing location/ address.....:</b>                                                            |                                                 |                                                                                                                                                                                                                                                            |
| <b>Tested by (name + signature) .....</b>                                                         |                                                 |                                                                                                                                                                                                                                                            |
| <b>Witnessed by (name, function, signature)..:</b>                                                |                                                 |                                                                                                                                                                                                                                                            |
| <b>Approved by (name, function, signature)....:</b>                                               |                                                 |                                                                                                                                                                                                                                                            |
|                                                                                                   |                                                 |                                                                                                                                                                                                                                                            |
| <input type="checkbox"/>                                                                          | <b>Testing procedure: SMT/CTF Stage 3 or 4:</b> |                                                                                                                                                                                                                                                            |
| <b>Testing location/ address.....:</b>                                                            |                                                 |                                                                                                                                                                                                                                                            |
| <b>Tested by (name, function, signature) .....</b>                                                |                                                 |                                                                                                                                                                                                                                                            |
| <b>Witnessed by (name, function, signature)..:</b>                                                |                                                 |                                                                                                                                                                                                                                                            |
| <b>Approved by (name, function, signature)....:</b>                                               |                                                 |                                                                                                                                                                                                                                                            |
| <b>Supervised by (name, function, signature) :</b>                                                |                                                 |                                                                                                                                                                                                                                                            |

**List of Attachments (including a total number of pages in each attachment):**

1. Photos (2 pages)
2. Differences of European Group (2 pages)

**Summary of testing:**

From the result of our tests on the submitted samples, we conclude they comply with the requirements of the standards

**Tests performed (name of test and test clause):**

| Clauses | Item(s)                                     |
|---------|---------------------------------------------|
| 21.6    | Marking                                     |
| 21.7    | Construction                                |
| 21.8    | Creepage distance and clearances            |
| 21.10   | Terminals                                   |
| 21.11   | External and internal wiring                |
| 21.12   | Protection against electric shock           |
| 21.13   | Endurance tests and thermal tests           |
| 21.15   | Insulation resistance and electric strength |
| 21.16   | Resistance to heat, fire and tracking       |

**Testing location:**

No.5, 2nd Langshan Road, North District, Hi-tech Industry Park, Nanshan, Shenzhen, Guangdong, China

**Summary of compliance with National Differences:**

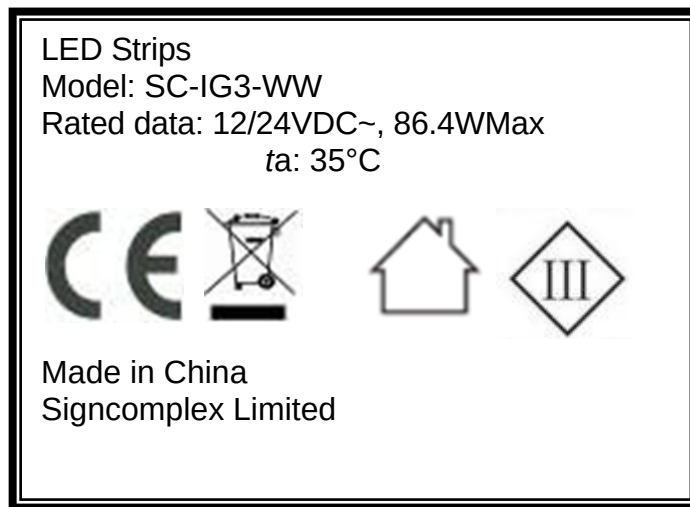
**List of countries addressed**

European Group

☒ The product fulfils the requirements of EN 60598-2-21:2015 used in conjunction with EN 60598-1:2015.

**Copy of marking plate:**

**The artwork below may be only a draft.**



|                                                                                                                                                                                                                                                                                               |                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>Test item particulars</b> .....: LED Strips                                                                                                                                                                                                                                                |                                                                                    |
| <b>Classification of installation and use</b> .....: Detachable light                                                                                                                                                                                                                         |                                                                                    |
| <b>Supply Connection</b> .....: Not directly connected to the power supply<br>.....:                                                                                                                                                                                                          |                                                                                    |
| <b>Possible test case verdicts:</b><br>- test case does not apply to the test object.....: N/A<br>- test object does meet the requirement.....: P (Pass)<br>- test object does not meet the requirement.....: F (Fail)                                                                        |                                                                                    |
| <b>Testing</b> .....:                                                                                                                                                                                                                                                                         |                                                                                    |
| <b>Date of receipt of test item</b> .....: 2016-09-10                                                                                                                                                                                                                                         |                                                                                    |
| <b>Date (s) of performance of tests</b> .....: 2016-09-11 to 2016-09-20                                                                                                                                                                                                                       |                                                                                    |
| <b>General remarks:</b>                                                                                                                                                                                                                                                                       |                                                                                    |
| "(See Enclosure #)" refers to additional information appended to the report.<br>"(See appended table)" refers to a table appended to the report.<br><br>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. |                                                                                    |
| <b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC60950-1:</b>                                                                                                                                                                                                                         |                                                                                    |
| The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided .....:                    | <input type="checkbox"/> Yes<br><input checked="" type="checkbox"/> Not applicable |
| <b>When differences exist; they shall be identified in the General product information section.</b>                                                                                                                                                                                           |                                                                                    |
| <b>Name and address of factory (ies)</b> .....: Same as applicant<br><br><br><br><br><br><br><br><br><br>                                                                                                                                                                                     |                                                                                    |
| <b>General product information:</b><br>1. The LED Strips is the detachable light and indoor use.<br>2. All tests were carried out on model SC-IG3-WW. All models are identical except for the appearance and model name.<br>3. The maximum operation temperature: 35°C.                       |                                                                                    |

| EN 60598-2-21 |                    |                 |         |
|---------------|--------------------|-----------------|---------|
| Clause        | Requirement + Test | Result - Remark | Verdict |

|                 |                                                   |                                                                                 |          |
|-----------------|---------------------------------------------------|---------------------------------------------------------------------------------|----------|
| <b>21.4 (0)</b> | <b>GENERAL TEST REQUIREMENTS</b>                  |                                                                                 | <b>P</b> |
| 21.4 (0.1)      | Information for luminaire design considered ..... | Standard<br>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | —        |
| 21.4 (0.3)      | More sections applicable.....                     | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>             | —        |

|                 |                                                                             |                                                                     |     |
|-----------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------|-----|
| <b>21.5 (2)</b> | <b>CLASSIFICATION</b>                                                       |                                                                     |     |
| 21.5 (2.2)      | Type of protection .....                                                    | Class III                                                           | —   |
| 21.5 (2.3)      | Degree of protection.....                                                   | IPX0                                                                | —   |
| 21.5 (2.4)      | Luminaire suitable for direct mounting on normally flammable surfaces ..... | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | —   |
| 21.5 (2.5)      | Luminaire for normal use .....                                              | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | —   |
|                 | Luminaire for rough service .....                                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | —   |
| 21.5.2 (-)      | Class II or Class III                                                       | Class III                                                           | P   |
| 21.5.3 (-)      | Rope lights for outdoor use shall be IP44 or higher                         | Indoor use                                                          | N/A |

|                 |                                       |         |          |
|-----------------|---------------------------------------|---------|----------|
| <b>21.6 (3)</b> | <b>MARKING</b>                        |         | <b>P</b> |
| 21.6 (3.2)      | Mandatory markings                    |         | P        |
|                 | Position of the marking               |         | P        |
|                 | Format of symbols/text                |         | P        |
| 21.6 (3.3)      | Additional information                |         | P        |
|                 | Language of instructions              | English | P        |
| 21.6 (3.3.1)    | Combination luminaires                |         | N/A      |
| 21.6 (3.3.2)    | Nominal frequency in Hz               |         | N/A      |
| 21.6 (3.3.3)    | Operating temperature                 | 35°C    | P        |
| 21.6 (3.3.4)    | Symbol or warning notice              |         | N/A      |
| 21.6 (3.3.5)    | Wiring diagram                        |         | P        |
| 21.6 (3.3.6)    | Special conditions                    |         | N/A      |
| 21.6 (3.3.7)    | Metal halide lamp luminaire – warning |         | N/A      |
| 21.6 (3.3.8)    | Limitation for semi-luminaires        |         | N/A      |
| 21.6 (3.3.9)    | Power factor and supply current       |         | N/A      |
| 21.6 (3.3.10)   | Suitability for use indoors           |         | P        |
| 21.6 (3.3.11)   | Luminaires with remote control        |         | N/A      |

| EN 60598-2-21     |                                                                             |                                            |          |
|-------------------|-----------------------------------------------------------------------------|--------------------------------------------|----------|
| Clause            | Requirement + Test                                                          | Result - Remark                            | Verdict  |
| 21.6 (3.3.12)     | Clip-mounted luminaire – warning                                            |                                            | N/A      |
| 21.6 (3.3.13)     | Specifications of protective shields                                        |                                            | N/A      |
| 21.6 (3.3.14)     | Symbol for nature of supply                                                 | ~                                          | P        |
| 21.6 (3.3.15)     | Rated current of socket outlet                                              |                                            | N/A      |
| 21.6 (3.3.16)     | Rough service luminaire                                                     |                                            | N/A      |
| 21.6 (3.3.17)     | Mounting instruction for type Y, type Z and some type X attachments         | Type X                                     | P        |
| 21.6 (3.3.18)     | Non-ordinary luminaires with PVC cable                                      |                                            | N/A      |
| 21.6 (3.3.19)     | Protective conductor current in instruction if applicable                   |                                            | N/A      |
| 21.6 (3.3.20)     | Provided with information if not intended to be mounted within arm's reach  |                                            | N/A      |
| 21.6 (3.3.21)     | Non-replaceable and non-user replaceable light sources information provided |                                            | N/A      |
|                   | Cautionary symbol                                                           |                                            | N/A      |
| 21.6 (3.3.22)     | Controllable luminaires, classification of insulation provided              |                                            | N/A      |
| 21.6 (3.4)        | Test with water                                                             | 15s                                        | P        |
|                   | Test with hexane                                                            | 15s                                        | P        |
|                   | Legible after test                                                          |                                            | P        |
|                   | Label attached                                                              |                                            | P        |
| <b>21.6.2 (-)</b> | <b>Rope light marking</b>                                                   |                                            | <b>P</b> |
|                   | Rated voltage and wattage marked on the rope light                          |                                            | P        |
|                   | Durable non-removable label if information on the cable                     |                                            | P        |
| <b>21.6.3 (-)</b> | <b>Rope light and packing marking</b>                                       |                                            | <b>P</b> |
|                   | Marking if only for indoor use                                              |                                            | P        |
| <b>21.6.4 (-)</b> | <b>Marking on the packing or instructions</b>                               |                                            | <b>P</b> |
|                   | Marking a) – e)                                                             |                                            | P        |
| <b>21.7 (4)</b>   | <b>CONSTRUCTION</b>                                                         |                                            | <b>P</b> |
| 21.7 (4.2)        | Components replaceable without difficulty                                   | Not directly connected to the power supply | P        |



| EN 60598-2-21     |                                                                                                                          |                 |         |
|-------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause            | Requirement + Test                                                                                                       | Result - Remark | Verdict |
| 21.7 (4.3)        | Wireways smooth and free from sharp edges                                                                                |                 | P       |
| <b>21.7 (4.4)</b> | <b>Lampholders</b>                                                                                                       |                 | N/A     |
| 21.7 (4.4.1)      | Integral lampholder                                                                                                      |                 | N/A     |
| 21.7 (4.4.2)      | Wiring connection                                                                                                        |                 | N/A     |
| 21.7 (4.4.3)      | Lampholder for end-to-end mounting                                                                                       |                 | N/A     |
| 21.7 (4.4.4)      | Positioning                                                                                                              |                 | N/A     |
|                   | - pressure test (N) .....                                                                                                |                 | —       |
|                   | After test the lampholder comply with relevant standard sheets and show no damage                                        |                 | N/A     |
|                   | After test on single-capped lampholder the lampholder have not moved from its position and show no permanent deformation |                 | N/A     |
|                   | - bending test (Nm) .....                                                                                                |                 | —       |
|                   | After test the lampholder have not moved from its position and show no permanent deformation                             |                 | N/A     |
| 21.7 (4.4.5)      | Peak pulse voltage                                                                                                       |                 | N/A     |
| 21.7 (4.4.6)      | Centre contact                                                                                                           |                 | N/A     |
| 21.7 (4.4.7)      | Parts in rough service luminaires resistant to tracking                                                                  |                 | N/A     |
| 21.7 (4.4.8)      | Lamp connectors                                                                                                          |                 | N/A     |
| 21.7 (4.4.9)      | Caps and bases correctly used                                                                                            |                 | N/A     |
| 21.7 (4.4.10)     | Light source for lampholder or connection according IEC 60061 not connected another way                                  |                 | N/A     |
| <b>21.7 (4.5)</b> | <b>Starter holders</b>                                                                                                   |                 | N/A     |
|                   | Starter holder in luminaires other than class II                                                                         |                 | N/A     |
|                   | Starter holder class II construction                                                                                     |                 | N/A     |
| <b>21.7 (4.6)</b> | <b>Terminal blocks</b>                                                                                                   |                 | P       |
|                   | Tails                                                                                                                    |                 | P       |
|                   | Unsecured blocks                                                                                                         |                 | N/A     |
| <b>21.7 (4.7)</b> | <b>Terminals and supply connections</b>                                                                                  |                 | P       |
| 21.7 (4.7.1)      | Contact to metal parts                                                                                                   |                 | P       |
| 21.7 (4.7.2)      | Test 8 mm live conductor                                                                                                 |                 | P       |
|                   | Test 8 mm earth conductor                                                                                                |                 | N/A     |
| 21.7 (4.7.3)      | Terminals for supply conductors                                                                                          |                 | P       |
| 21.7 (4.7.3.1)    | Welded method and material                                                                                               |                 | N/A     |
|                   | - stranded or solid conductor                                                                                            |                 | N/A     |
|                   | - spot welding                                                                                                           |                 | N/A     |

| EN 60598-2-21      |                                                                                    |                 |         |
|--------------------|------------------------------------------------------------------------------------|-----------------|---------|
| Clause             | Requirement + Test                                                                 | Result - Remark | Verdict |
|                    | - welding between wires                                                            |                 | N/A     |
|                    | - Type Z attachment                                                                |                 | N/A     |
|                    | - mechanical test according to 15.8.2                                              |                 | N/A     |
|                    | - electrical test according to 15.9                                                |                 | N/A     |
|                    | - heat test according to 15.9.2.3 and 15.9.2.4                                     |                 | N/A     |
| 21.7 (4.7.4)       | Terminals other than supply connection                                             |                 | P       |
| 21.7 (4.7.5)       | Heat-resistant wiring/sleeves                                                      |                 | P       |
| 21.7(4.7.6)        | Multi-pole plug                                                                    |                 | N/A     |
|                    | - test at 30 N                                                                     |                 | N/A     |
| <b>21.7 (4.8)</b>  | <b>Switches</b>                                                                    |                 | N/A     |
|                    | - adequate rating                                                                  |                 | N/A     |
|                    | - adequate fixing                                                                  |                 | N/A     |
|                    | - polarized supply                                                                 |                 | N/A     |
|                    | - compliance with IEC 61058-1 for electronic switches                              |                 | N/A     |
| <b>21.7 (4.9)</b>  | <b>Insulating lining and sleeves</b>                                               |                 | P       |
| 21.7 (4.9.1)       | Retainment                                                                         |                 | P       |
|                    | Method of fixing .....                                                             |                 | —       |
| 21.7 (4.9.2)       | Insulated linings and sleeves:                                                     |                 | P       |
|                    | Resistant to a temperature > 20 °C to the wire temperature or                      |                 | P       |
|                    | a) & c) Insulation resistance and electric strength                                |                 | P       |
|                    | b) Ageing test. Temperature (°C)..... : 45.4                                       |                 | P       |
| <b>21.7 (4.10)</b> | <b>Double or reinforced insulation</b>                                             |                 | P       |
| 21.7 (4.10.1)      | No contact, mounting surface – accessible metal parts – wiring of basic insulation |                 | N/A     |
|                    | Safe installation fixed luminaires                                                 |                 | N/A     |
|                    | Capacitors and switches                                                            |                 | N/A     |
|                    | Interference suppression capacitors according to IEC 60384-14                      |                 | N/A     |
| 21.7 (4.10.2)      | Assembly gaps:                                                                     |                 | P       |
|                    | - not coincidental                                                                 |                 | P       |
|                    | - no straight access with test probe                                               |                 | P       |
| 21.7 (4.10.3)      | Retainment of insulation:                                                          |                 | P       |

| EN 60598-2-21      |                                                          |                 |         |
|--------------------|----------------------------------------------------------|-----------------|---------|
| Clause             | Requirement + Test                                       | Result - Remark | Verdict |
|                    | - fixed                                                  |                 | N/A     |
|                    | - unable to be replaced; luminaire inoperative           |                 | N/A     |
|                    | - sleeves retained in position                           |                 | P       |
|                    | - lining in lampholder                                   |                 | N/A     |
| <b>21.7 (4.11)</b> | <b>Electrical connections and current-carrying parts</b> |                 | P       |
| 21.7 (4.11.1)      | Contact pressure                                         |                 | P       |
| 21.7 (4.11.2)      | Screws:                                                  |                 | N/A     |
|                    | - self-tapping screws                                    |                 | N/A     |
|                    | - thread-cutting screws                                  |                 | N/A     |
| 21.7 (4.11.3)      | Screw locking:                                           |                 | N/A     |
|                    | - spring washer                                          |                 | N/A     |
|                    | - rivets                                                 |                 | N/A     |
| 21.7 (4.11.4)      | Material of current-carrying parts                       |                 | P       |
| 21.7 (4.121.6)     | No contact to wood or mounting surface                   |                 | P       |
| 21.7 (4.11.6)      | Electro-mechanical contact systems                       |                 | N/A     |
| <b>21.7 (4.12)</b> | <b>Screws and connections (mechanical) and glands</b>    |                 | N/A     |
| 21.7 (4.12.1)      | Screws not made of soft metal                            |                 | N/A     |
|                    | Screws of insulating material                            |                 | N/A     |
|                    | Torque test: torque (Nm); part..... :                    |                 | N/A     |
|                    | Torque test: torque (Nm); part..... :                    |                 | N/A     |
|                    | Torque test: torque (Nm); part..... :                    |                 | N/A     |
| 21.7 (4.12.2)      | Screws with diameter < 3 mm screwed into metal           |                 | N/A     |
| 21.7 (4.12.4)      | Locked connections:                                      |                 | N/A     |
|                    | - fixed arms; torque (Nm) ..... :                        |                 | N/A     |
|                    | - lampholder; torque (Nm) ..... :                        |                 | N/A     |
|                    | - push-button switches; torque 0,8 Nm ..... :            |                 | N/A     |
| 21.7 (4.12.5)      | Screwed glands; force (Nm)..... :                        |                 | N/A     |
| <b>21.7 (4.13)</b> | <b>Mechanical strength</b>                               |                 | P       |

| EN 60598-2-21      |                                                                     |                 |         |
|--------------------|---------------------------------------------------------------------|-----------------|---------|
| Clause             | Requirement + Test                                                  | Result - Remark | Verdict |
| 21.7<br>(4.13.1)   | Impact tests:                                                       |                 | P       |
|                    | - fragile parts; energy (Nm) .....                                  | 0.20            | P       |
|                    | - other parts; energy (Nm).....                                     | 0.35            | P       |
|                    | 1) live parts                                                       |                 | P       |
|                    | 2) linings                                                          |                 | N/A     |
|                    | 3) protection                                                       |                 | P       |
|                    | 4) covers                                                           |                 | N/A     |
| 21.7<br>(4.13.3)   | Straight test finger                                                |                 | P       |
| 21.7<br>(4.13.4)   | Rough service luminaires                                            |                 | N/A     |
|                    | - IP54 or higher                                                    |                 | N/A     |
|                    | a) fixed                                                            |                 | N/A     |
|                    | b) hand-held                                                        |                 | N/A     |
|                    | c) delivered with a stand                                           |                 | N/A     |
|                    | d) for temporary installations and suitable for mounting on a stand |                 | N/A     |
| 21.7<br>(4.13.6)   | Tumbling barrel                                                     |                 | N/A     |
| <b>21.7 (4.14)</b> | <b>Suspensions, fixings and means of adjusting</b>                  |                 | N/A     |
| 21.7<br>(4.14.1)   | Mechanical load:                                                    |                 | N/A     |
|                    | A) four times the weight                                            |                 | N/A     |
|                    | B) torque 2,5 Nm                                                    |                 | N/A     |
|                    | C) bracket arm; bending moment (Nm) .....                           |                 | N/A     |
|                    | D) load track-mounted luminaires                                    |                 | N/A     |
|                    | E) clip-mounted luminaires, glass-shelve. Thickness (mm) .....      |                 | N/A     |
|                    | Metal rod. diameter (mm) .....                                      |                 | N/A     |
|                    | Fixed luminaire or independent control gear without fixing devices  |                 | N/A     |
| 21.7<br>(4.14.2)   | Load to flexible cables                                             |                 | N/A     |
|                    | Mass (kg) .....                                                     |                 | —       |
|                    | Stress in conductors (N/mm <sup>2</sup> ) .....                     |                 | N/A     |
|                    | Mass (kg) of semi-luminaire .....                                   |                 | —       |
|                    | Bending moment (Nm) of semi-luminaire .....                         |                 | N/A     |

| EN 60598-2-21      |                                                                    |                               |         |
|--------------------|--------------------------------------------------------------------|-------------------------------|---------|
| Clause             | Requirement + Test                                                 | Result - Remark               | Verdict |
| 21.7<br>(4.14.3)   | Adjusting devices:                                                 |                               | N/A     |
|                    | - flexing test; number of cycles..... :                            |                               | N/A     |
|                    | - strands broken .....                                             |                               | N/A     |
|                    | - electric strength test afterwards                                |                               | N/A     |
| 21.7<br>(4.14.4)   | Telescopic tubes: cords not fixed to tube; no strain on conductors |                               | N/A     |
| 21.7<br>(4.14.5)   | Guide pulleys                                                      |                               | N/A     |
| 21.7<br>(4.14.6)   | Strain on socket-outlets                                           |                               | N/A     |
| <b>21.7 (4.15)</b> | <b>Flammable materials</b>                                         |                               | P       |
|                    | - glow-wire test 650°C .....                                       | See Test Table 21.16 (13.3.2) | P       |
|                    | - spacing $\geq 30$ mm                                             |                               | N/A     |
|                    | - screen withstanding test of 13.3.1                               |                               | N/A     |
|                    | - screen dimensions                                                |                               | N/A     |
|                    | - no fiercely burning material                                     |                               | P       |
|                    | - thermal protection                                               |                               | N/A     |
|                    | - electronic circuits exempted                                     |                               | N/A     |
| 21.7<br>(4.15.2)   | Luminaires made of thermoplastic material with lamp control gear   |                               | N/A     |
|                    | a) construction                                                    |                               | N/A     |
|                    | b) temperature sensing control                                     |                               | N/A     |
|                    | c) surface temperature                                             |                               | N/A     |
| <b>21.7 (4.16)</b> | <b>Luminaires for mounting on normally flammable surfaces</b>      |                               | P       |
|                    | No lamp control gear .....                                         | (compliance with Section 12)  | P       |
| 21.7<br>(4.16.1)   | Lamp control gear spacing:                                         |                               | N/A     |
|                    | - spacing 35 mm                                                    |                               | N/A     |
|                    | - spacing 10 mm                                                    |                               | N/A     |
| 21.7<br>(4.16.2)   | Thermal protection:                                                |                               | N/A     |
|                    | - in lamp control gear                                             |                               | N/A     |
|                    | - external                                                         |                               | N/A     |
|                    | - fixed position                                                   |                               | N/A     |
|                    | - temperature marked lamp control gear                             |                               | N/A     |

| EN 60598-2-21      |                                                                                      |                                                                                       |         |
|--------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------|
| Clause             | Requirement + Test                                                                   | Result - Remark                                                                       | Verdict |
| 21.7 (4.16.3)      | Design to satisfy the test of 12.6                                                   | (see clause 12.6)                                                                     | N/A     |
| <b>21.7 (4.17)</b> | <b>Drain holes</b>                                                                   |                                                                                       | N/A     |
|                    | Clearance at least 5 mm                                                              |                                                                                       | N/A     |
| <b>21.7 (4.18)</b> | <b>Resistance to corrosion</b>                                                       |                                                                                       | P       |
| 21.7 (4.18.1)      | - rust-resistance                                                                    |                                                                                       | N/A     |
| 21.7 (4.18.2)      | - season cracking in copper                                                          |                                                                                       | P       |
| 21.7 (4.18.3)      | - corrosion of aluminium                                                             |                                                                                       | N/A     |
| 21.7 (4.19)        | Igniters compatible with ballast                                                     |                                                                                       | N/A     |
| 21.7 (4.20)        | Rough service vibration                                                              |                                                                                       | N/A     |
| <b>21.7 (4.21)</b> | <b>Protective shield</b>                                                             |                                                                                       | N/A     |
| 21.7 (4.21.1)      | Shield fitted if tungsten halogen lamps or metal halide lamps                        |                                                                                       | N/A     |
|                    | Shield of glass if tungsten halogen lamps                                            |                                                                                       | N/A     |
| 21.7 (4.21.2)      | Particles from a shattering lamp not impair safety                                   |                                                                                       | N/A     |
| 21.7 (4.21.3)      | No direct path                                                                       |                                                                                       | N/A     |
| 21.7 (4.21.4)      | Impact test on shield                                                                |                                                                                       | N/A     |
|                    | Glow-wire test on lamp compartment .....                                             | See Test Table 21.16 (13.3.2)                                                         | N/A     |
| 21.7 (4.22)        | Attachments to lamps not cause overheating or damage                                 |                                                                                       | N/A     |
| 21.7 (4.23)        | Semi-luminaires comply Class II                                                      |                                                                                       | N/A     |
| <b>21.7 (4.24)</b> | <b>Photobiological hazards</b>                                                       |                                                                                       | N/A     |
| 21.7 (4.24.1)      | No excessive UV radiation if tungsten halogen lamps and metal halide lamps (Annex P) |                                                                                       | N/A     |
| 21.7 (4.24.2)      | Retinal blue light hazard                                                            |                                                                                       | N/A     |
|                    | Luminaires with $E_{thr}$ :                                                          |                                                                                       | N/A     |
|                    | a) Fixed luminaires                                                                  |                                                                                       | N/A     |
|                    | - distance x m, borderline between RG1 and RG2 .. :                                  |                                                                                       | N/A     |
|                    | - marking and instruction according 3.2.23                                           |  | N/A     |

| EN 60598-2-21      |                                                                                                                                                    |                 |         |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause             | Requirement + Test                                                                                                                                 | Result - Remark | Verdict |
|                    | b) Portable and handheld luminaires                                                                                                                |                 | N/A     |
|                    | - marking according 3.2.23 if RG1 exceeded at 200 mm according to IEC/TR 62778                                                                     |                 | N/A     |
|                    | Portable luminaires for children IEC 60598-2-10 and Mains socket outlet nightlights IEC 60598-2-12 not exceed RG1 at 200 mm according to IEC/62778 |                 | N/A     |
| <b>21.7 (4.25)</b> | <b>Mechanical hazard</b>                                                                                                                           |                 | P       |
|                    | No sharp point or edges                                                                                                                            |                 | P       |
| <b>21.7 (4.26)</b> | <b>Short-circuit protection</b>                                                                                                                    |                 | P       |
| 21.7 (4.26.1)      | Adequate means of uninsulated accessible SELV parts                                                                                                |                 | P       |
| 21.7 (4.26.2)      | Short-circuit test with test chain according 4.26.3                                                                                                |                 | N/A     |
|                    | Test chain not melt through                                                                                                                        |                 | N/A     |
|                    | Test sample not exceed values of Table 12.1 and 12.2                                                                                               |                 | N/A     |
| <b>21.7 (4.27)</b> | <b>Terminal blocks with integrated screwless earthing contacts</b>                                                                                 |                 | N/A     |
|                    | Test according Annex V                                                                                                                             |                 | N/A     |
|                    | Pull test of terminal fixing (20 N)                                                                                                                |                 | N/A     |
|                    | After test, resistance < 0,05 $\Omega$                                                                                                             |                 | N/A     |
|                    | Pull test of mechanical connection (50 N)                                                                                                          |                 | N/A     |
|                    | After test, resistance < 0,05 $\Omega$                                                                                                             |                 | N/A     |
|                    | Voltage drop test, resistance < 0,05 $\Omega$                                                                                                      |                 | N/A     |
| <b>21.7 (4.28)</b> | <b>Fixing of thermal sensing control</b>                                                                                                           |                 | N/A     |
|                    | Not plug-in or easily replaceable type                                                                                                             |                 | N/A     |
|                    | Reliably kept in position                                                                                                                          |                 | N/A     |
|                    | No adhesive fixing if UV radiations from a lamp can degrade the fixing                                                                             |                 | N/A     |
|                    | Not outside the luminaire enclosure                                                                                                                |                 | N/A     |
|                    | Test of adhesive fixing:                                                                                                                           |                 | N/A     |
|                    | Max. temperature on adhesive material (°C) ..... :                                                                                                 |                 | —       |
|                    | 100 cycles between t min and t max                                                                                                                 |                 | N/A     |
|                    | Temperature sensing control still in position                                                                                                      |                 | N/A     |
| <b>21.7 (4.29)</b> | <b>Luminaires with non-replaceable light source</b>                                                                                                |                 | N/A     |
|                    | Not possible to replace light source                                                                                                               |                 | N/A     |
|                    | Live part not accessible after parts have been opened by hand or tools                                                                             |                 | N/A     |

| EN 60598-2-21      |                                                                                                                                                                                     |                 |         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause             | Requirement + Test                                                                                                                                                                  | Result - Remark | Verdict |
| <b>21.7 (4.30)</b> | <b>Luminaires with non-user replaceable light source</b>                                                                                                                            |                 | N/A     |
|                    | If protective cover provide protection against electric shock and marked with "caution, electric shock risk" symbol:                                                                |                 | N/A     |
|                    | Minimum two fixing means                                                                                                                                                            |                 | N/A     |
| <b>21.7 (4.31)</b> | <b>Insulation between circuits</b>                                                                                                                                                  |                 | P       |
|                    | Circuits insulated from LV supply fulfil requirements according 4.31.1 – 4.31.3                                                                                                     |                 | P       |
|                    | Controllable luminaires requiring same level of insulation for all components, the insulation between control terminals and LV supply fulfil requirements according 4.31.1 – 4.31.3 |                 | N/A     |
| 21.7 (4.31.1)      | SELV circuits                                                                                                                                                                       |                 | P       |
|                    | Used SELV source                                                                                                                                                                    |                 | P       |
|                    | Voltage $\leq$ ELV                                                                                                                                                                  |                 | N/A     |
|                    | Insulating of SELV circuits from LV supply                                                                                                                                          |                 | N/A     |
|                    | Insulating of SELV circuits from other non SELV circuits                                                                                                                            |                 | P       |
|                    | Insulating of SELV circuits from FELV                                                                                                                                               |                 | N/A     |
|                    | Insulating of SELV circuits from other SELV circuits                                                                                                                                |                 | N/A     |
|                    | SELV circuits insulated from accessible parts according Table X.1                                                                                                                   |                 | N/A     |
|                    | Plugs not able to enter socket-outlets of other voltage systems                                                                                                                     |                 | N/A     |
|                    | Socket outlets does not admit plugs of other voltage systems                                                                                                                        |                 | N/A     |
|                    | Plugs and socket-outlets does not have protective conductor contact                                                                                                                 |                 | N/A     |
| 21.7 (4.31.2)      | FELV circuits                                                                                                                                                                       |                 | N/A     |
|                    | Used FELV source                                                                                                                                                                    |                 | N/A     |
|                    | Voltage $\leq$ ELV                                                                                                                                                                  |                 | N/A     |
|                    | Insulating of FELV circuits from LV supply                                                                                                                                          |                 | N/A     |
|                    | FELV circuits insulated from accessible parts according Table X.1                                                                                                                   |                 | N/A     |
|                    | Plugs not able to enter socket-outlets of other voltage systems                                                                                                                     |                 | N/A     |
|                    | Socket outlets does not admit plugs of other voltage systems                                                                                                                        |                 | N/A     |



| EN 60598-2-21      |                                                                                                            |                 |          |
|--------------------|------------------------------------------------------------------------------------------------------------|-----------------|----------|
| Clause             | Requirement + Test                                                                                         | Result - Remark | Verdict  |
|                    | Socket-outlets does not have protective conductor contact                                                  |                 | N/A      |
| 21.7 (4.31.3)      | Other circuits                                                                                             |                 | P        |
|                    | Other circuits insulated from accessible parts according Table X.1                                         |                 | P        |
|                    | Class II construction with equipotential bonding for protection against indirect contacts with live parts: |                 | N/A      |
|                    | - conductive parts are connected together                                                                  |                 | N/A      |
|                    | - test according 7.2.3 of above                                                                            |                 | N/A      |
|                    | - conductive part not cause an electric shock in case of an insulation fault                               |                 | N/A      |
|                    | - equipotential bonding in master/slave applications                                                       |                 | N/A      |
|                    | - master luminaire provided with terminal for accessible conductive parts of slave luminaires              |                 | N/A      |
|                    | - slave luminaire constructed as class I                                                                   |                 | N/A      |
| <b>21.7 (4.32)</b> | <b>Overvoltage protective devices</b>                                                                      |                 | N/A      |
|                    | Comply with IEC 61643-11                                                                                   |                 | N/A      |
|                    | External to control gear and connected to earth:                                                           |                 | N/A      |
|                    | - only in fixed luminaires                                                                                 |                 | N/A      |
|                    | - only connected to protective earth                                                                       |                 | N/A      |
| <b>21.7.2 (-)</b>  | <b>Terminal blocks</b>                                                                                     |                 | <b>P</b> |
|                    | Clause 4.6 of IEC 60598-1 referring to terminal blocks does not apply                                      |                 | —        |
| <b>21.7.3 (-)</b>  | <b>Terminals and supply connections</b>                                                                    |                 | <b>P</b> |
|                    | Comply with Annex A                                                                                        |                 | P        |
| <b>21.7.4 (-)</b>  | <b>Control units</b>                                                                                       |                 | <b>P</b> |
|                    | Forming an integral part enclosed in non-flammable insulating material tested according 21.16              |                 | P        |
|                    | Securely fixed to the cable                                                                                |                 | P        |
|                    | Electronic control device comply with IEC 61347-2-11                                                       |                 | N/A      |
|                    | LED driver comply with IEC 61347-2-13                                                                      |                 | N/A      |
| <b>21.7.5 (-)</b>  | <b>Mechanical strength</b>                                                                                 |                 | <b>P</b> |
|                    | a) Rigid rope lights                                                                                       |                 | N/A      |
|                    | 1) Pull test: force 60 N                                                                                   |                 | N/A      |
|                    | 2) Torque test: torque 0,15 Nm                                                                             |                 | N/A      |
|                    | b) Flexible rope lights                                                                                    |                 | P        |

| EN 60598-2-21 |                                                                                                             |                 |         |
|---------------|-------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause        | Requirement + Test                                                                                          | Result - Remark | Verdict |
|               | 1) Pull test: force 60 N                                                                                    |                 | P       |
|               | 2) Torque test: torque 0,15 Nm                                                                              |                 | P       |
|               | 3) Cylinder 150 mm @ 10 times at 25 °C ± 2 °C                                                               |                 | P       |
|               | For rope lights having an IP number over X0<br>Additionally:<br>Cylinder 150 mm @ 10 times at -15 °C ± 2 °C |                 | N/A     |
|               | 4) Mandrel of between 4 and 5 times the diameter of test piece                                              |                 | P       |
|               | c) Impact test at low temperature of -15 °C ± 5 °C                                                          |                 | P       |

|                  |                                                                           |                                                                                           |     |
|------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----|
| <b>21.8 (11)</b> | <b>CREEPAGE DISTANCES AND CLEARANCES</b>                                  |                                                                                           | N/A |
| 21.8(11.2)       | Creepage distances and clearances..... :                                  | See Table 21.8 (11.2)                                                                     | N/A |
|                  | Working voltage (V)..... :                                                |                                                                                           | —   |
|                  | Rated pulse voltage (kV)..... :                                           | 2.5kV                                                                                     | —   |
|                  | Voltage form..... :                                                       | Sinusoidal <input checked="" type="checkbox"/><br>Non-sinusoidal <input type="checkbox"/> | —   |
|                  | PTI..... :                                                                | < 600 <input checked="" type="checkbox"/> ≥ 600 <input type="checkbox"/>                  | —   |
|                  | Impulse withstand category (Normal category II)<br>(Category III Annex U) | Category II <input type="checkbox"/> Category III <input checked="" type="checkbox"/>     | —   |

|                   |                                            |               |            |
|-------------------|--------------------------------------------|---------------|------------|
| <b>21.10 (14)</b> | <b>SCREW TERMINALS</b>                     |               | <b>N/A</b> |
|                   | Separately approved; component list..... : | (see Annex 1) | N/A        |
|                   | Part of the luminaire..... :               | (see Annex 3) | N/A        |

|                   |                                                       |               |     |
|-------------------|-------------------------------------------------------|---------------|-----|
| <b>21.10 (15)</b> | <b>SCREWLESS TERMINALS AND ELECTRICAL CONNECTIONS</b> |               | N/A |
|                   | Separately approved; component list..... :            | (see Annex 1) | N/A |
|                   | Part of the luminaire..... :                          | (see Annex 4) | N/A |

|                    |                                                                                                                                              |                                            |     |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----|
| <b>21.11 (5)</b>   | <b>EXTERNAL AND INTERNAL WIRING</b>                                                                                                          |                                            | P   |
| <b>21.11 (5.2)</b> | <b>Supply connection and external wiring</b>                                                                                                 |                                            | P   |
| 21.11(5.2.1)       | Means of connection..... :                                                                                                                   | Not directly connected to the power supply | P   |
|                    | Outdoor luminaire has not PVC insulated external wiring if not class III or SELV ≤ 25 V a.c./60 V d.c. or protected from outdoor environment |                                            | N/A |
| 21.11 (5.2.2)      | Type of cable..... :                                                                                                                         | Replaced by 21.11.2                        | -   |

| EN 60598-2-21       |                                                         |                     |         |
|---------------------|---------------------------------------------------------|---------------------|---------|
| Clause              | Requirement + Test                                      | Result - Remark     | Verdict |
|                     | Nominal cross-sectional area (mm <sup>2</sup> ) ..... : | Replaced by 21.11.2 | -       |
|                     | Cables equal to IEC 60227 or IEC 60245                  | Replaced by 21.11.2 | -       |
| 21.11<br>(5.2.3)    | Type of attachment, X, Y or Z                           | Type X              | P       |
| 21.11<br>(5.2.5)    | Type Z not connected to screws                          |                     | N/A     |
| 21.11<br>(5.2.6)    | Cable entries:                                          |                     | P       |
|                     | - suitable for introduction                             |                     | P       |
|                     | - adequate degree of protection                         |                     | P       |
| 21.11<br>(5.2.7)    | Cable entries through rigid material have rounded edges |                     | P       |
| 21.11<br>(5.2.8)    | Insulating bushings:                                    |                     | P       |
|                     | - suitably fixed                                        |                     | P       |
|                     | - material in bushings                                  |                     | P       |
|                     | - material not likely to deteriorate                    |                     | P       |
|                     | - tubes or guards made of insulating material           |                     | P       |
| 21.11<br>(5.2.9)    | Locking of screwed bushings                             |                     | N/A     |
| 21.11<br>(5.2.10)   | Cord anchorage:                                         |                     | P       |
|                     | - covering protected from abrasion                      |                     | P       |
|                     | - clear how to be effective                             |                     | P       |
|                     | - no mechanical or thermal stress                       |                     | P       |
|                     | - no tying of cables into knots etc.                    |                     | P       |
|                     | - insulating material or lining                         |                     | P       |
| 21.11<br>(5.2.10.1) | Cord anchorage for type X attachment:                   |                     | P       |
|                     | a) at least one part fixed                              |                     | P       |
|                     | b) types of cable                                       |                     | P       |
|                     | c) no damaging of the cable                             |                     | P       |
|                     | d) whole cable can be mounted                           |                     | P       |
|                     | e) no touching of clamping screws                       |                     | N/A     |
|                     | f) metal screw not directly on cable                    |                     | N/A     |
|                     | g) replacement without special tool                     |                     | P       |
|                     | Glands not used as anchorage                            |                     | P       |

| EN 60598-2-21       |                                                                    |                 |         |
|---------------------|--------------------------------------------------------------------|-----------------|---------|
| Clause              | Requirement + Test                                                 | Result - Remark | Verdict |
|                     | Labyrinth type anchorages                                          |                 | N/A     |
| 21.11<br>(5.2.10.2) | Adequate cord anchorage for type Y and type Z attachment           | Type X          | N/A     |
| 21.11<br>(5.2.10.3) | Tests:                                                             |                 | N/A     |
|                     | - impossible to push cable; unsafe                                 |                 | N/A     |
|                     | - pull test: 25 times; pull (N) ..... :                            |                 | N/A     |
|                     | - torque test: torque (Nm)..... :                                  |                 | N/A     |
|                     | - displacement $\leq 2$ mm                                         |                 | N/A     |
|                     | - no movement of conductors                                        |                 | N/A     |
|                     | - no damage of cable or cord                                       |                 | N/A     |
|                     | - function independent of electrical connection                    |                 | N/A     |
| 21.11<br>(5.2.11)   | External wiring passing into luminaire                             |                 | P       |
| 21.11<br>(5.2.12)   | Looping-in terminals                                               |                 | N/A     |
| 21.11<br>(5.2.13)   | Wire ends not tinned                                               |                 | N/A     |
|                     | Wire ends tinned: no cold flow                                     |                 | N/A     |
| 21.11<br>(5.2.14)   | Mains plug same protection                                         |                 | P       |
|                     | Class III luminaire plug                                           |                 | N/A     |
|                     | No unsafe compatibility                                            |                 | N/A     |
| 21.11<br>(5.2.16)   | Appliance inlets (IEC 60320)                                       |                 | N/A     |
|                     | Installation couplers (IEC 61535)                                  |                 | N/A     |
|                     | Other appliance inlet or connector according relevant IEC standard |                 | N/A     |
| 21.11<br>(5.2.17)   | No standardized interconnecting cables properly assembled          |                 | N/A     |
| 21.11<br>(5.2.18)   | Used plug in accordance with                                       |                 | P       |
|                     | - IEC 60083                                                        |                 | P       |
|                     | - other standard                                                   |                 | N/A     |
| <b>21.11 (5.3)</b>  | <b>Internal wiring</b>                                             |                 | N/A     |
| 21.11<br>(5.3.1)    | Internal wiring of suitable size and type                          |                 | N/A     |
|                     | Through wiring                                                     |                 | N/A     |

| EN 60598-2-21       |                                                                                |                 |         |
|---------------------|--------------------------------------------------------------------------------|-----------------|---------|
| Clause              | Requirement + Test                                                             | Result - Remark | Verdict |
|                     | - not delivered/ mounting instruction                                          |                 | N/A     |
|                     | - factory assembled                                                            |                 | N/A     |
|                     | - socket outlet loaded (A) ..... :                                             |                 | N/A     |
|                     | - temperatures ..... :                                                         | (see Annex 2)   | N/A     |
|                     | Green-yellow for earth only                                                    |                 | N/A     |
| 21.11<br>(5.3.1.1)  | Internal wiring connected directly to fixed wiring                             |                 | N/A     |
|                     | Cross-sectional area (mm <sup>2</sup> )..... :                                 |                 | N/A     |
|                     | Insulation thickness                                                           |                 | N/A     |
|                     | Extra insulation added where necessary                                         |                 | N/A     |
| 21.11<br>(5.3.1.2)  | Internal wiring connected to fixed wiring via internal current-limiting device |                 | N/A     |
|                     | Adequate cross-sectional area and insulation thickness                         |                 | N/A     |
| 21.11<br>(5.3.1.3)  | Double or reinforced insulation for class II                                   |                 | N/A     |
| 21.11<br>(5.3.1.4)  | Conductors without insulation                                                  |                 | N/A     |
| 21.11<br>(5.3.21.6) | SELV current-carrying parts                                                    |                 | N/A     |
| 21.11<br>(5.3.1.6)  | Insulation thickness other than PVC or rubber                                  |                 | N/A     |
| 21.11<br>(5.3.2)    | Sharp edges etc.                                                               |                 | N/A     |
|                     | No moving parts of switches etc.                                               |                 | N/A     |
|                     | Joints, raising/lowering devices                                               |                 | N/A     |
|                     | Telescopic tubes etc.                                                          |                 | N/A     |
|                     | No twisting over 360°                                                          |                 | N/A     |
| 21.11<br>(5.3.3)    | Insulating bushings:                                                           |                 | N/A     |
|                     | - suitable fixed                                                               |                 | N/A     |
|                     | - material in bushings                                                         |                 | N/A     |
|                     | - material not likely to deteriorate                                           |                 | N/A     |
|                     | - cables with protective sheath                                                |                 | N/A     |
| 21.11<br>(5.3.4)    | Joints and junctions effectively insulated                                     |                 | N/A     |
| 21.11<br>(5.3.5)    | Strain on internal wiring                                                      |                 | N/A     |

| EN 60598-2-21      |                                                                                                                        |                 |            |
|--------------------|------------------------------------------------------------------------------------------------------------------------|-----------------|------------|
| Clause             | Requirement + Test                                                                                                     | Result - Remark | Verdict    |
| 21.11<br>(5.3.6)   | Wire carriers                                                                                                          |                 | N/A        |
| 21.11<br>(5.3.7)   | Wire ends not tinned                                                                                                   |                 | N/A        |
|                    | Wire ends tinned: no cold flow                                                                                         |                 | N/A        |
| <b>21.11.2 (-)</b> | <b>Cables for rope lights</b>                                                                                          |                 | <b>P</b>   |
|                    | Type of cable.....:                                                                                                    | IEC 52          | P          |
|                    | Cables not lighter than IEC 60227 or IEC 60245 for class II rope lights                                                |                 | P          |
|                    | Cables not lighter than insulation according to 5.3.1 of part 1 for class III rope lights                              |                 | N/A        |
|                    | Nominal cross-sectional area (mm <sup>2</sup> ) .....                                                                  | 0.75            | P          |
|                    | Mechanical properties according 4.14.1 and 4.14.2 of part 1                                                            |                 | P          |
| <b>21.11.3 (-)</b> | <b>Cord anchorage test</b>                                                                                             |                 | <b>P</b>   |
|                    | Pull test 30 N 25 times on single-core cable                                                                           |                 | P          |
| <b>21.11.4 (-)</b> | <b>Plugs and cable length</b>                                                                                          |                 | <b>P</b>   |
|                    | Splash-proof plug or permanent connection if for outdoor use                                                           |                 | N/A        |
|                    | Length of the cable between the plug and the connection to the rope light not less than 1,5 m                          |                 | P          |
| <b>21.11.5 (-)</b> | <b>Maximum length of extendable class II rope lights</b>                                                               |                 | <b>N/A</b> |
|                    | Maximum length 100 m for 0,5 mm <sup>2</sup> cable                                                                     |                 | N/A        |
|                    | Maximum length 150 m for 0,75 mm <sup>2</sup> cable                                                                    |                 | N/A        |
| <b>21.12 (8)</b>   | <b>PROTECTION AGAINST ELECTRIC SHOCK</b>                                                                               |                 | <b>P</b>   |
| 21.12<br>(8.2.1)   | Live parts not accessible                                                                                              |                 | P          |
|                    | Basic insulated parts not used on the outer surface without appropriate protection                                     |                 | P          |
|                    | Basic insulated parts not accessible with standard test finger on portable, settable and adjustable luminaires         |                 | P          |
|                    | Basic insulated parts not accessible with Ø 50 mm probe from outside, other types of luminaires                        |                 | N/A        |
|                    | Lamp and starterholders in portable and adjustable luminaires comply with double or reinforced insulation requirements |                 | P          |
|                    | Basic insulation only accessible under lamp or starter replacement                                                     |                 | N/A        |

| EN 60598-2-21      |                                                                                 |                 |         |
|--------------------|---------------------------------------------------------------------------------|-----------------|---------|
| Clause             | Requirement + Test                                                              | Result - Remark | Verdict |
|                    | Protection in any position                                                      |                 | P       |
|                    | Double-ended tungsten filament lamp                                             |                 | N/A     |
|                    | Insulation lacquer not reliable                                                 |                 | N/A     |
|                    | Double-ended high pressure discharge lamp                                       |                 | N/A     |
|                    | Relevant warning according to 3.2.18 fitted to the luminaire                    |                 | N/A     |
| 21.12<br>(8.2.2)   | Portable luminaire adjusted in most unfavourable position                       |                 | P       |
| 21.12<br>(8.2.3.a) | Class II luminaire:                                                             |                 | P       |
|                    | - basic insulated metal parts not accessible during starter or lamp replacement |                 | P       |
|                    | - basic insulation not accessible other than during starter or lamp replacement |                 | P       |
|                    | - glass protective shields not used as supplementary insulation                 |                 | N/A     |
| 21.12<br>(8.2.3.b) | BC lampholder of metal in class I luminaires shall be earthed                   |                 | N/A     |
| 21.12<br>(8.2.3.c) | SELV circuits with exposed current carrying parts:                              |                 | N/A     |
|                    | Ordinary luminaire:                                                             |                 | N/A     |
|                    | - touch current .....                                                           |                 | N/A     |
|                    | - no-load voltage .....                                                         |                 | N/A     |
|                    | Other than ordinary luminaire:                                                  |                 | N/A     |
|                    | - nominal voltage .....                                                         |                 | N/A     |
| 21.12<br>(8.2.4)   | Portable luminaire have protection independent of supporting surface            |                 | P       |
| 21.12<br>(8.2.5)   | Compliance with the standard test finger or relevant probe                      |                 | P       |
| 21.12<br>(8.2.6)   | Covers reliably secured                                                         |                 | P       |
| 21.12<br>(8.2.7)   | Discharging of capacitors $\geq 0,5 \mu\text{F}$                                |                 | N/A     |
|                    | Portable plug connected luminaire with capacitor                                |                 | N/A     |
|                    | Other plug connected luminaire with capacitor                                   |                 | N/A     |
|                    | Discharge device on or within capacitor                                         |                 | N/A     |
|                    | Discharge device mounted separately                                             |                 | N/A     |

| EN 60598-2-21     |                                                                                                     |                  |          |
|-------------------|-----------------------------------------------------------------------------------------------------|------------------|----------|
| Clause            | Requirement + Test                                                                                  | Result - Remark  | Verdict  |
| <b>21.13 (12)</b> | <b>ENDURANCE TEST AND THERMAL TEST</b>                                                              |                  | <b>P</b> |
| 21.13 (-)         | If IP > IP 20 relevant test of (12.4), (12.5) and (12.6) after (9.2) before (9.3) specified in 4.13 |                  | —        |
| 21.13 (12.3)      | Endurance test:                                                                                     |                  | N/A      |
|                   | - mounting-position..... :                                                                          | Detached mounted | —        |
|                   | - test temperature (°C) ..... :                                                                     | 35°C             | —        |
|                   | - total duration (h) ..... :                                                                        | 168h             | —        |
|                   | - supply voltage: Un factor; calculated voltage (V) .. :                                            |                  | —        |
|                   | - lamp used ..... :                                                                                 | LED lamp         | —        |
| 21.13 (12.3.2)    | After endurance test:                                                                               |                  | P        |
|                   | - no part unserviceable                                                                             |                  | P        |
|                   | - luminaire not unsafe                                                                              |                  | P        |
|                   | - no damage to track system                                                                         |                  | N/A      |
|                   | - marking legible                                                                                   |                  | P        |
|                   | - no cracks, deformation etc.                                                                       |                  | P        |
| 21.13 (12.4)      | Thermal test (normal operation)                                                                     | (see Annex 2)    | P        |
| 21.13 (12.5)      | Thermal test (abnormal operation)                                                                   | (see Annex 2)    | N/A      |
| 21.13 (12.6)      | Thermal test (failed lamp control gear condition):                                                  |                  | N/A      |
| 21.13 (12.6.1)    | Through wiring or looping-in wiring loaded by a current of (A) ..... :                              |                  | —        |
|                   | - case of abnormal conditions ..... :                                                               |                  | —        |
|                   | - electronic lamp control gear                                                                      |                  | N/A      |
|                   | - measured winding temperature (°C): at 1,1 Un .... :                                               |                  | —        |
|                   | - measured mounting surface temperature (°C) at 1,1 Un..... :                                       |                  | N/A      |
|                   | - calculated mounting surface temperature (°C) ..... :                                              |                  | N/A      |
|                   | - track-mounted luminaires                                                                          |                  | N/A      |
| 21.13 (12.6.2)    | Temperature sensing control                                                                         |                  | N/A      |
|                   | - case of abnormal conditions ..... :                                                               |                  | —        |
|                   | - thermal link                                                                                      |                  | N/A      |
|                   | - manual reset cut-out                                                                              |                  | N/A      |



| EN 60598-2-21       |                                                                            |                          |         |
|---------------------|----------------------------------------------------------------------------|--------------------------|---------|
| Clause              | Requirement + Test                                                         | Result - Remark          | Verdict |
|                     | - auto reset cut-out                                                       |                          | N/A     |
|                     | - measured mounting surface temperature (°C) .....                         |                          | N/A     |
|                     | - track-mounted luminaires                                                 |                          | N/A     |
| 21.13<br>(12.7)     | Thermal test (failed lamp control gear in plastic luminaires):             |                          | N/A     |
| 21.13<br>(12.7.1)   | Luminaire without temperature sensing control                              |                          | N/A     |
| 21.13<br>(12.7.1.1) | Luminaire with fluorescent lamp ≤ 70W                                      |                          | N/A     |
|                     | Test method 12.7.1.1 or Annex W .....                                      |                          | —       |
|                     | Test according to 12.7.1.1:                                                |                          | N/A     |
|                     | - case of abnormal conditions .....                                        |                          | —       |
|                     | - Ballast failure at supply voltage (V) .....                              |                          | —       |
|                     | - Components retained in place after the test                              |                          | N/A     |
|                     | - Test with standard test finger after the test                            |                          | N/A     |
|                     | Test according to Annex W:                                                 |                          | N/A     |
|                     | - case of abnormal conditions .....                                        |                          | —       |
|                     | - measured winding temperature (°C): at 1,1 Un .....                       |                          | —       |
|                     | - measured temperature of fixing point/exposed part (°C): at 1,1 Un .....  |                          | —       |
|                     | - calculated temperature of fixing point/exposed part (°C) .....           |                          | —       |
|                     | Ball-pressure test .....                                                   | See Table 21.16 (13.2.1) | N/A     |
| 21.13<br>(12.7.1.2) | Luminaire with discharge lamp, fluorescent lamp > 70W, transformer > 10 VA |                          | N/A     |
|                     | - case of abnormal conditions .....                                        |                          | —       |
|                     | - measured winding temperature (°C): at 1,1 Un .....                       |                          | —       |
|                     | - measured temperature of fixing point/exposed part (°C): at 1,1 Un .....  |                          | —       |
|                     | - calculated temperature of fixing point/exposed part (°C) .....           |                          | —       |
|                     | Ball-pressure test .....                                                   | See Table 21.16 (13.2.1) | N/A     |
| 21.13<br>(12.7.1.3) | Luminaire with short circuit proof transformers ≤ 10 VA                    |                          | N/A     |
|                     | - case of abnormal conditions .....                                        |                          | —       |
|                     | - Components retained in place after the test                              |                          | N/A     |
|                     | - Test with standard test finger after the test                            |                          | N/A     |

| EN 60598-2-21      |                                                                                                                                                         |                          |          |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------|
| Clause             | Requirement + Test                                                                                                                                      | Result - Remark          | Verdict  |
| 21.13<br>(12.7.2)  | Luminaire with temperature sensing control                                                                                                              |                          | N/A      |
|                    | - thermal link..... : Yes <input type="checkbox"/> No <input type="checkbox"/>                                                                          |                          | —        |
|                    | - manual reset cut-out ..... : Yes <input type="checkbox"/> No <input type="checkbox"/>                                                                 |                          | —        |
|                    | - auto reset cut-out..... : Yes <input type="checkbox"/> No <input type="checkbox"/>                                                                    |                          | —        |
|                    | - case of abnormal conditions ..... :                                                                                                                   |                          | —        |
|                    | - highest measured temperature of fixing point/<br>exposed part (°C): ..... :                                                                           |                          | —        |
|                    | Ball-pressure test: ..... :                                                                                                                             | See Table 21.16 (13.2.1) | N/A      |
| <b>21.13.2 (-)</b> | <b>Test voltage</b>                                                                                                                                     |                          |          |
|                    | Provision of 12.3.1 d) of part 1 and if class III rope<br>lights 1,1 x rated voltage of transformer/convertor                                           |                          | —        |
|                    | Provision of 12.4.1 d) of part 1 and if class III rope<br>lights 1,06 x rated voltage of transformer/convertor                                          |                          | —        |
| <b>21.13.3 (-)</b> | <b>Short-circuit test of rectifier</b>                                                                                                                  |                          | <b>P</b> |
|                    | No emission of flames or molten material or<br>production of flammable gases and no live parts<br>accessible when short-circuit output of the rectifier |                          | P        |

|                  |                                                                                                   |  |          |
|------------------|---------------------------------------------------------------------------------------------------|--|----------|
| <b>21.14 (9)</b> | <b>RESISTANCE TO DUST, SOLID OBJECTS AND MOISTURE</b>                                             |  | <b>P</b> |
| 21.14(-)         | If IP > IP 20 the order of tests as specified in clause 1.12                                      |  | N/A      |
| 21.14 (9.2)      | Tests for ingress of dust, solid objects and moisture:                                            |  | —        |
|                  | - classification according to IP..... : IPX0                                                      |  | —        |
|                  | - mounting position during test..... : As normal use                                              |  | —        |
|                  | - fixing screws tightened; torque (Nm) ..... :                                                    |  | —        |
|                  | - tests according to clauses..... : Clause 9.2                                                    |  | —        |
|                  | - electric strength test afterwards                                                               |  | N/A      |
|                  | a) no deposit in dust-proof luminaire                                                             |  | N/A      |
|                  | b) no talcum in dust-tight luminaire                                                              |  | N/A      |
|                  | c) no trace of water on current-carrying parts or on<br>insulation where it could become a hazard |  | N/A      |
|                  | d) i) For luminaires without drain holes – no water<br>entry                                      |  | N/A      |
|                  | d) ii) For luminaires with drain holes – no hazardous<br>water entry                              |  | N/A      |
|                  | e) no water in watertight luminaire                                                               |  | N/A      |
|                  | f) no contact with live parts (IP 2X)                                                             |  | N/A      |

| EN 60598-2-21 |                                                                                |                 |         |
|---------------|--------------------------------------------------------------------------------|-----------------|---------|
| Clause        | Requirement + Test                                                             | Result - Remark | Verdict |
|               | f) no entry into enclosure (IP 3X and IP 4X)                                   |                 | N/A     |
|               | f) no contact with live parts (IP3X and IP4X)                                  |                 | N/A     |
|               | g) no trace of water on part of lamp requiring protection from splashing water |                 | N/A     |
|               | h) no damage of protective shield or glass envelope                            |                 | N/A     |
| 21.14 (9.3)   | Humidity test 48 h                                                             |                 | P       |

|                   |                                                                                                                                   |        |          |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------|----------|
| <b>21.15 (10)</b> | <b>INSULATION RESISTANCE AND ELECTRIC STRENGTH</b>                                                                                |        | <b>P</b> |
| 21.15(10.2.1)     | Insulation resistance test                                                                                                        |        | P        |
|                   | Cable or cord covered by metal foil or replaced by a metal rod of mm Ø .....                                                      |        | —        |
|                   | Insulation resistance (MΩ) .....                                                                                                  |        | —        |
|                   | SELV                                                                                                                              |        | N/A      |
|                   | - between current-carrying parts of different polarity :                                                                          |        | N/A      |
|                   | - between current-carrying parts and mounting surface..... :                                                                      |        | N/A      |
|                   | - between current-carrying parts and metal parts of the luminaire..... :                                                          |        | N/A      |
|                   | - between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts..... : |        | N/A      |
|                   | - Insulation bushings as described in Section 5 .....                                                                             |        | N/A      |
|                   | Other than SELV                                                                                                                   |        | P        |
|                   | - between live parts of different polarity .....                                                                                  | >100MΩ | P        |
|                   | - between live parts and mounting surface .....                                                                                   | >100MΩ | P        |
|                   | - between live parts and metal parts .....                                                                                        | >100MΩ | P        |
|                   | - between live parts of different polarity through action of a switch..... :                                                      |        | N/A      |
|                   | - between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts..... : |        | N/A      |
|                   | - Insulation bushings as described in Section 5 .....                                                                             |        | N/A      |
| 21.15 (10.2.2)    | Electric strength test                                                                                                            |        | P        |
|                   | Dummy lamp                                                                                                                        |        | N/A      |
|                   | Luminaires with ignitors after 24 h test                                                                                          |        | N/A      |

| EN 60598-2-21 |                                                                                                                                   |                 |         |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause        | Requirement + Test                                                                                                                | Result - Remark | Verdict |
|               | Luminaires with manual ignitors                                                                                                   |                 | N/A     |
|               | Test voltage (V) .....                                                                                                            |                 | N/A     |
|               | SELV                                                                                                                              |                 | N/A     |
|               | - between current-carrying parts of different polarity :                                                                          |                 | N/A     |
|               | - between current-carrying parts and mounting surface..... :                                                                      |                 | N/A     |
|               | - between current-carrying parts and metal parts of the luminaire..... :                                                          |                 | N/A     |
|               | - between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts..... : |                 | N/A     |
|               | - Insulation bushings as described in Section 5 .....                                                                             |                 | N/A     |
|               | Other than SELV                                                                                                                   |                 | P       |
|               | - between live parts of different polarity .....                                                                                  | 500V            | P       |
|               | - between live parts and mounting surface .....                                                                                   | 500V            | P       |
|               | - between live parts and metal parts .....                                                                                        |                 | N/A     |
|               | - between live parts of different polarity through action of a switch..... :                                                      |                 | N/A     |
|               | - between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts..... : |                 | N/A     |
|               | - Insulation bushings as described in Section 5 .....                                                                             |                 | N/A     |
| 21.15 (10.3)  | Touch current or protective conductor current (mA) :                                                                              | 0.03mA          | P       |

|                   |                                                                |                               |     |
|-------------------|----------------------------------------------------------------|-------------------------------|-----|
| <b>21.16 (13)</b> | <b>RESISTANCE TO HEAT, FIRE AND TRACKING</b>                   |                               | P   |
| 21.16(13.2.1)     | Ball-pressure test .....                                       | See Test Table 21.16 (13.2.1) | P   |
| 21.16 (13.3.1)    | Needle-flame test (10 s)..... :                                | See Test Table 21.16 (13.3.1) | P   |
| 21.16 (13.3.2)    | Glow-wire test (650°C) .....                                   | See Test Table 21.16 (13.3.2) | P   |
| 21.16 (13.4)      | Proof tracking test (IEC 60112)..... :                         | See Test Table 21.16 (13.4)   | N/A |
| 20.16 (-)         | Flexible pipes of rope lights in compliance with IEC 60811-508 |                               | P   |

| EN 60598-2-21                               |                                                                |     |     |                 |     |     |         |
|---------------------------------------------|----------------------------------------------------------------|-----|-----|-----------------|-----|-----|---------|
| Clause                                      | Requirement + Test                                             |     |     | Result - Remark |     |     | Verdict |
| 21.18 (11.2)                                | TABLES: Creepage distances and clearances                      |     |     |                 |     |     | N/A     |
| Table 11.1                                  | Minimum distances (mm) for a.c. (50/60 Hz) sinusoidal voltages |     |     |                 |     |     |         |
| RMS working voltage (V) not exceeding       |                                                                | 50  | 150 | 250             | 500 | 750 | 1000    |
| Creepage distances                          |                                                                |     |     |                 |     |     |         |
| Required basic insulation, PTI ≥ 600        |                                                                | 0,6 | 0,8 | 1,5             | 3   | 4   | 5,5     |
| Measured                                    |                                                                | -   | -   | -               | -   | -   | -       |
| Required basic insulation, PTI < 600        |                                                                | 1,2 | 1,6 | 2,5             | 5   | 8   | 10      |
| Measured                                    |                                                                | -   | -   |                 | -   | -   | -       |
| Required supplementary insulation PTI ≥ 600 |                                                                | -   | 0,8 | 1,5             | 3   | 4   | 5,5     |
| Measured                                    |                                                                | -   | -   | -               | -   | -   | -       |
| Required supplementary insulation PTI < 600 |                                                                | -   | 1,6 | 2.7             | 5   | 8   | 10      |
| Measured                                    |                                                                | -   | -   | -               | -   | -   | -       |
| Required reinforced insulation              |                                                                | -   | 3,2 | 5               | 6   | 8   | 11      |
| Measured                                    |                                                                | -   | -   |                 | -   | -   | -       |
| Clearances                                  |                                                                |     |     |                 |     |     |         |
| Required basic insulation                   |                                                                | 0,2 | 0,8 | 1,5             | 3   | 4   | 5,5     |
| Measured                                    |                                                                | -   | -   |                 | -   | -   | -       |
| Required supplementary insulation           |                                                                | -   | 0,8 | 1,5             | 3   | 4   | 5,5     |
| Measured                                    |                                                                | -   | -   | -               | -   | -   | -       |
| Required reinforced insulation              |                                                                | -   | 1,6 | 3               | 6   | 8   | 11      |
| Measured                                    |                                                                | -   | -   |                 | -   | -   | -       |
| Table 11.2                                  | Minimum distances (mm) for non-sinusoidal pulse voltages       |     |     |                 |     |     | N/A     |
| Rated pulse voltage (peak kV)               |                                                                | 2,0 | 2,5 | 3,0             | 4,0 | 5,0 | 6,0     |
| Required clearances                         |                                                                | 1,0 | 1,5 | 2               | 3   | 4   | 5,5     |
| Measured                                    |                                                                | -   | -   | -               | -   | -   | -       |
| Rated pulse voltage (peak kV)               |                                                                | 10  | 12  | 15              | 20  | 25  | 30      |
| Required clearances                         |                                                                | 11  | 14  | 18              | 25  | 33  | 40      |
| Measured                                    |                                                                | -   | -   | -               | -   | -   | -       |
| Rated pulse voltage (peak kV)               |                                                                | 50  | 60  | 80              | 100 | -   | -       |
| Required clearances                         |                                                                | 75  | 90  | 130             | 170 | -   | -       |
| Measured                                    |                                                                | -   | -   | -               | -   | -   | -       |

| EN 60598-2-21 |                    |                 |         |
|---------------|--------------------|-----------------|---------|
| Clause        | Requirement + Test | Result - Remark | Verdict |

|                                          |                                             |                       |                          |   |
|------------------------------------------|---------------------------------------------|-----------------------|--------------------------|---|
| 21.16<br>(13.2.1)                        | TABLE: Ball Pressure Test of Thermoplastics |                       |                          | P |
| Allowed impression diameter (mm) ..... : |                                             | 2.0 mm                |                          | — |
| Object/ Part No./ Material               | Manufacturer/<br>trademark                  | Test temperature (°C) | Impression diameter (mm) |   |
| Plastic enclosure of rectifier           | TORAY                                       | 125                   | 1.0mm                    |   |
| Insulating sleeve                        | MICRO                                       | 125                   | 1.4mm                    |   |
| Supplementary information:--             |                                             |                       |                          |   |

|                                   |                                                  |                                                       |                                          |                                    |          |
|-----------------------------------|--------------------------------------------------|-------------------------------------------------------|------------------------------------------|------------------------------------|----------|
| 21.16<br>(13.3.1)                 | <b>TABLE: Needle-flame test (IEC 60695-11-5)</b> |                                                       |                                          |                                    | <b>P</b> |
| Object/ Part No./<br>Material     | Manufacturer/<br>trademark                       | Duration of<br>application of test<br>flame (ta); (s) | Ignition of<br>specified layer<br>Yes/No | Duration of<br>burning (tb)<br>(s) | Verdict  |
| Plastic enclosure of<br>rectifier | TORAY                                            | 30                                                    | No                                       | 0                                  | P        |
| Insulating sleeve                 | MICRO                                            | 30                                                    | No                                       | 0                                  | P        |
| Supplementary information:        |                                                  |                                                       |                                          |                                    |          |

|                                                                                                                                                                             |                                               |                                                       |                                          |                                    |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------|------------------------------------------|------------------------------------|----------|
| 21.16<br>(13.3.2)                                                                                                                                                           | <b>TABLE: Glow-wire test (IEC 60695-2-11)</b> |                                                       |                                          |                                    | <b>P</b> |
| <b>Glow wire temperature .....</b>                                                                                                                                          |                                               | 650°C                                                 | —                                        |                                    |          |
| Object/ Part No./<br>Material                                                                                                                                               | Manufacturer/<br>trademark                    | Duration of<br>application of test<br>flame (ta); (s) | Ignition of<br>specified layer<br>Yes/No | Duration of<br>burning (tb)<br>(s) | Verdict  |
| Plastic enclosure of<br>rectifier                                                                                                                                           | TORAY                                         | 30                                                    | No                                       | 0                                  | P        |
| Insulating sleeve                                                                                                                                                           | MICRO                                         | 30                                                    | No                                       | 0                                  | P        |
| Any flame or glowing of the sample extinguished within 30 s of withdrawing the glow-wire, and any burning or molten drop did not ignite the underlying parts (Yes/No) ..... |                                               |                                                       |                                          |                                    | Yes      |
| Supplementary information:--                                                                                                                                                |                                               |                                                       |                                          |                                    |          |

|                               |                                               |                                                                          |    |    |            |
|-------------------------------|-----------------------------------------------|--------------------------------------------------------------------------|----|----|------------|
| 21.16<br>(13.4)               | <b>TABLE: Proof tracking test (IEC 60112)</b> |                                                                          |    |    | <b>N/A</b> |
| <b>Test voltage PTI .....</b> |                                               | 175 V                                                                    | —  |    |            |
| Object/ Part No./ Material    | Manufacturer/<br>trademark                    | Withstand 50 drops without failure on three places or on three specimens |    |    | Verdict    |
| --                            | --                                            | --                                                                       | -- | -- | --         |

| EN 60598-2-21 |                    |                 |         |
|---------------|--------------------|-----------------|---------|
| Clause        | Requirement + Test | Result - Remark | Verdict |

Supplementary information:--

|                |                                                                                                                                                                                                                           |  |            |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------|
| <b>ANNEX A</b> | <b>Requirements for interconnecting connectors for use in rope lights</b>                                                                                                                                                 |  | <b>P</b>   |
|                | <b>This Annex A consist relevant requirements and modifications of IEC 61984</b>                                                                                                                                          |  | <b>P</b>   |
| <b>5.2</b>     | <b>Classification according to protection against electric shock</b>                                                                                                                                                      |  | <b>P</b>   |
|                | Only enclosed connectors                                                                                                                                                                                                  |  | P          |
| <b>5.3</b>     | <b>Classification according to the style of connector</b>                                                                                                                                                                 |  | <b>P</b>   |
|                | Only free connectors                                                                                                                                                                                                      |  | P          |
| <b>5.4</b>     | <b>Classification according to additional characteristics of connectors</b>                                                                                                                                               |  | <b>P</b>   |
|                | According b), d), e), f), h), and j)                                                                                                                                                                                      |  | -          |
| <b>6.2.1</b>   | <b>Identification</b>                                                                                                                                                                                                     |  | <b>P</b>   |
|                | According a) and b)                                                                                                                                                                                                       |  | -          |
| <b>6.4.1</b>   | <b>Non accessibility of live parts</b>                                                                                                                                                                                    |  | <b>P</b>   |
|                | Test with test finger on class II rope lights                                                                                                                                                                             |  | P          |
| <b>6.9.1</b>   | <b>Polarisation</b>                                                                                                                                                                                                       |  | <b>P</b>   |
|                | Improper connection of mating parts is prevented                                                                                                                                                                          |  | P          |
|                | No unsafe compatibility between connectors for class II and class III rope lights of the same manufacturer                                                                                                                |  | P          |
|                | Male part of class III rope lights not make contact in the female contact of low voltage connectors (e.g. IEC 60320)                                                                                                      |  | N/A        |
|                | Manufacturer designed connectors, no unsafe compatibility with systems according IEC 60320 and IEC 60906 and national domestic plug and socket-outlet systems in the country where the rope light is placed on the market |  | P          |
| <b>6.9.3</b>   | <b>Connection of conductors</b>                                                                                                                                                                                           |  | <b>P</b>   |
|                | Cross sectional area of the contact making part of the interconnecting coupler not less than the corresponding conductor in the interconnected cable                                                                      |  | P          |
| <b>6.10</b>    | <b>Design of a CBC</b>                                                                                                                                                                                                    |  | <b>N/A</b> |
|                | Adequate breaking capacity                                                                                                                                                                                                |  | N/A        |
|                | Female part at the end of the rope light, other than ordinary, provided with sealing device securely fixed to the coupler                                                                                                 |  | N/A        |
| <b>6.13</b>    | <b>Dielectric strength</b>                                                                                                                                                                                                |  | <b>N/A</b> |
|                | Test according clause 21.15 of this standard                                                                                                                                                                              |  | N/A        |
| <b>6.14.2</b>  | <b>Electrical endurance (CBC)</b>                                                                                                                                                                                         |  | <b>N/A</b> |
|                | Meet the specified breaking capacity                                                                                                                                                                                      |  | N/A        |

| EN 60598-2-21 |                                                |                 |         |
|---------------|------------------------------------------------|-----------------|---------|
| Clause        | Requirement + Test                             | Result - Remark | Verdict |
|               | Number of cycles 50                            |                 | —       |
|               | Test according 7.3.5                           |                 | N/A     |
| <b>6.14.3</b> | <b>Bendings (non-rewirable connectors)</b>     |                 | N/A     |
|               | Meet the specified number of bendings          |                 | N/A     |
|               | Number of cycles 1000                          |                 | —       |
|               | Test according 7.3.10                          |                 | N/A     |
| <b>6.17</b>   | <b>Cable clamp</b>                             |                 | P       |
|               | Test according clause 21.11.3 of this standard |                 | P       |

| ANNEX 1 TABLE: Critical components information                                                                                                                                                                                                                                                                                                                                                                                            |      |                           |                 |                       |                      |                                     | P |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------|-----------------|-----------------------|----------------------|-------------------------------------|---|
| Object / part No.                                                                                                                                                                                                                                                                                                                                                                                                                         | Code | Manufacturer/ trademark   | Type / model    | Technical data        | Standard             | Mark(s) of conformity <sup>1)</sup> |   |
| Power supply                                                                                                                                                                                                                                                                                                                                                                                                                              | A    | Yip Chun Products Factory | IEC 52          | 2x0.75mm <sup>2</sup> | IEC 60227            | VDE 40004170                        |   |
| Plastic enclosure of rectifier                                                                                                                                                                                                                                                                                                                                                                                                            | A    | TORAY INDUSTRIES INC      | 824V            | 125°C, V-0            | UL 94<br>UL 746      | UL E41797                           |   |
| Insulating sleeve                                                                                                                                                                                                                                                                                                                                                                                                                         | A    | MICRO PLASTICS INC        | NM22OCB037 5    | 125°C, V-0            | UL 94<br>UL 746      | UL E96397                           |   |
| LED mouldle                                                                                                                                                                                                                                                                                                                                                                                                                               | A    | SHARP                     | WW-GW6NMNJNS 0D | 400MA 18V             | EN 62031<br>EN 62471 | Tested with appliance               |   |
| Supplementary information:<br><sup>1)</sup> Provided evidence ensures the agreed level of compliance. See OD-CB2039.<br>The codes above have the following meaning:<br>A - The component is replaceable with another one, also certified, with equivalent characteristics<br>B - The component is replaceable if authorised by the test house<br>C - Integrated component tested together with the appliance<br>D - Alternative component |      |                           |                 |                       |                      |                                     |   |

| ANNEX 2 TABLE: Temperature measurements, thermal tests of Section 12 |                                                        |                       | P |
|----------------------------------------------------------------------|--------------------------------------------------------|-----------------------|---|
|                                                                      | Type reference .....                                   | SC-SF-DID-RGB2812-60A | — |
|                                                                      | Lamp used.....                                         | LED lamp              | — |
|                                                                      | Lamp control gear used.....                            |                       | — |
|                                                                      | Mounting position of luminaire .....                   | As in normal use      | — |
|                                                                      | Supply wattage (W) .....                               | 86.4W                 | — |
|                                                                      | Supply current (A) .....                               | 3.6A                  | — |
|                                                                      | Calculated power factor.....                           |                       | — |
|                                                                      | Table: measured temperatures corrected for ta = 25 °C: |                       | P |



| EN 60598-2-21                  |                                                                                             |                      |        |        |                 |                        |         |
|--------------------------------|---------------------------------------------------------------------------------------------|----------------------|--------|--------|-----------------|------------------------|---------|
| Clause                         | Requirement + Test                                                                          |                      |        |        | Result - Remark |                        | Verdict |
|                                | - abnormal operating mode ..... :                                                           |                      |        |        |                 |                        | —       |
|                                | - test 1: rated voltage..... :                                                              |                      |        |        | N/A             |                        | —       |
|                                | - test 2: 1,06 times rated voltage or 1,05 times rated wattage ..... :                      |                      |        |        | --              |                        | —       |
|                                | - test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage ..... : |                      |        |        | N/A             |                        | —       |
|                                | - test 4: 1,1 times rated voltage or 1,05 times rated wattage ..... :                       |                      |        |        | N/A             |                        | —       |
|                                | Through wiring or looping-in wiring loaded by a current of A during the test ..... :        |                      |        |        | N/A             |                        | —       |
| Temperature measurements, (°C) |                                                                                             |                      |        |        |                 |                        |         |
| Part                           | Ambient                                                                                     | Clause 12.4 – normal |        |        |                 | Clause 12.5 – abnormal |         |
|                                |                                                                                             | test 1               | test 2 | test 3 | limit           | test 4                 | limit   |
| Insulating sleeve              | 21.6                                                                                        | -                    | 26.4   | -      | 90              | -                      | -       |
| Plastic enclosure of rectifier | 21.6                                                                                        | -                    | 56.7   | -      | 125             | -                      | -       |
| Mounted surface                | 21.6                                                                                        | -                    | 42.6   | -      | 90              | -                      | -       |
| Surface of Rope light          | 21.6                                                                                        | -                    | 64.7   | -      | 90              | -                      | -       |
| Power supply                   | 21.6                                                                                        |                      | 30.5   | -      | 90              |                        |         |
| Supplementary information:--   |                                                                                             |                      |        |        |                 |                        |         |

| ANNEX 3    | Screw terminals (part of the luminaire) |  |  |  |  | N/A |
|------------|-----------------------------------------|--|--|--|--|-----|
| (14)       | SCREW TERMINALS                         |  |  |  |  | N/A |
| (14.2)     | Type of terminal.....                   |  |  |  |  | —   |
|            | Rated current (A) .....                 |  |  |  |  | —   |
| (14.3.2.1) | One or more conductors                  |  |  |  |  | N/A |
| (14.3.2.2) | Special preparation                     |  |  |  |  | N/A |
| (14.3.2.3) | Terminal size                           |  |  |  |  | N/A |
|            | Cross-sectional area (mm²).....         |  |  |  |  | —   |
| (14.3.3)   | Conductor space (mm).....               |  |  |  |  | N/A |
| (14.4)     | Mechanical tests                        |  |  |  |  | N/A |
| (14.4.1)   | Minimum distance                        |  |  |  |  | N/A |
| (14.4.2)   | Cannot slip out                         |  |  |  |  | N/A |
| (14.4.3)   | Special preparation                     |  |  |  |  | N/A |

| EN 60598-2-21 |                                                        |                 |         |
|---------------|--------------------------------------------------------|-----------------|---------|
| Clause        | Requirement + Test                                     | Result - Remark | Verdict |
| (14.4.4)      | Nominal diameter of thread (metric ISO thread) ..... : | M               | N/A     |
|               | External wiring                                        |                 | N/A     |
|               | No soft metal                                          |                 | N/A     |
| (14.4.5)      | Corrosion                                              |                 | N/A     |
| (14.4.6)      | Nominal diameter of thread (mm) ..... :                |                 | N/A     |
|               | Torque (Nm) ..... :                                    |                 | N/A     |
| (14.4.7)      | Between metal surfaces                                 |                 | N/A     |
|               | Lug terminal                                           |                 | N/A     |
|               | Mantle terminal                                        |                 | N/A     |
|               | Pull test; pull (N) ..... :                            |                 | N/A     |
| (14.4.8)      | Without undue damage                                   |                 | N/A     |

|                |                                                          |  |     |
|----------------|----------------------------------------------------------|--|-----|
| <b>ANNEX 4</b> | <b>Screwless terminals (part of the luminaire)</b>       |  | N/A |
| <b>(15)</b>    | <b>SCREWLESS TERMINALS</b>                               |  | N/A |
| (15.2)         | Type of terminal..... :                                  |  | —   |
|                | Rated current (A)..... :                                 |  | —   |
| (15.3.1)       | Material                                                 |  | N/A |
| (15.3.2)       | Clamping                                                 |  | N/A |
| (15.3.3)       | Stop                                                     |  | N/A |
| (15.3.4)       | Unprepared conductors                                    |  | N/A |
| (15.3.5)       | Pressure on insulating material                          |  | N/A |
| (15.3.6)       | Clear connection method                                  |  | N/A |
| (15.3.7)       | Clamping independently                                   |  | N/A |
| (15.3.8)       | Fixed in position                                        |  | N/A |
| (15.3.10)      | Conductor size                                           |  | N/A |
|                | Type of conductor                                        |  | N/A |
| (15.5.1)       | Terminals internal wiring                                |  | N/A |
| (15.5.1.1)     | Pull test spring-type terminals (4 N, 4 samples) ..... : |  | N/A |
| (15.5.1.2)     | Pull test pin or tab terminals (4 N, 4 samples) ..... :  |  | N/A |
|                | Insertion force not exceeding 50 N                       |  | N/A |
| (15.5.1.2)     | Permanent connections: pull-off test (20 N)              |  | N/A |
| (15.5.2)       | Electrical tests                                         |  | N/A |
|                | Voltage drop (mV) after 1 h (4 samples) ..... :          |  | N/A |
|                | Voltage drop of two inseparable joints                   |  | N/A |

| EN 60598-2-21 |                                                                                     |                 |         |
|---------------|-------------------------------------------------------------------------------------|-----------------|---------|
| Clause        | Requirement + Test                                                                  | Result - Remark | Verdict |
|               | Number of cycles:                                                                   |                 | —       |
|               | Voltage drop (mV) after 10th alt. 25th cycle (4 samples)..... :                     |                 | N/A     |
|               | Voltage drop (mV) after 50th alt. 100th cycle (4 samples)..... :                    |                 | N/A     |
|               | After ageing, voltage drop (mV) after 10th alt. 25th cycle (4 samples) ..... :      |                 | N/A     |
|               | After ageing, voltage drop (mV) after 50th alt. 100th cycle (4 samples) ..... :     |                 | N/A     |
| (15.6)        | Terminals external wiring                                                           |                 | N/A     |
|               | Terminal size and rating                                                            |                 | N/A     |
| (15.6.2.1)    | Pull test spring-type terminals or welded connections (4 samples); pull (N) ..... : |                 | N/A     |
|               | Pull test pin or tab terminals (4 samples); pull (N) ..... :                        |                 | N/A     |

|                   |                                                            |   |   |   |   |   |   |   |   |    |     |
|-------------------|------------------------------------------------------------|---|---|---|---|---|---|---|---|----|-----|
| (15.6.3.1)        | TABLE: Contact resistance test                             |   |   |   |   |   |   |   |   |    | N/A |
|                   | Voltage drop (mV) after 1 h                                |   |   |   |   |   |   |   |   |    | —   |
| terminal          | 1                                                          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |     |
| voltage drop (mV) |                                                            |   |   |   |   |   |   |   |   |    |     |
|                   | Voltage drop of two inseparable joints                     |   |   |   |   |   |   |   |   |    |     |
|                   | Voltage drop after 10th alt. 25th cycle                    |   |   |   |   |   |   |   |   |    |     |
|                   | Max. allowed voltage drop (mV) ..... :                     |   |   |   |   |   |   |   |   |    | —   |
| terminal          | 1                                                          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |     |
| voltage drop (mV) |                                                            |   |   |   |   |   |   |   |   |    |     |
|                   | Voltage drop after 50th alt. 100th cycle                   |   |   |   |   |   |   |   |   |    |     |
|                   | Max. allowed voltage drop (mV) ..... :                     |   |   |   |   |   |   |   |   |    | —   |
| terminal          | 1                                                          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |     |
| voltage drop (mV) |                                                            |   |   |   |   |   |   |   |   |    |     |
|                   | Continued ageing: voltage drop after 10th alt. 25th cycle  |   |   |   |   |   |   |   |   |    |     |
|                   | Max. allowed voltage drop (mV) ..... :                     |   |   |   |   |   |   |   |   |    | —   |
| terminal          | 1                                                          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |     |
| voltage drop (mV) |                                                            |   |   |   |   |   |   |   |   |    |     |
|                   | Continued ageing: voltage drop after 50th alt. 100th cycle |   |   |   |   |   |   |   |   |    |     |
|                   | Max. allowed voltage drop (mV) ..... :                     |   |   |   |   |   |   |   |   |    | —   |
| terminal          | 1                                                          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |     |
| voltage drop (mV) |                                                            |   |   |   |   |   |   |   |   |    |     |

| EN 60598-2-21              |                    |  |  |  |  |                 |  |  |  |         |
|----------------------------|--------------------|--|--|--|--|-----------------|--|--|--|---------|
| Clause                     | Requirement + Test |  |  |  |  | Result - Remark |  |  |  | Verdict |
|                            |                    |  |  |  |  |                 |  |  |  |         |
| Supplementary information: |                    |  |  |  |  |                 |  |  |  |         |

| ATTACHMENT |                    |                 |         |
|------------|--------------------|-----------------|---------|
| Clause     | Requirement + Test | Result - Remark | Verdict |

|                                                                                                                                                                                                                               |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| <p align="center"><b>ATTACHMENT TO TEST REPORT</b><br/> <b>EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES</b><br/> <b>LUMINAIRES</b><br/> <b>PART 2: PARTICULAR REQUIREMENTS</b><br/> <b>SECTION 21: ROPE LIGHTS</b></p> |  |  |  |
| <b>Differences according to</b> .....: EN 60598-2-21:2015 used in conjunction with<br>EN 60598-1:2015                                                                                                                         |  |  |  |
| <b>Annex Form No.</b> .....: EU_GD_IEC60598_2_21A<br><b>Annex Form Originator</b> .....: OVE<br><b>Master Annex Form</b> .....: 2016-01                                                                                       |  |  |  |
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|  |                                          |  |
|--|------------------------------------------|--|
|  | <b>CENELEC COMMON MODIFICATIONS (EN)</b> |  |
|--|------------------------------------------|--|

|                   |                                                                                     |  |          |
|-------------------|-------------------------------------------------------------------------------------|--|----------|
| <b>21.6 (3)</b>   | <b>MARKING</b>                                                                      |  | <b>P</b> |
| 21.6<br>(3.3.101) | For luminaires not supplied with terminal block:<br>Adequate warning on the package |  | P        |

|                 |                                    |  |            |
|-----------------|------------------------------------|--|------------|
| <b>21.7 (4)</b> | <b>CONSTRUCTION</b>                |  | <b>N/A</b> |
| 21.7 (4.11.6)   | Electro-mechanical contact systems |  | N/A        |

|                  |                                                                          |  |            |
|------------------|--------------------------------------------------------------------------|--|------------|
| <b>21.11 (5)</b> | <b>EXTERNAL AND INTERNAL WIRING</b>                                      |  | <b>N/A</b> |
| 21.11 (5.2.1)    | Connecting leads                                                         |  | N/A        |
|                  | - without a means for connection to the supply                           |  | N/A        |
|                  | - terminal block specified                                               |  | N/A        |
|                  | - relevant information provided                                          |  | N/A        |
|                  | - compliance with 4.6, 4.7.1, 4.7.2, 4.10.1, 11.2, 12 and 13.2 of Part 1 |  | N/A        |
| 21.11 (5.2.2)    | Cables equal to EN 50525                                                 |  | N/A        |
|                  | Replace table 5.1 – Supply cord                                          |  | N/A        |

|                    |                                                                                                       |  |            |
|--------------------|-------------------------------------------------------------------------------------------------------|--|------------|
| <b>21.13 (12)</b>  | <b>ENDURANCE TESTS AND THERMAL TESTS</b>                                                              |  | <b>N/A</b> |
| 21.13<br>(12.4.2c) | Thermal test (normal operation)<br>see footnote c to table 12.2 relating to unsleeved<br>fixed wiring |  | N/A        |

| ATTACHMENT |                    |                 |         |
|------------|--------------------|-----------------|---------|
| Clause     | Requirement + Test | Result - Remark | Verdict |

|           |                                                         |  |            |
|-----------|---------------------------------------------------------|--|------------|
| <b>ZB</b> | <b>ANNEX ZB, SPECIAL NATIONAL CONDITIONS (EN)</b>       |  | <b>N/A</b> |
| (3.3)     | DK: power supply cords of class I luminaires with label |  | N/A        |
| (4.5.1)   | DK: socket-outlets                                      |  | N/A        |
| (5.2.1)   | CY, DK, FI, GB: type of plug                            |  | N/A        |

|           |                                                                                                                                                                                                                                                                                                                               |  |            |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------|
| <b>ZC</b> | <b>ANNEX ZC, NATIONAL DEVIATIONS (EN)</b>                                                                                                                                                                                                                                                                                     |  | <b>N/A</b> |
| (4 & 5)   | FR: Shuttered socket-outlets 10/16A                                                                                                                                                                                                                                                                                           |  | N/A        |
|           | FR: Safety requirements for high buildings<br><br>(Arrêté du 30 décembre 2011 portant règlement de sécurité pour la construction des immeubles de grande hauteur et leur protection contre les risques d'incendie et de panique; Section VIII; Article GH 48, Eclairage)<br><br>Glow-wire test for outer parts of luminaires: |  | N/A        |
|           | - 850°C for luminaires in stairways and horizontal travel paths                                                                                                                                                                                                                                                               |  | N/A        |
|           | - 650°C for indoor luminaires                                                                                                                                                                                                                                                                                                 |  | N/A        |
|           | GB: Requirements according to United Kingdom Building Regulation                                                                                                                                                                                                                                                              |  | N/A        |

| EN 62031 |                    |                 |         |
|----------|--------------------|-----------------|---------|
| Clause   | Requirement + Test | Result - Remark | Verdict |

|     |                                                                                     |  |   |
|-----|-------------------------------------------------------------------------------------|--|---|
| 4   | <b>GENERAL REQUIREMENTS</b>                                                         |  | — |
| 4.4 | Integral modules treated as part of luminaires defined in clause 0.5 of IEC 60598-1 |  | — |
| 4.5 | Independent modules complies with requirements in IEC 60598-1                       |  | — |

|     |                                                                 |               |   |
|-----|-----------------------------------------------------------------|---------------|---|
| 5   | <b>GENERAL TEST REQUIREMENTS</b>                                |               | — |
| 5.5 | SELV-operated LED modules comply with Annex I of IEC 61347-2-13 | (see Annex B) | — |

|   |                                                            |                                                                     |   |
|---|------------------------------------------------------------|---------------------------------------------------------------------|---|
| 6 | <b>CLASSIFICATION</b>                                      |                                                                     | — |
|   | Built-in module .....                                      | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | — |
|   | Independent module.....                                    | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | — |
|   | Integral module .....                                      | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | — |
|   | For Integral module; Note to 1.2.1 in IEC 60598-1 applies. |                                                                     | — |

|     |                                             |        |     |
|-----|---------------------------------------------|--------|-----|
| 7   | <b>MARKING</b>                              |        | —   |
| 7.1 | Mandatory markings:                         | module | N/A |
|     | - mark of origin                            |        | N/A |
|     | - model number, type reference .....        |        | N/A |
|     | - rated supply voltage (V) .....            |        | N/A |
|     | - rated supply current (A) .....            |        | N/A |
|     | - rated input power (V) .....               |        | N/A |
|     | - nominal power                             |        | N/A |
|     | - indication of connections, wiring diagram |        | N/A |
|     | - value of tc                               |        | N/A |
|     | - eye protection                            |        | N/A |
|     | - marking of built-in modules only          |        | N/A |
| 7.2 | - location of marking                       |        | N/A |
| 7.3 | Marking durable and legible                 |        | N/A |
|     | Rubbing 15 s water, marking legible         |        | N/A |

| EN 62031 |                                           |                 |         |
|----------|-------------------------------------------|-----------------|---------|
| Clause   | Requirement + Test                        | Result - Remark | Verdict |
| <b>8</b> | <b>SCREW TERMINALS</b>                    |                 | —       |
|          | Compliance with section 14 of IEC 60598-1 |                 | N/A     |
|          | <b>SCREWLESS TERMINALS</b>                |                 | N/A     |
|          | Compliance with section 15 of IEC 60598-1 |                 | N/A     |
|          | <b>CONNECTORS</b>                         |                 | N/A     |
|          | Compliance with IEC 60838-2-2             |                 | N/A     |

|          |                                                                                                                                                        |  |     |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----|
| <b>9</b> | <b>PROVISION FOR PROTECTIVE EARTHING</b>                                                                                                               |  | —   |
|          | External metal parts connected to the earth terminal:                                                                                                  |  | N/A |
|          | - compliance with 7.2.1 in IEC 60598-1                                                                                                                 |  | N/A |
|          | Test with a current of 10 A between earthing terminal and each of the accessible metal parts; measured resistance ( $\Omega$ ): < 0,5 $\Omega$ ..... : |  | N/A |
|          | Protective earth, symbol                                                                                                                               |  | N/A |
|          | Terminal complying with clause 8 in Part 1                                                                                                             |  | N/A |
|          | Locked against loosening and not possible to loosen by hand                                                                                            |  | N/A |
|          | Not possible to loosen clamping means unintentionally on screwless terminals                                                                           |  | N/A |
|          | Earthing via means of fixing                                                                                                                           |  | N/A |
|          | Earthing terminal only used for the earthing of the control gear                                                                                       |  | N/A |
|          | All parts of material minimizing the danger of electrolytic corrosion                                                                                  |  | N/A |
|          | Made of brass or equivalent material                                                                                                                   |  | N/A |
|          | Contact surface bare metal                                                                                                                             |  | N/A |
|          | Conductors by tracks on printed circuit boards:                                                                                                        |  | N/A |
|          | - a.c. current of 25 A for 1 min between earthing terminal and accessible metal parts                                                                  |  | N/A |
|          | - compliance with clause 7.2.1 in IEC 60598-1                                                                                                          |  | N/A |

|               |                                                                                                                                                |  |   |
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| <b>8 (10)</b> | <b>PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS</b>                                                                                   |  | — |
|               | Protection against accidental contact with live parts in compliance with IEC 61347-1 (clause numbers between parentheses refer to IEC 61347-1) |  | P |
| - (10.1)      | Control gear protected against accidental contact with live parts                                                                              |  | P |
| - (A1)        | Current measured according to IEC 60990, figure 4 and clause 7.1: max. 0,7 mA (peak) or 2,0 mA d.c., for $f \geq 1000$ Hz max. 70 mA ..... :   |  | P |
| - (A2)        | Voltage at 50 k $\Omega$ (V): max. 34 V (peak) ..... :                                                                                         |  | P |



| EN 62031 |                    |                 |         |
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| Clause   | Requirement + Test | Result - Remark | Verdict |

|          |                                                                                                                                                                                                                                                                             |  |     |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----|
|          | Lacquer or enamel not used for protection or insulation                                                                                                                                                                                                                     |  | P   |
|          | Adequate mechanical strength on parts providing protection                                                                                                                                                                                                                  |  | P   |
| - (10.2) | Capacitors > 0,5 $\mu$ F: voltage after 1 min (V): < 50 V .....                                                                                                                                                                                                             |  | N/A |
| 8.1 (-)  | SELV-equivalent controlgear accessible parts are insulated from live parts by double or reinforced insulation according 8.6 and 13.1 in IEC 60065                                                                                                                           |  | N/A |
| 8.2 (-)  | Exposed terminals of SELV or SELV-equivalent controlgear are allowed if:<br>- the rated or maximum output voltage does not exceeding 25 V r.m.s.<br>- the no-load output voltage does not exceed 30 V r.m.s. or $33\sqrt{2}$ V peak                                         |  | N/A |
|          | Insulated terminals if rated output voltage >25 V                                                                                                                                                                                                                           |  | N/A |
|          | One capacitor Y1 or two capacitors Y2 of the same values used in series between SELV or SELV-equivalent output and primary circuits<br>- Capacitor complying with IEC 60384-14<br>- Other components bridging the separating transformer complying with EN 60065, clause 14 |  | N/A |

|           |                                                                                                                                                         |                |   |
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| <b>11</b> | <b>MOISTURE RESISTANCE AND INSULATION</b>                                                                                                               |                | — |
|           | Protection against moisture and insulation in compliance with Clause 11, IEC 61347-1                                                                    |                | P |
|           | After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance with d.c. 500 V (M $\Omega$ ): $\geq 2$ M $\Omega$ ..... | 100 M $\Omega$ | P |
|           | Adequate insulation between input and output terminals not bounded together in SELV-equivalent controlgear                                              |                | P |
|           | For double or reinforced insulation the resistance exceeds 4 M $\Omega$                                                                                 |                | P |

|           |                                                               |      |     |
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| <b>12</b> | <b>ELECTRIC STRENGTH</b>                                      |      | —   |
|           | Electric strength in compliance with Clause 12 of IEC 61347-1 |      | P   |
|           | Immediately after clause 11 electric strength test for 1 min  |      | P   |
|           | Working voltage $\leq 42$ V, test voltage 500 V               |      | N/A |
|           | Working voltage > 42 V, test voltage (V): $2U + 1000$ V ..... | 500V | P   |
|           | Reinforced insulation, test voltage (V): .....                |      | N/A |

| EN 62031  |                                                                                                                                                         |                 |         |
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| Clause    | Requirement + Test                                                                                                                                      | Result - Remark | Verdict |
|           | No flashover or breakdown                                                                                                                               |                 | P       |
|           | Windings in separating transformers in SELV-equivalent control gear according to 14.3.2 of EN 60065                                                     |                 | N/A     |
| <b>13</b> | <b>FAULT CONDITIONS</b>                                                                                                                                 |                 | —       |
| 13.1      | In compliance with IEC 61347-1 (clause numbers between parentheses refer to IEC 61347-1)                                                                |                 | P       |
|           | When operated under fault conditions the LED-module:                                                                                                    |                 | P       |
|           | - does not emit flames or molten material                                                                                                               |                 | P       |
|           | - does not produce flammable gases                                                                                                                      |                 | P       |
|           | - protection against accidental contact not impaired                                                                                                    |                 | P       |
|           | Thermally protected controlgear does not exceed the marked temperature value                                                                            |                 | N/A     |
|           | Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected |                 | P       |
| - (14.1)  | Short-circuit of creepage distances and clearances if less than specified in clause 16 in Part 1 (except between live parts and accessible metal parts) |                 | P       |
|           | Distances on printed boards provided with coating according to IEC 60664-3                                                                              |                 | N/A     |
| - (14.2)  | Short-circuit or interruption of semiconductor devices                                                                                                  |                 | P       |
| - (14.3)  | Short-circuit across insulation consisting of lacquer, enamel or textile                                                                                |                 | P       |
| - (14.4)  | Short-circuit across electrolytic capacitors                                                                                                            |                 | P       |
| - (14.5)  | During the tests, a five-layer tissue paper, where the test specimen is wrapped, does not ignite                                                        |                 | P       |
|           | After the tests the insulation resistance with d.c. 500 V (MΩ) are $\geq 1 \text{ M}\Omega$ .....                                                       |                 | P       |
|           | Temperature declared thermally protected LED-modules fulfil the requirements in Annex C of IEC 61437-1                                                  |                 | N/A     |
| 13.2      | Module withstands overpower condition >15 min.                                                                                                          |                 | P       |
|           | Module with automatic protective device or power limiter, test performed 15 min. at limit.                                                              |                 | N/A     |
|           | During the tests, tissue paper, spread below module, does not ignite                                                                                    |                 | P       |

| EN 62031  |                                                                                                                                         |                 |         |
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| Clause    | Requirement + Test                                                                                                                      | Result - Remark | Verdict |
| 15        | CONSTRUCTION                                                                                                                            |                 | —       |
|           | Wood, cotton, silk, paper and similar fibrous material not used as insulation                                                           |                 | P       |
| 16        | CREEPAGE DISTANCES AND CLEARANCES                                                                                                       |                 | —       |
|           | Creepage and distances and clearances in compliance with IEC 60598-1                                                                    |                 | P       |
|           | Class of protection .....                                                                                                               |                 | —       |
|           | Working voltage (V) .....                                                                                                               |                 | —       |
|           | Voltage form .....                                                                                                                      |                 | —       |
|           | PTI .....                                                                                                                               |                 | —       |
|           | Rated pulse voltage (kV) .....                                                                                                          | --              | —       |
|           | (1) Live parts of different polarity: cr (mm); cl (mm) .....                                                                            |                 | P       |
|           | (2) Live parts and accessible parts: cr (mm); cl (mm) .....                                                                             |                 | P       |
|           | (3) Parts becoming live: cr (mm); cl (mm) .....                                                                                         |                 | N/A     |
|           | (4) Outer surface of cable: cr (mm); cl (mm) .....                                                                                      |                 | N/A     |
|           | (5) Live parts of switches: cr (mm); cl (mm) .....                                                                                      |                 | N/A     |
|           | (6) Live parts and supporting surface: cr (mm); cl (mm) .....                                                                           |                 | N/A     |
| 17 (17)   | SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS                                                                                          |                 | —       |
|           | Screws, current-carrying parts and connections in compliance with IEC 60598-1 (clause numbers between parentheses refer to IEC 60598-1) |                 | P       |
| (4.11)    | Electrical connections:                                                                                                                 |                 | P       |
| (4.11.1)  | Contact pressure                                                                                                                        |                 | P       |
| (4.11.2)  | Screws:                                                                                                                                 |                 | N/A     |
|           | - self-tapping screws                                                                                                                   |                 | N/A     |
|           | - thread-cutting screws                                                                                                                 |                 | N/A     |
|           | - at least two self-tapping screws                                                                                                      |                 | N/A     |
| (4.11.3)  | Screw locking:                                                                                                                          |                 | N/A     |
| (4.11.4)  | Material of current-carrying parts                                                                                                      |                 | P       |
| (4.121.6) | No contact to wood                                                                                                                      |                 | P       |
| (4.12)    | Mechanical connections and glands:                                                                                                      |                 | N/A     |
| (4.12.1)  | Mechanical stress                                                                                                                       |                 | P       |
|           | Screws not made of soft metal                                                                                                           |                 | P       |
|           | Screws of insulating material                                                                                                           |                 | N/A     |
|           | Torque test: part; torque (Nm) .....                                                                                                    |                 | N/A     |
|           | Torque test: part; torque (Nm) .....                                                                                                    |                 | N/A     |
|           | Torque test: part; torque (Nm) .....                                                                                                    |                 | N/A     |

| EN 62031       |                                                                                                                                |                                 |         |
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| Clause         | Requirement + Test                                                                                                             | Result - Remark                 | Verdict |
| (4.12.2)       | Screw diameter < 3 mm screwed into metal                                                                                       |                                 | N/A     |
| (4.12.3)       | Void                                                                                                                           |                                 | —       |
| (4.12.4)       | Locked connections                                                                                                             |                                 | N/A     |
| (4.12.5)       | Screwed glands: force (N) ..... :                                                                                              |                                 | N/A     |
| <b>18 (18)</b> | <b>RESISTANCE TO HEAT, FIRE AND TRACKING</b>                                                                                   |                                 | —       |
|                | Resistance to Heat, Fire and Tracking in compliance with IEC 61347-1 (clause numbers between parentheses refer to IEC 61347-1) |                                 | P       |
| (18.1)         | Parts of insulating material retaining live parts in position, ball-pressure test:                                             |                                 | P       |
|                | - part; test temperature (°C) ..... :                                                                                          | Insulating sleeve: 125°C, 1.4mm | P       |
|                | - part; test temperature (°C) ..... :                                                                                          |                                 | N/A     |
|                | - part; test temperature (°C) ..... :                                                                                          |                                 | N/A     |
| (18.2)         | Printed boards in accordance with IEC 60249-1, 4.3                                                                             |                                 | N/A     |
| (18.3)         | External parts of insulating material preventing electric shock glow-wire test 650 °C                                          |                                 | N/A     |
| (18.4)         | Parts of insulating material retaining live parts in position, needle-flame test 10 s:                                         |                                 | P       |
|                | - flame extinguished within 30 s                                                                                               |                                 | P       |
|                | - no flaming drops igniting tissue paper                                                                                       |                                 | P       |
| (18.5)         | Tracking test                                                                                                                  |                                 | N/A     |
| <b>19</b>      | <b>RESISTANCE TO CORROSION</b>                                                                                                 |                                 | —       |
|                | Resistance to corrosion in compliance with IEC 61347-1                                                                         |                                 | N/A     |
|                | Rust protection:                                                                                                               |                                 | N/A     |
|                | - test according 4.18.1 of IEC 60598-1                                                                                         |                                 | N/A     |
|                | - adequate varnish on the outer surface                                                                                        |                                 | N/A     |
| <b>21</b>      | <b>Heat management</b>                                                                                                         |                                 | —       |
| 21.1           | General                                                                                                                        |                                 | -       |
|                | For exchangeable modules                                                                                                       |                                 | N/A     |
| 21.2           | Heat-conducting foil and paste                                                                                                 |                                 | N/A     |
| 21.3           | Heat protection (under consideration)                                                                                          |                                 | N/A     |
| 21.4           | Construction                                                                                                                   |                                 | N/A     |
| <b>A</b>       | <b>ANNEX A - TESTS</b>                                                                                                         |                                 | --      |
|                | All tests performed in accordance with the advise                                                                              |                                 | P       |

| EN 62031 |                                                        |                 |         |
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| Clause   | Requirement + Test                                     | Result - Remark | Verdict |
|          | given in Annex H of IEC 61347-1, if applicable         |                 |         |
| B        | ANNEX B - SELV-operated LED modules                    |                 | N/A     |
|          | Requirements not applicable to the evaluated products. |                 |         |

| EN 62471 |                                                                                                                                                                                                                                                                                           |                 |         |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause   | Requirement + Test                                                                                                                                                                                                                                                                        | Result - Remark | Verdict |
| <b>4</b> | <b>EXPOSURE LIMITS</b>                                                                                                                                                                                                                                                                    |                 | P       |
|          | Contents of the whole Clause 4 of EN 62471:2008 moved into a new informative Annex ZB                                                                                                                                                                                                     |                 | P       |
|          | Limits of the Artificial Optical Radiation Directive (2006/25/EC) have been applied instead of those fixed in EN 62471: 2008                                                                                                                                                              |                 | P       |
| 4.1      | General                                                                                                                                                                                                                                                                                   |                 | P       |
| 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 JM-2 within any 8-hour period                                                                                                                                                                                                     |                 | P       |
|          | To protect against injury of eye or skin from ultraviolet radiation exposure produced by a broad-band source, the effective integrated spectral irradiance, Es, of yhe light source shall not exceed the levels defined by:                                                               |                 | P       |
|          | $E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J} \cdot \text{m}^{-2}$                                                                                                                        |                 | P       |
|          | The permissible time for exposure to ultraviolet radiation incident upon the unprotrcted eye or skin shall be computed by :                                                                                                                                                               |                 | P       |
|          | $t_{\max} = \frac{30}{E_s}$                                                                                                                                                                                                                                                               |                 | P       |
| 4.3.2    | Near-UN hazard exposure limit for eye                                                                                                                                                                                                                                                     |                 | P       |
|          | For the speatral region 315nm to 40nm(UV-A) the total radiant exposure to the eye shall not exceed 10000 J.m-2 for exposure times greater than 1000s(approximmetely 16 minutes) the UV-A irradiance for the unprotected eye, EUVA, shall not exceed 10 W.m-2                              |                 | P       |
|          | The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000s, shall be computed by:                                                                                                                                              |                 | P       |
|          | $t_{\max} \leq \frac{10000}{E_{UVA}}$                                                                                                                                                                                                                                                     |                 | P       |
| 4.3.3    | Retinal blue light hazard exposure limit                                                                                                                                                                                                                                                  |                 | P       |
|          | To protct against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light soure weighted against the blue-light hazard function, B( $\lambda$ ), i.e., the blue-light weighted radiance, LB, shall not exceed the levels defined by: |                 | P       |

| EN 62471 |                                                                                                                                                                                                                                                                                                |                 |         |
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| Clause   | Requirement + Test                                                                                                                                                                                                                                                                             | Result - Remark | Verdict |
|          | $L_B \cdot t = \sum_{300}^{700} \sum_t L_{\lambda}(\lambda, t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 10^6 \text{ J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$                                                                                                              |                 | P       |
|          | $L_B = \sum_{300}^{700} L_{\lambda} \cdot B(\lambda) \cdot \Delta \lambda \leq 100$                                                                                                                                                                                                            |                 | P       |
| 4.3.4    | Retinal blue light hazard exposure limit-small source                                                                                                                                                                                                                                          |                 | N/A     |
|          | 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/A     |
|          | $E_B \cdot t = \sum_{300}^{700} \sum_t E_{\lambda}(\lambda, t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 100 \text{ J} \cdot \text{m}^{-2}$                                                                                                                                    |                 | N/A     |
|          | $E_B = \sum_{300}^{700} E_{\lambda} \cdot B(\lambda) \cdot \Delta \lambda \leq 1$                                                                                                                                                                                                              |                 | N/A     |
| 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       |
|          | $L_R = \sum_{380}^{1400} L_{\lambda} \cdot R(\lambda) \cdot \Delta \lambda \leq \frac{50000}{\alpha \cdot t^{0.25}} \text{ W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$                                                                                                                        |                 | P       |
| 4.3.6    | Retinal thermal hazard exposure limit—weak visual stimulus                                                                                                                                                                                                                                     |                 | P       |
|          | The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis), ocular exposure to infrared radiation, EIR, over the wavelength range 780 nm to 3000nm, for times less than 1000s, shall not exceed:                                          |                 | P       |
|          | $L_{IR} = \sum_{780}^{1400} L_{\lambda} \cdot R(\lambda) \cdot \Delta \lambda \leq \frac{6000}{\alpha} \text{ W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$                                                                                                                                     |                 | P       |
|          | For times greater than 1000s the limit becomes:                                                                                                                                                                                                                                                |                 | P       |
|          | $E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 100 \text{ W} \cdot \text{m}^{-2}$                                                                                                                                                                                           |                 | P       |
| 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, EIR, over the wavelength range 780 nm                                                                                                  |                 | P       |

| EN 62471 |                                                                                                                                                    |                         |         |
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| Clause   | Requirement + Test                                                                                                                                 | Result - Remark         | Verdict |
|          | to 3000 nm, for times less than 1000 s, shall not exceed:                                                                                          |                         |         |
|          | $E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 18\,000 \cdot t^{-0,75} \quad W \cdot m^{-2}$                                     | $t \leq 1000 \text{ s}$ | P       |
|          | For times greater than 1000 s the limit becomes:                                                                                                   |                         | P       |
|          | $E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2}$                                                         | $t > 1000 \text{ s}$    | P       |
| 4.3.8    | Thermal hazard exposure limit for the skin                                                                                                         |                         | P       |
|          | Visible and infrared radiant exposure (380 nm to 3000nm) of the skin shall be limited to:                                                          |                         | P       |
|          | $E_H \cdot t = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta\lambda \leq 20000 \cdot t^{0,25} \quad J \cdot m^{-2}$ |                         | P       |

|        |                                                                                                                                                                                                                |  |     |
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| 5      | MEASURE OF LAMPS AND LAMP SYSTEMS                                                                                                                                                                              |  | --  |
| 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)                                                                                                                                                                                        |  | N/A |
|        | Seasoning of lamps shall be done stated in the appropriate IEC lamp standard.                                                                                                                                  |  | N/A |
| 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, 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                                                                                                                                                                                                 |  | P   |
|        | Operation of the test lamp shall be provided in accordance with:                                                                                                                                               |  | P   |
|        | --the appropriate IEC lamp standard, or                                                                                                                                                                        |  | N/A |
|        | --the manufacture's recommendation                                                                                                                                                                             |  | P   |
| 5.21.6 | Lamp system operation                                                                                                                                                                                          |  | P   |
|        | The power source for operation of the test lamp shall be provided in accordance with:                                                                                                                          |  | P   |



| EN 62471 |                                                                                                                                                                                        |                 |         |
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| Clause   | Requirement + Test                                                                                                                                                                     | Result - Remark | Verdict |
|          | --the appropriate IEC standard, or                                                                                                                                                     |                 | N/A     |
|          | --the manufacture's recommendation                                                                                                                                                     |                 | P       |
| 5.2      | Measurement procedure                                                                                                                                                                  |                 | P       |
| 5.2.1    | Irradiance measures                                                                                                                                                                    |                 | P       |
|          | Minimum aperture diameter 7 mm                                                                                                                                                         |                 | P       |
|          | Maximum aperture diameter 50mm.                                                                                                                                                        |                 | P       |
|          | The measurement shall be made in that position of that beam giving that maximum reading.                                                                                               |                 | P       |
|          | The measurement instrument is adequate calibrated.                                                                                                                                     |                 | P       |
| 5.2.1    | Radiance measurements                                                                                                                                                                  |                 | P       |
| 5.2.2.1  | Standard method                                                                                                                                                                        |                 | N/A     |
|          | The measurements made with an optical system                                                                                                                                           |                 | N/A     |
|          | The instrument shall be calibrated to read in absolute radiance power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument |                 | N/A     |
| 5.2.2.2  | Alternative method                                                                                                                                                                     |                 | P       |
|          | 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             |                 | P       |
| 5.2.3    | Measurement of source size                                                                                                                                                             |                 | P       |
|          | The determination of $\alpha$ , the angle subtended by a source, requires the determination of 50% emission points of the source.                                                      |                 | P       |
| 5.2.4    | Pulse width measurement for pulsed sources                                                                                                                                             |                 | N/A     |
|          | The determination of $t$ , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.                        |                 | N/A     |
| 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                              |                 | 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                                        |                 | P       |

| EN 62471 |                                                                                             |                         |         |
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| Clause   | Requirement + Test                                                                          | Result - Remark         | Verdict |
|          | weighted energy.                                                                            |                         |         |
| 5.3.3    | Measurement uncertainty                                                                     |                         | P       |
|          | The quality of all measurement results must be quantified by an analysis of the uncertainty | See Annex C in the norm | P       |

|          |                                                                                                                                                                                                                              |           |     |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----|
| <b>6</b> | <b>LAMP CLASSIFICATION</b>                                                                                                                                                                                                   |           | --  |
|          | For the purpose of this standard it was decided that the values shall be reported as follows:                                                                                                                                |           | 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 200mm | r=500 lux | P   |
|          | --for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200mm                                                                                                     |           | N/A |
| 6.1      | Continuous wave lamps                                                                                                                                                                                                        |           | P   |
| 6.1.1    | Exempt Group                                                                                                                                                                                                                 |           | P   |
|          | In the exempt 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 (Es) within 8-hours exposure (30000s), nor                                                                                                                                                   |           | P   |
|          | --a near-UV hazard(EUVA) within 1000s, (about 16 min), nor                                                                                                                                                                   |           | P   |
|          | --a retinal blue-light hazard (LB) within 1000s (about 2.8 h), nor                                                                                                                                                           |           | P   |
|          | --a retinal thermal hazard(LR) within 10s, nor                                                                                                                                                                               |           | P   |
|          | --an infrared radiation hazard for the eye (EIR) within 1000s                                                                                                                                                                |           | P   |
| 6.1.2    | Risk Group (Low-Risk)                                                                                                                                                                                                        |           | N/A |
|          | In this group are lamp, which exceed the limits for the exempt group but that does not pose:                                                                                                                                 |           | N/A |
|          | --an actinic ultraviolet hazard(ES) within 10000s, nor                                                                                                                                                                       |           | N/A |
|          | --a near ultraviolet hazard (EUVA) within 300s,nor                                                                                                                                                                           |           | N/A |
|          | --a retinal blue-light hazard (LB) within 100s, nor                                                                                                                                                                          |           | N/A |
|          | --a retinal thermal hazard (LR) within 10s, nor                                                                                                                                                                              |           | N/A |
|          | --an infrared radiation hazard for the eye(EIR) within 100s                                                                                                                                                                  |           | N/A |
|          | Lamps that emit infrared radiation without a strong                                                                                                                                                                          |           | N/A |

| EN 62471 |                                                                                                                                                                                                                                                           |                 |         |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause   | Requirement + Test                                                                                                                                                                                                                                        | Result - Remark | Verdict |
|          | visual stimulus and do not pose a near-infrared retinal hazard (LIR), within 100s are in Risk Group 1.                                                                                                                                                    |                 |         |
| 6.1.3    | Risk Group 2 (Moderate-Risk)                                                                                                                                                                                                                              |                 | N/A     |
|          | This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose                                                                                                                                                      |                 | N/A     |
|          | --an actinic ultraviolet hazard(ES) within 10000s, nor                                                                                                                                                                                                    |                 | N/A     |
|          | --a near ultraviolet hazard (EUVA) within 100s,nor                                                                                                                                                                                                        |                 | N/A     |
|          | --a retinal blue-light hazard (LB) within 0.25s, nor                                                                                                                                                                                                      |                 | N/A     |
|          | --a retinal thermal hazard (LR) within 0.25s(aversion response), nor                                                                                                                                                                                      |                 | N/A     |
|          | --an infrared radiation hazard for the eye(EIR) within 10s                                                                                                                                                                                                |                 | N/A     |
|          | Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (LIR), within 100s are in Risk Group 2.                                                                                                |                 | N/A     |
| 6.1.4    | Risk Group (High-Risk)                                                                                                                                                                                                                                    |                 | N/A     |
|          | Lamps which exceed the limits for Risk Group 2 are in Group 3.                                                                                                                                                                                            |                 | N/A     |
| 6.2      | Pulsed lamps                                                                                                                                                                                                                                              |                 | N/A     |
|          | Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0.25s.                                                                                                                                                                |                 | N/A     |
|          | A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.                                                                                                                                                  |                 | N/A     |
|          | The risk group determination of the lamp being tested shall be made as follows:                                                                                                                                                                           |                 | N/A     |
|          | --A lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)                                                                                                                                                     |                 | N/A     |
|          | --for single pulsed lamp, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group.                                                                                          |                 | N/A     |
|          | -- for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does 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/A     |

| EN 62471 |                    |                 |         |
|----------|--------------------|-----------------|---------|
| Clause   | Requirement + Test | Result - Remark | Verdict |

| Table 4.1                    | Spectral weighting function for assessing ultraviolet hazards for skin and eye           |                                         |                                         | P   |
|------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------|-----|
| Wavelength<br>$\lambda$ , nm | UV hazard function<br>SUV ( $\lambda$ )                                                  | Wavelength<br>$\lambda$ , nm            | UV hazard function<br>SUV ( $\lambda$ ) |     |
| 200                          | 0.030                                                                                    | 313                                     | 0.0060                                  |     |
| 205                          | 0.051                                                                                    | 315                                     | 0.0035                                  |     |
| 210                          | 0.075                                                                                    | 316                                     | 0.0025                                  |     |
| 215                          | 0.095                                                                                    | 317                                     | 0.0025                                  |     |
| 220                          | 0.120                                                                                    | 318                                     | 0.0015                                  |     |
| 225                          | 0.150                                                                                    | 319                                     | 0.0010                                  |     |
| 230                          | 0.190                                                                                    | 320                                     | 0.0010                                  |     |
| 235                          | 0.240                                                                                    | 322                                     | 0.00065                                 |     |
| 240                          | 0.300                                                                                    | 323                                     | 0.00055                                 |     |
| 245                          | 0.360                                                                                    | 325                                     | 0.00050                                 |     |
| 250                          | 0.430                                                                                    | 328                                     | 0.00045                                 |     |
| 254                          | 0.500                                                                                    | 330                                     | 0.00040                                 |     |
| 255                          | 0.520                                                                                    | 333                                     | 0.00038                                 |     |
| 260                          | 0.650                                                                                    | 335                                     | 0.00035                                 |     |
| 265                          | 0.810                                                                                    | 340                                     | 0.00026                                 |     |
| 270                          | 1.000                                                                                    | 345                                     | 0.00024                                 |     |
| 275                          | 0.960                                                                                    | 350                                     | 0.00020                                 |     |
| 280                          | 0.880                                                                                    | 355                                     | 0.00018                                 |     |
| 285                          | 0.770                                                                                    | 360                                     | 0.00015                                 |     |
| 290                          | 0.640                                                                                    | 365                                     | 0.00015                                 |     |
| 295                          | 0.540                                                                                    | 370                                     | 0.000093                                |     |
| 297                          | 0.460                                                                                    | 375                                     | 0.000078                                |     |
| 300                          | 0.300                                                                                    | 380                                     | 0.000068                                |     |
| 303                          | 0.120                                                                                    | 385                                     | 0.000050                                |     |
| 305                          | 0.060                                                                                    | 390                                     | 0.000044                                |     |
| 308                          | 0.026                                                                                    | 395                                     | 0.000035                                |     |
| 310                          | 0.015                                                                                    | 400                                     | 0.000030                                |     |
| Table 4.2                    | Special weighting functions for assessing retinal hazards from broadband optical sources |                                         |                                         | N/A |
| Wavelength<br>nm             | Blue-light hazard function<br>B ( $\lambda$ )                                            | Burn hazard function<br>R ( $\lambda$ ) |                                         |     |
| 300                          | 0,01                                                                                     | --                                      |                                         |     |

| EN 62471 |                    |                 |         |
|----------|--------------------|-----------------|---------|
| Clause   | Requirement + Test | Result - Remark | Verdict |
| 305      | 0,01               | --              |         |
| 310      | 0,01               | --              |         |
| 315      | 0,01               | --              |         |
| 320      | 0,01               | --              |         |
| 325      | 0,01               | --              |         |
| 330      | 0,01               | --              |         |
| 335      | 0,01               | --              |         |
| 340      | 0,01               | --              |         |
| 350      | 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             |         |

| EN 62471  |                        |                                  |         |
|-----------|------------------------|----------------------------------|---------|
| Clause    | Requirement + Test     | Result - Remark                  | Verdict |
| 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 | --                     | $0,2 \cdot 100,02(1150-\lambda)$ |         |
| 1200-1400 | --                     | 0,02                             |         |

| Table 5.4               | Summary of the ELs for the surface of 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.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                | $E_s = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$                                    | 315-400             | <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             | <100<br>>100          | <0,011                      | 100/t<br>1,0                             |
| Eye IR                  | $E_{IR} = \sum E_\lambda \cdot \Delta\lambda$                                                  | 780-3000            | <1000<br>>1000        | 1,4(80)                     | 18000/t0,75                              |
| Skin thermal            | $E_H = \sum E_\lambda \cdot \Delta\lambda$                                                     | 380-3000            | <10                   | $2 \pi$ sr                  | 20000/t0,75                              |

| Table 5.5   | Summary of the ELs for the retina (radiance based values)   |                     |                                          |                                                                        | N/A                                        |
|-------------|-------------------------------------------------------------|---------------------|------------------------------------------|------------------------------------------------------------------------|--------------------------------------------|
| Hazard Name | Relevant equation                                           | Wavelength range nm | Exposure duration sec                    | Field of view radians                                                  | EL interms of constant radiance W.m-2.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>>10000 | $0,011 \cdot \sqrt{(t/10)}$<br>0,011<br>$0,0011 \cdot \sqrt{t}$<br>0,1 | 106/t<br>106/t<br>106/t<br>100             |

| EN 62471                                  |                                                                  |          |                  |                            |                                                |
|-------------------------------------------|------------------------------------------------------------------|----------|------------------|----------------------------|------------------------------------------------|
| Clause                                    | Requirement + Test                                               |          | Result - Remark  |                            | Verdict                                        |
| 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 · √ (t/10) | 50000/(α · t<br>0,25)<br>50000/(α · t<br>0,25) |
| Retinal thermal<br>(weak visual stimulus) | $L_{IR} = \sum L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda$ | 780-1400 | >10              | 0,011                      | 6000/α                                         |

| Table 6.1 Emission limits for risk groups of continuous wave lamps (Base on 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                                                                                         | SUV(λ)          | Es     | W•m-2      | 0,001                        | 1.35E-07 | --       | --       | --       | --       |
| Near UV                                                                                            |                 | EUVA   | W•m-2      | 0,33                         | 3.43E-07 | --       | --       | --       | --       |
| Blue light                                                                                         | B(λ)            | LB     | W•m-2•sr-1 | 100                          | 5.27E+00 | 10000    | 7.03E+00 | 4000000  | 7.03E+00 |
| Blue light, small source                                                                           | B(λ)            | EB     | W•m-2      | --                           | --       | --       | --       | --       | --       |
| Retinal thermal                                                                                    | R(λ)            | LR     | W•m-2•sr-1 | 28000/α                      | 1.28E+02 | 28000/α  | 1.30E+02 | 71000/α  | 1.41E+02 |
| Retinal thermal, weak visual stimulus**                                                            | R(λ)            | LIR    | W•m-2•sr-1 | 545000<br>0,0017 ≤ α ≤ 0,011 | --       |          |          |          |          |
|                                                                                                    |                 |        |            | 6000/α<br>0,011 ≤ α ≤ 0,1    | 0.00E+00 |          |          |          |          |
| IR radiation, eye                                                                                  |                 | EIR    | W•m-2      | 100                          | 0.00E+00 | 570      | 0.00E+00 | 3200     | 0.00E+00 |

Remark:

Angular subtense of apparent source, α= 13.6mrad

\* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.

\*\* Involves evaluation of non-GLS source

**Attachment: Photos of the product:**

Photo 1

Description: Over view



Photo 2

Description: Over view

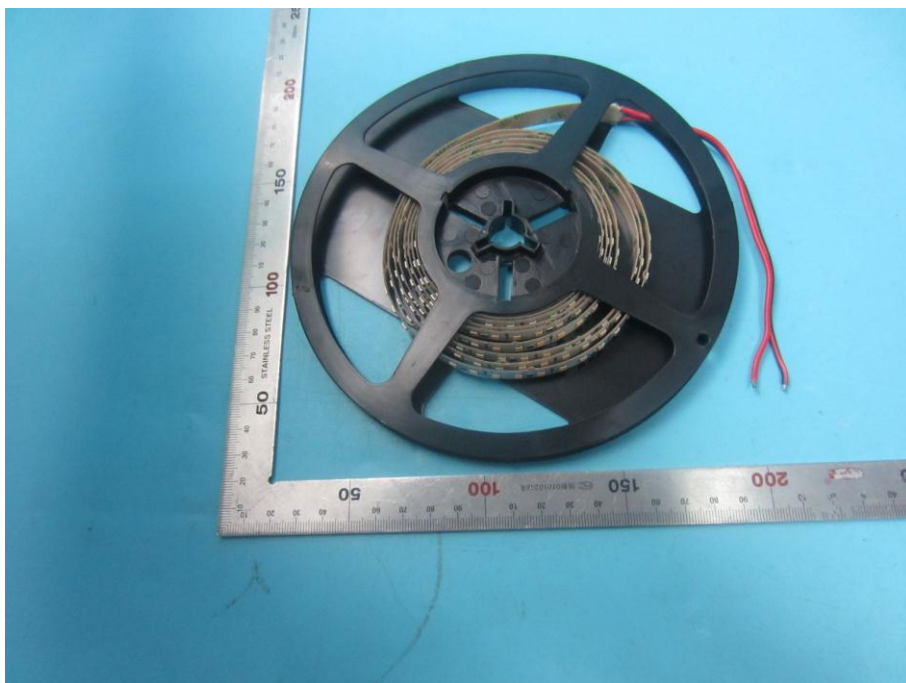




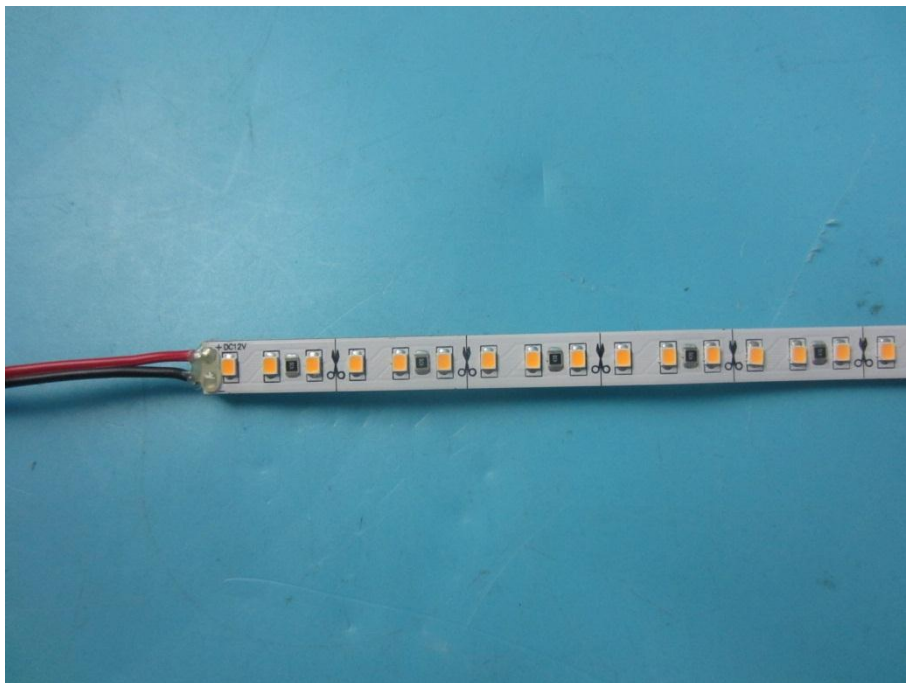
Photo 3

Description: Over view



Photo 4

Description: Internal view



--End of report--