



**TEST REPORT**  
**IEC 60598-2-1**  
**Luminaires**  
**Part 2: Particular requirements**  
**Section 1: Fixed general purpose luminaires**

Report Number..... : 9712302106  
 Date of issue..... : 08/05/2017  
 Total number of pages ..... 33 + appendices

Name of Testing Laboratory preparing the Report ..... : The Standards Institution of Israel  
 42 Chaim Levanon St., Tel Aviv 6997701, Israel

Applicant's name ..... : Tzuba Vision ECO Light Systems Ltd.  
 Address..... : Kibbutz Tzuba, 9087000, Israel

**Test specification:**

Standard ..... : IEC 60598-2-1 (ed.1), am1 used in conjunction with IEC 60598-1 (ed.8);  
 EN 60598-2-1:1989 used in conjunction with EN 60598-1:2015/AC:2015/AC:2016

Test procedure ..... : N/A

Non-standard test method ..... : N/A

Test Report Form No. .... : IEC60598\_2\_1E  
 Test Report Form(s) Originator .... : Intertek Semko AB  
 Master TRF ..... : 2016-04

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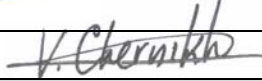
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<p>Test item description..... :                  Trade Mark..... :                  Manufacturer ..... :                  Model/Type reference ..... :                  Ratings..... :</p>	<p>Led Lighting Fixture</p>  <p>Tzuba Vision</p> <p>LDLS 140, LDLS 280, LDLS 560, LDLS 1120</p> <p>LDLS 140: 4.5W, 25mA, 230Vac, 50Hz;                  LDLS 280: 9W, 45mA, 230Vac, 50Hz;                  LDLS 560: 18W, 90mA, 230Vac, 50Hz;                  LDLS 1120: 36W, 180mA, 230Vac, 50Hz                  (All models can be following by the suffix "EM")</p>
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<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>	
<input checked="" type="checkbox"/> <b>Testing Laboratory:</b>	The Standards Institution of Israel
<b>Testing location/ address .....</b>	42 Chaim Levanon St., Tel Aviv 6997701, Israel
<input type="checkbox"/> <b>Associated CB Testing Laboratory:</b>	
<b>Testing location/ address .....</b>	
<b>Tested by (name, function, signature).....</b>	ANATOLY OIMATOV 
<b>Approved by (name, function, signature)...</b>	VLADIMIR CHERNIKH 
<b>Testing procedure: CTF Stage 1:</b>	
<input type="checkbox"/> <b>Testing procedure: CTF Stage 1:</b>	
<b>Testing location/ address .....</b>	
<b>Tested by (name, function, signature).....</b>	
<b>Approved by (name, function, signature)...</b>	
<b>Testing procedure: CTF Stage 2:</b>	
<input type="checkbox"/> <b>Testing procedure: 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>	
<b>Testing procedure: CTF Stage 3:</b>	
<input type="checkbox"/> <b>Testing procedure: CTF Stage 3:</b>	
<b>Testing procedure: CTF Stage 4:</b>	
<input type="checkbox"/> <b>Testing procedure: CTF Stage 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):**

- Appendix 1 – Photographs (2 pages attached)
- Appendix 2 – European Group Differences and National Differences (3 pages attached)
- Appendix 3 – Test report according to IEC62031 (22 pages attached)
- Appendix 4 – SII test report 9712301837 according to IEC62471 (20 pages attached)
- Appendix 5 – DEKRA test report according to IEC62471 for the LED package (22 pages attached)

**Summary of testing:**

All testing was performed on model LDLS560 and considered representative of all other models covered by this report.

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

- 1.5 (3) Marking
- 1.6 (4) Construction
- 1.7 (11) Creepage distance and clearances
- 1.8 (7) Provision to earthing
- 1.12 (12) Endurance test and thermal test
- 1.13 (9.3) Resistance to dust and moisture
- 1.14 (13) Insulation resistance and electric strength

**Testing location:**

The Standards Institution of Israel  
42 Chaim Levanon St., Tel Aviv 6997701, Israel

**Summary of compliance with National Differences:**

List of countries addressed: European Group Differences and National Differences

The product fulfils the requirements of IEC60598-2-1:1979 + A1:1987 / EN 60598-2-1:1989 used in conjunction with IEC60598-1 (8th Ed.): 2014 and EN60598-1:2015.

**Copy of marking plate:**

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



<b>Test item particulars</b> .....: Led light fixture	
<b>Classification of installation and use</b> .....: Class I, indoor use	
<b>Supply Connection</b> .....: Permanent connection .....:	
<b>Possible test case verdicts:</b> - test case does not apply to the test object..... : N/A - test object does meet the requirement ..... : P (Pass) - test object does not meet the requirement..... : F (Fail)	
<b>Testing</b> ..... :	
<b>Date of receipt of test item</b> ..... : 15/01/2017	
<b>Date (s) of performance of tests</b> ..... : 15/01/2017-24/04/2017	
<b>General remarks:</b>	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.	
Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Clause numbers between brackets refer to clauses in IEC 60598-1	
<b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60598-1:</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 <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> ..... : Tzuba Vision ECO Light Systems Ltd. Kibbutz Tzuba, 9087000, Israel	
<b>General product information:</b>	
1. The equipment under test is a PCB board, intended for use with compact LED lamp. LED lamp is powered by from AC mains. The unit incorporates PCB, LED, terminal for connection to AC mains. The LED was separately evaluated for eye safety aspects (IEC62471) as specified in SII test report Ref. No. 9712301837, see Appendix 4.	
2. The equipment is intended for indoor use only.	
3. All models have the same type LED, similar appearance and construction, but different dimension, power and LED quantities.	
4. The unit is a component for building in a host enclosure.	


IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

1.2 (0)	GENERAL TEST REQUIREMENTS		P
1.2 (0.1)	Information for luminaire design considered .....	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Lamp standard:	—
1.2 (0.3)	More sections applicable.....	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—

1.4 (2)	CLASSIFICATION OF LUMINAIRES		
1.4 (2.2)	Type of protection .....	Class I	P
1.4 (2.3)	Degree of protection.....	IPX0	P
1.4 (2.4)	Luminaire suitable for direct mounting on normally flammable surfaces .....	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
1.4 (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"/>	—

1.5 (3)	MARKING		P
1.5 (3.2)	Mandatory markings		P
	Position of the marking	On the PCB	P
	Format of symbols/text		P
1.5 (3.3)	Additional information		P
	Language of instructions	English	P
1.5 (3.3.1)	Combination luminaires		N/A
1.5 (3.3.2)	Nominal frequency in Hz	50Hz	P
1.5 (3.3.3)	Operating temperature		N/A
1.5 (3.3.4)	Symbol or warning notice		N/A
1.5 (3.3.5)	Wiring diagram	Suitable for direct connection to the mains supply. See user manual.	N/A
1.5 (3.3.6)	Special conditions		N/A
1.5 (3.3.7)	Metal halide lamp luminaire – warning		N/A
1.5 (3.3.8)	Limitation for semi-luminaires		N/A
1.5 (3.3.9)	Power factor and supply current		N/A
1.5 (3.3.10)	Suitability for use indoors	Only for indoor use	P
1.5 (3.3.11)	Luminaires with remote control		N/A
1.5 (3.3.12)	Clip-mounted luminaire – warning		N/A
1.5 (3.3.13)	Specifications of protective shields		N/A
1.5 (3.3.14)	Symbol for nature of supply		P
1.5 (3.3.15)	Rated current of socket outlet	No socket outlet	N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.5 (3.3.16)	Rough service luminaire	Not intended	N/A
1.5 (3.3.17)	Mounting instruction for type Y, type Z and some type X attachments		N/A
1.5 (3.3.18)	Non-ordinary luminaires with PVC cable		N/A
1.5 (3.3.19)	Protective conductor current in instruction if applicable		N/A
1.5 (3.3.20)	Provided with information if not intended to be mounted within arm's reach		N/A
1.5 (3.3.21)	Non replaceable and non-user replaceable light sources information provided	<p>The instructions contain the following information:</p> <ul style="list-style-type: none"> <li>– For non-user replaceable light sources: "The light source contained in this luminaire shall only be replaced by the manufacturer or his service agent or a similar qualified person."</li> <li>"Caution, risk of electric shock"</li> </ul>  <p>(Source: IEC 60417-6042 (2011-11))</p>	P
	Cautionary symbol		P
1.5 (3.3.22)	Controllable luminaires, classification of insulation provided	Basic insulation between mains and GND, reinforced between mains and SELV	P
1.5 (3.4)	Test with water		P
	Test with hexane		P
	Legible after test		P
	Label attached		P

<b>1.6 (4)</b>	<b>CONSTRUCTION</b>		P
1.6 (4.2)	Components replaceable without difficulty	No such part	N/A
1.6 (4.3)	Wireways smooth and free from sharp edges		N/A
<b>1.6 (4.4)</b>	<b>Lampholders</b>	No lampholders	N/A
1.6 (4.4.1)	Integral lampholder		N/A
1.6 (4.4.2)	Wiring connection		N/A
1.6 (4.4.3)	Lampholder for end-to-end mounting		N/A
1.6 (4.4.4)	Positioning		N/A
	- pressure test (N) .....		—

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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 (N) .....		—
	After test the lampholder have not moved from its position and show no permanent deformation		N/A
1.6 (4.4.5)	Peak pulse voltage		N/A
1.6 (4.4.6)	Centre contact		N/A
1.6 (4.4.7)	Parts in rough service luminaires resistant to tracking		N/A
1.6 (4.4.8)	Lamp connectors		N/A
1.6 (4.4.9)	Caps and bases correctly used		N/A
1.6 (4.4.10)	Light source for lampholder or connection according IEC 60061 not connected another way		N/A
<b>1.6 (4.5)</b>	<b>Starter holders</b>	No starter holder	N/A
	Starter holder in luminaires other than class II		N/A
	Starter holder class II construction		N/A
<b>1.6 (4.6)</b>	<b>Terminal blocks</b>		N/A
	Tails		N/A
	Unsecured blocks		N/A
<b>1.6 (4.7)</b>	<b>Terminals and supply connections</b>	Approved terminal connector	P
1.6 (4.7.1)	Contact to metal parts	Non intended for adjustments	N/A
1.6 (4.7.2)	Test 8 mm live conductor	Approved terminal connector	N/A
	Test 8 mm earth conductor	Approved terminal connector	N/A
1.6 (4.7.3)	Terminals for supply conductors		N/A
1.6 (4.7.3.1)	Welded method and material		N/A
	- stranded or solid conductor		N/A
	- spot welding		N/A
	- welding between wires		N/A
	- Type Z attachment		N/A
	- mechanical test according to 15.6.2		N/A
	- electrical test according to 15.6.3		N/A
	- heat test according to 15.6.3.2.3 and 15.6.3.2.4		N/A
1.6 (4.7.4)	Terminals other than supply connection		N/A
1.6 (4.7.5)	Heat-resistant wiring/sleeves		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.6 (4.7.6)	Multi-pole plug		N/A
	- test at 30 N		N/A
<b>1.6 (4.8)</b>	<b>Switches</b>	No switches	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>1.6 (4.9)</b>	<b>Insulating lining and sleeves</b>	No such components	N/A
1.6 (4.9.1)	Retainment		N/A
	Method of fixing .....		N/A
1.6 (4.9.2)	Insulated linings and sleeves:		N/A
	Resistant to a temperature > 20 °C to the wire temperature or		N/A
	a) & c) Insulation resistance and electric strength		N/A
	b) Ageing test. Temperature (°C) .....		N/A
<b>1.6 (4.10)</b>	<b>Double or reinforced insulation</b>	Class I luminaire	N/A
1.6 (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
1.6 (4.10.2)	Assembly gaps:		N/A
	- not coincidental		N/A
	- no straight access with test probe		N/A
1.6 (4.10.3)	Retainment of insulation:		N/A
	- fixed		N/A
	- unable to be replaced; luminaire inoperative		
	- sleeves retained in position		N/A
	- lining in lampholder		N/A
1.6 (4.10.4)	Protective impedance device		N/A
	Double or reinforced insulation bridged by appropriate and at least two resistors or two Y2 capacitors or one Y1 capacitor		N/A
	Y1 or Y2 capacitors comply with IEC 60384-14		N/A

TRF No. IEC60598\_2\_1E



IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Resistors comply with test (a) in 14.1 of IEC 60065		N/A
<b>1.6 (4.11)</b>	<b>Electrical connections and current-carrying parts</b>		P
1.6 (4.11.1)	Contact pressure	Approved terminal connector	P
1.6 (4.11.2)	Screws:		N/A
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
1.6 (4.11.3)	Screw locking:		N/A
	- spring washer		N/A
	- rivets		N/A
1.6 (4.11.4)	Material of current-carrying parts	Copper	P
1.6 (4.11.5)	No contact to wood or mounting surface		P
1.6 (4.11.6)	Electro-mechanical contact systems	No such parts	N/A
<b>1.6 (4.12)</b>	<b>Screws and connections (mechanical) and glands</b>		N/A
1.6 (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
1.6 (4.12.2)	Screws with diameter < 3 mm screwed into metal		N/A
1.6 (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
1.6 (4.12.5)	Screwed glands; force (Nm)..... :		N/A
<b>1.6 (4.13)</b>	<b>Mechanical strength</b>		N/A
1.6 (4.13.1)	Impact tests:		N/A
	- fragile parts; energy (Nm) .....	Enclosure shall be provided by the host equipment	N/A
	- other parts; energy (Nm)..... :		N/A
	1) live parts		N/A
	2) linings		N/A
	3) protection		N/A
	4) covers		N/A
1.6 (4.13.3)	Straight test finger		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.6 (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
1.6 (4.13.6)	Tumbling barrel		N/A
<b>1.6 (4.14)</b>	<b>Suspensions, fixings and means of adjusting</b>		N/A
1.6 (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
1.6 (4.14.2)	Load to flexible cables	No such parts	N/A
	Mass (kg) .....		—
	Stress in conductors (N/mm <sup>2</sup> ) .....		N/A
	Mass (kg) of semi-luminaire .....		N/A
	Bending moment (Nm) of semi-luminaire .....		N/A
1.6 (4.14.3)	Adjusting devices:		N/A
	- flexing test; number of cycles..... :		N/A
	- strands broken .....		N/A
	- electric strength test afterwards		N/A
1.6 (4.14.4)	Telescopic tubes: cords not fixed to tube; no strain on conductors		N/A
1.6 (4.14.5)	Guide pulleys		N/A
1.6 (4.14.6)	Strain on socket-outlets		N/A
<b>1.6 (4.15)</b>	<b>Flammable materials</b>	Approved PCB and terminals is used	N/A
	- glow-wire test 650°C .....		N/A
	- spacing $\geq$ 30 mm		N/A
	- screen withstanding test of 13.3.1		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- screen dimensions		N/A
	- no fiercely burning material		N/A
	- thermal protection		N/A
	- electronic circuits exempted		N/A
1.6 (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>1.6 (4.16)</b>	<b>Luminaires for mounting on normally flammable surfaces</b>		N/A
	No lamp control gear .....		N/A
1.6 (4.16.1)	Lamp control gear spacing:		N/A
	- spacing 35 mm		N/A
	- spacing 10 mm		N/A
1.6 (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
1.6 (4.16.3)	Design to satisfy the test of 12.6	(see clause 12.6)	N/A
<b>1.6 (4.17)</b>	<b>Drain holes</b>		N/A
	Clearance at least 5 mm		N/A
<b>1.6 (4.18)</b>	<b>Resistance to corrosion</b>		P
1.6 (4.18.1)	- rust-resistance		P
1.6 (4.18.2)	- season cracking in copper		N/A
1.6 (4.18.3)	- corrosion of aluminium		P
1.6 (4.19)	Igniters compatible with ballast		N/A
1.6 (4.20)	Rough service vibration		N/A
<b>1.6 (4.21)</b>	<b>Protective shield</b>		N/A
1.6 (4.21.1)	Shield fitted if tungsten halogen lamps or metal halide lamps		N/A
	Shield of glass if tungsten halogen lamps		N/A
1.6 (4.21.2)	Particles from a shattering lamp not impair safety		N/A
1.6 (4.21.3)	No direct path		N/A
1.6 (4.21.4)	Impact test on shield		N/A
	Glow-wire test on lamp compartment..... :	See Test Table 1.15 (13.3.2)	N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.6 (4.22)	Attachments to lamps not cause overheating or damage		N/A
1.6 (4.23)	Semi-luminaires comply Class II		N/A
<b>1.6 (4.24)</b>	<b>Photobiological hazards</b> Specified in SII test report Ref. No. 9712301837 (IEC62471), see Appendix 4 of this report.		P
1.6 (4.24.1)	No excessive UV radiation if tungsten halogen lamps and metal halide lamps (Annex P)		N/A
1.6 (4.24.2)	Retinal blue light hazard		N/A
	Class of risk group assessed according to IEC/TR 62778 .....		—
	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
	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>1.6 (4.25)</b>	<b>Mechanical hazard</b>		P
	No sharp point or edges		P
<b>1.6 (4.26)</b>	<b>Short-circuit protection</b>		N/A
1.6 (4.26.1)	Adequate means of uninsulated accessible SELV parts	To be provided externally for the SELV source	N/A
1.6 (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>1.6 (4.27)</b>	<b>Terminal blocks with integrated screwless earthing contacts</b>		P
	Test according Annex V	Approved terminals are used	N/A
	Pull test of terminal fixing (20 N)		N/A
	After test, resistance < 0,05 Ω		N/A
	Pull test of mechanical connection (50 N)		N/A
	After test, resistance < 0,05 Ω		N/A
	Voltage drop test, resistance < 0,05 Ω		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>1.6 (4.28)</b>	<b>Fixing of thermal sensing control</b>	No such parts	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>1.6 (4.29)</b>	<b>Luminaires with non-replaceable light source</b>		P
	Not possible to replace light source		P
	Live part not accessible after parts have been opened by hand or tools	Component for building-in, to be evaluated after installation	N/A
<b>1.6 (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>1.6 (4.31)</b>	<b>Insulation between circuits</b>		P
	Circuits insulated from LV supply fulfil requirements according 4.31.1 – 4.31.3	SELV LEDs are separated from mains by reinforced insulation	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		P
<b>1.6 (4.31.1)</b>	<b>SELV circuits</b>		P
	Used SELV source	Emergency lighting LEDs shall be powered by 3Vdc external source	P
	Voltage ≤ ELV		P
	Insulating of SELV circuits from LV supply	Reinforced insulation used	P
	Insulating of SELV circuits from other non SELV circuits	Reinforced insulation between mains and SELV	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		P
	Plugs not able to enter socket-outlets of other voltage systems	No plugs	N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Socket outlets does not admit plugs of other voltage systems	No socket outlets	N/A
	Plugs and socket-outlets does not have protective conductor contact		N/A
1.6 (4.31.2)	FELV circuits	No such part	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
	Socket-outlets does not have protective conductor contact		N/A
1.6 (4.31.3)	Other circuits		N/A
	Other circuits insulated from accessible parts according Table X.1		N/A
	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		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
1.6 (4.32)	<b>Overvoltage protective devices</b>	No such parts	N/A
	Comply with IEC 61643-11		N/A
	External to controlgear and connected to earth:		N/A
	- only in fixed luminaires		N/A
	- only connected to protective earth		N/A

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>1.7 (11)</b>	<b>CREEPAGE DISTANCES AND CLEARANCES</b>		P
1.7 (11.2)	Creepage distances and clearances..... :	See Table 1.7 (11.2)	P
	Impulse withstand category (Normal category II) (Category III Annex U, Table U.1)	Category II <input checked="" type="checkbox"/> Category III <input type="checkbox"/>	—

<b>1.8 (7)</b>	<b>PROVISION FOR EARTHING</b>		P
1.8 (7.2.1 + 7.2.3)	Accessible metal parts		P
	Metal parts in contact with supporting surface		P
	Resistance < 0,5 Ω..... :	Resistance 0.039 Ω, test current 25A	P
	Self-tapping screws used		N/A
	Thread-forming screws		N/A
	Thread-forming screw used in a groove		N/A
	Earth makes contact first		N/A
	Terminal blocks with integrated screwless earthing contacts tested according Annex V	Approved terminal block is used	N/A
	Protective earthing of the luminaire not via built-in control gear		N/A
1.8 (7.2.2 + 7.2.3)	Earth continuity in joints, etc.		N/A
1.8 (7.2.4)	Locking of clamping means		N/A
	Compliance with 4.7.3		N/A
	Terminal blocks with integrated screwless earthing contacts tested according Annex V		N/A
1.8 (7.2.5)	Earth terminal integral part of connector socket		N/A
1.8 (7.2.6)	Earth terminal adjacent to mains terminals		N/A
1.8 (7.2.7)	Electrolytic corrosion of the earth terminal		N/A
1.8 (7.2.8)	Material of earth terminal	Copper and aluminium	P
	Contact surface bare metal		P
1.8 (7.2.10)	Class II luminaire for looping-in		N/A
	Double or reinforced insulation to functional earth		N/A
1.8 (7.2.11)	Earthing core coloured green-yellow		N/A
	Length of earth conductor		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>1.9 (14)</b>	<b>SCREW TERMINALS</b>		N/A
	Separately approved; component list	(see Annex 1)	N/A
	Part of the luminaire	(see Annex 3)	N/A
<b>1.9 (15)</b>	<b>SCREWLESS TERMINALS AND ELECTRICAL CONNECTIONS</b>		P
	Separately approved; component list..... :	(see Annex 1)	P
	Part of the luminaire .....		P
<b>1.10 (5)</b>	<b>EXTERNAL AND INTERNAL WIRING</b>		N/A
<b>1.10 (5.2)</b>	<b>Supply connection and external wiring</b>		N/A
1.10 (5.2.1)	Means of connection .....	No wiring other than PWB	N/A
	Outdoor luminaire has not PVC insulated external wiring if not class III or SELV $\leq 25$ V a.c./60 V d.c. or protected from outdoor environment		N/A
1.10 (5.2.2)	Type of cable .....		N/A
	Nominal cross-sectional area (mm <sup>2</sup> ) .....		N/A
	Cables equal to IEC 60227 or IEC 60245		N/A
1.10 (5.2.3)	Type of attachment, X, Y or Z		N/A
1.10 (5.2.5)	Type Z not connected to screws		N/A
1.10 (5.2.6)	Cable entries:		N/A
	- suitable for introduction		N/A
	- adequate degree of protection		N/A
1.10 (5.2.7)	Cable entries through rigid material have rounded edges		N/A
1.10 (5.2.8)	Insulating bushings:		N/A
	- suitably fixed		N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- tubes or guards made of insulating material		N/A
1.10 (5.2.9)	Locking of screwed bushings		N/A
1.10 (5.2.10)	Cord anchorage:		N/A
	- covering protected from abrasion		N/A
	- clear how to be effective		N/A
	- no mechanical or thermal stress		N/A
	- no tying of cables into knots etc.		N/A

TRF No. IEC60598\_2\_1E



IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- insulating material or lining		N/A
1.10 (5.2.10.1)	Cord anchorage for type X attachment:		N/A
	a) at least one part fixed		N/A
	b) types of cable		N/A
	c) no damaging of the cable		N/A
	d) whole cable can be mounted		N/A
	e) no touching of clamping screws		N/A
	f) metal screw not directly on cable		N/A
	g) replacement without special tool		N/A
	Glands not used as anchorage		N/A
	Labyrinth type anchorages		N/A
1.10 (5.2.10.2)	Adequate cord anchorage for type Y and type Z attachment		N/A
1.10 (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
1.10 (5.2.11)	External wiring passing into luminaire		N/A
1.10 (5.2.12)	Looping-in terminals		N/A
1.10 (5.2.13)	Wire ends not tinned		N/A
	Wire ends tinned: no cold flow		N/A
1.10 (5.2.14)	Mains plug same protection		N/A
	Class III luminaire plug		N/A
	No unsafe compatibility		N/A
1.10 (5.2.16)	Appliance inlets (IEC 60320)		N/A
	Installation couplers (IEC 61535)		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Other appliance inlet or connector according relevant IEC standard		N/A
1.10 (5.2.17)	No standardized interconnecting cables properly assembled		N/A
1.10 (5.2.18)	Used plug in accordance with		N/A
	- IEC 60083		N/A
	- other standard		N/A
<b>1.10 (5.3)</b>	<b>Internal wiring</b>	No such parts	N/A
1.10 (5.3.1)	Internal wiring of suitable size and type		N/A
	Through wiring		N/A
	- 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
1.10 (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
1.10 (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
1.10 (5.3.1.3)	Double or reinforced insulation for class II		N/A
1.10 (5.3.1.4)	Conductors without insulation		N/A
1.10 (5.3.1.5)	SELV current-carrying parts		N/A
1.10 (5.3.1.6)	Insulation thickness other than PVC or rubber		N/A
1.10 (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

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.10 (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
1.10 (5.3.4)	Joints and junctions effectively insulated		N/A
1.10 (5.3.5)	Strain on internal wiring		N/A
1.10 (5.3.6)	Wire carriers		N/A
1.10 (5.3.7)	Wire ends not tinned		N/A
	Wire ends tinned: no cold flow		N/A

1.11 (8)	PROTECTION AGAINST ELECTRIC SHOCK		N/A
1.11 (8.2.1)	Live parts not accessible	Evaluated in end use product	N/A
	Basic insulated parts not used on the outer surface without appropriate protection		N/A
	Basic insulated parts not accessible with standard test finger on portable, settable and adjustable luminaires		N/A
	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		N/A
	Basic insulation only accessible under lamp or starter replacement		N/A
	Protection in any position		N/A
	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
1.11 (8.2.2)	Portable luminaire adjusted in most unfavourable position		N/A
1.11 (8.2.3.a)	Class II luminaire:	No such parts	N/A
	- basic insulated metal parts not accessible during starter or lamp replacement		N/A
	- basic insulation not accessible other than during starter or lamp replacement		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- glass protective shields not used as supplementary insulation		N/A
1.11 (8.2.3.b)	BC lampholder of metal in class I luminaires shall be earthed		N/A
1.11 (8.2.3.c)	SELV circuits with exposed current carrying parts:		N/A
	Ordinary luminaire:		N/A
	- voltage under load (V)..... :		N/A
	- no-load voltage (V)..... :		N/A
	- touch current if applicable (mA) ..... :		N/A
	One conductive part insulated if required		N/A
	Other than ordinary luminaire:		N/A
	- nominal voltage (V) ..... :		N/A
	Class III luminaire only for connection to SELV		N/A
	Class III luminaire not provided with means for protective earthing		N/A
1.11 (8.2.4)	Portable luminaire have protection independent of supporting surface		N/A
1.11 (8.2.5)	Compliance with the standard test finger or relevant probe		N/A
1.11 (8.2.6)	Covers reliably secured		N/A
1.11 (8.2.7)	Luminaire other than below with capacitor > 0,5 μF not exceed 50 V 1 min after disconnection	No such capacitors	N/A
	Portable luminaire with capacitor > 0,1 μF (0.25) not exceed 34 V 1 s after disconnection		N/A
	Other luminaires with capacitor > 0,1 μF (0.25) with plug and track adaptors not exceed 60 V 5 s after disconnection		N/A

<b>1.12 (12)</b>	<b>ENDURANCE TEST AND THERMAL TEST</b>		<b>P</b>
1.12 (-)	If IP > IP 20 relevant test of (12.4), (12.5) and (12.6) after (9.2) before (9.3) specified in 1.13		—
1.12 (12.3)	Endurance test:		<b>P</b>
	- mounting-position..... :	According to manual instruction	—
	- test temperature (°C) ..... :	25°C	—
	- total duration (h)..... :	240h	—
	- supply voltage: Un factor; calculated voltage (V)... :	253Vac	—
	- lamp used..... :	LED module	—

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.12 (12.3.2)	After endurance test:		P
	- no part unserviceable		P
	- luminaire not unsafe		P
	- no damage to track system		P
	- marking legible		P
	- no cracks, deformation etc.		P
1.12 (12.4)	Thermal test (normal operation)	(see Annex 2)	P
1.12 (12.5)	Thermal test (abnormal operation)	(see Annex 2)	P
1.12 (12.6)	Thermal test (failed lamp control gear condition):		
1.12 (12.6.1)	Through wiring or looping-in wiring loaded by a current of (A) .....	Loaded by own load	—
	- case of abnormal conditions .....		—
	- electronic lamp control gear		P
	- measured winding temperature (°C): at 1,1 Un .....	No winding	—
	- measured mounting surface temperature (°C) at 1,1 Un .....		P
	- calculated mounting surface temperature (°C) .....	To be evaluated for the end product	N/A
	- track-mounted luminaires		N/A
1.12 (12.6.2)	Temperature sensing control		N/A
	- case of abnormal conditions .....		—
	- thermal link		N/A
	- manual reset cut-out		N/A
	- auto reset cut-out		N/A
	- measured mounting surface temperature (°C) .....		N/A
	- track-mounted luminaires		N/A
1.12 (12.7)	Thermal test (failed lamp control gear in plastic luminaires):		N/A
1.12 (12.7.1)	Luminaire without temperature sensing control		N/A
1.12 (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) .....		—

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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 .....		N/A
1.12 (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 .....		N/A
1.12 (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
1.12 (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/exposed part (°C): .....		—
	Ball-pressure test: .....	See Table 1.15 (13.2.1)	N/A

<b>1.13 (9)</b>	<b>RESISTANCE TO DUST AND MOISTURE</b>		<b>P</b>
1.13 (-)	If IP > IP 20 the order of tests as specified in clause 1.12		N/A
1.13 (9.2)	Tests for ingress of dust, solid objects and moisture:		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- classification according to IP..... :	IPX0	—
	- mounting position during test..... :		—
	- fixing screws tightened; torque (Nm) ..... :		—
	- tests according to clauses..... :		—
	- 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 insulation where it could become a hazard		N/A
	c.1) For luminaires without drain holes – no water entry		N/A
	c.2) For luminaires with drain holes – no hazardous water entry		N/A
	d) no water in watertight or pressure watertight luminaire		N/A
	e) no contact with live parts (IP 2X)		N/A
	e) no entry into enclosure (IP 3X and IP 4X)		N/A
	e) no contact with live parts through drain holes and ventilation slots (IP3X and IP4X)		N/A
	f) no trace of water on part of lamp requiring protection from splashing water		N/A
	g) no damage of protective shield or glass envelope		N/A
1.13 (9.3)	Humidity test 48 h	Applied	P

<b>1.14 (10)</b>	<b>INSULATION RESISTANCE AND ELECTRIC STRENGTH</b>		<b>P</b>
1.14 (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)..... :	2 MΩ between mains and GND	—
	SELV		N/A
	- between current-carrying parts of different polarity :	Test impossible, LED diode employed	N/A
	- between current-carrying parts and mounting surface..... :	>10 GΩ	P
	- between current-carrying parts and metal parts of the luminaire..... :	>10 GΩ	P

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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 ..... :	>10 GΩ	P
	- between live parts and mounting surface ..... :	>10 GΩ	P
	- between live parts and metal parts ..... :	>10 GΩ	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
1.14 (10.2.2)	Electric strength test		P
	Dummy lamp		N/A
	Luminaires with ignitors after 24 h test		N/A
	Luminaires with manual ignitors		N/A
	Test voltage (V) ..... :	Basic insulation for voltages of SELV:500V; Basic insulation for voltages other than SELV: 1460V; Double or reinforced insulation: 2920V	P
	SELV		P
	- between current-carrying parts of different polarity :	Test impossible, LED diode employed	N/A
	- between current-carrying parts and mounting surface..... :		P
	- between current-carrying parts and metal parts of the luminaire..... :		P
	- 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 ..... :	Test impossible, diode bridge employed	N/A
	- between live parts and mounting surface ..... :		P

TRF No. IEC60598\_2\_1E



IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

	- between live parts and metal parts .....		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
1.14 (10.3)	Touch current or protective conductor current (mA):	Touch current 0.07mA	P

1.15 (13)	RESISTANCE TO HEAT, FIRE AND TRACKING		P
1.15 (13.2.1)	Ball-pressure test .....	Housing of approved terminal blocks	N/A
1.15 (13.3.1)	Needle-flame test (10 s) .....	Housing of approved terminal blocks and PCB material are rated V-0	N/A
1.15 (13.3.2)	Glow-wire test (650°C) .....	Housing of approved terminal blocks and PCB material are rated V-0	N/A
1.15 (13.4)	Proof tracking test (IEC 60112) .....	Housing of approved terminal blocks and PCB material are regarded IIIb	N/A

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>1.7 (11.2)</b>	<b>TABLE: Creepage distances and clearances</b>						P
	<b>Minimum distances (mm) for a.c. (50/60 Hz) sinusoidal voltages</b>						P
	<b>Applicable part of IEC 60598-1 Table 11.1* and 11.2*</b>						P
	Insulation type **	Measured clearance	Required		Measured creepage	Required	
			clearance	*Table		creepage	*Table
Distance 1: between trace PE to pad of LED (Live parts)	B	2.6	1.5	11.1	2.6	2.5	11.1
Working voltage (V) .....					230Vac		—
PTI .....					< 600 <input checked="" type="checkbox"/> ≥ 600 <input type="checkbox"/>		—
Pulse voltage if applicable (kV) .....					N/A		—
Reinforced information:							
Distance 2: between pad "+" (SELV) to pad of LED (Live parts)	R	6.0	3.0	11.1	6.0	5.0	11.1
between trace "+" and "-" (Live parts) to pad of LED (SELV)	R	6.4	3.0	11.1	6.4	5.0	11.1
between pad "+" and "-" (Live parts) to pad of LED (SELV)	R	5.1	3.0	11.1	5.1	5.0	11.1
Working voltage (V) .....					230Vac		—
PTI .....					< 600 <input checked="" type="checkbox"/> ≥ 600 <input type="checkbox"/>		—
Pulse voltage if applicable (kV) .....					N/A		—
Supplementary information:							
Distance 3:	--	--	--	--	--	--	--
Working voltage (V) .....					--		—
PTI .....					< 600 <input type="checkbox"/> ≥ 600 <input type="checkbox"/>		—
Pulse voltage if applicable (kV) .....					--		—
Supplementary information:							

\*\* Insulation type: B – Basic; S – Supplementary; R – Reinforced. See also IEC 60598-1 Annex M.

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>1.15 (13.2.1)</b>	<b>TABLE: Ball Pressure Test of Thermoplastics</b>			<b>N/A</b>
<b>Allowed impression diameter (mm) .....</b>				—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	Verdict
Supplementary information:				

<b>1.15 (13.3.1)</b>	<b>TABLE: Needle-flame test (IEC 60695-11-5)</b>				<b>N/A</b>
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Supplementary information:					

<b>1.15 (13.3.2)</b>	<b>TABLE: Glow-wire test (IEC 60695-2-11)</b>				<b>N/A</b>
<b>Glow wire temperature .....</b>		650°C		—	
Object/ Part No./ Material	Manufacturer/ trademark	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict	
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) .....					
Supplementary information:					

<b>1.15 (13.4)</b>	<b>TABLE: Proof tracking test (IEC 60112)</b>		Approved PCB is used		<b>N/A</b>
<b>Test voltage PTI .....</b>		175 V		—	
Object/ Part No./ Material	Manufacturer/ trademark	Withstand 50 drops without failure on three places or on three specimens		Verdict	
Supplementary information:					

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

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>	
Connectors J1-J5	A	Molex	104188-0110	300Vac, 9A, V-0, 130°C	UL1977	UL (E29179)	
Fuse F1	A	Bel Fuse	0679H	F 0.5A 350Vac	UL 248-1 UL248-14 IEC60127-1 IEC60127-7	UL (E20624), TUV	
LED	A	Lumileds (Phillips)	L128-4080CA35z00T1	6.8Vdc, 0.7W, 240mA	IEC62471	Tested by DEKRA (see report in App. 5) Additionally tested in appliance, see SII report 9712301837 in App. 4)	
PCB	A	Jiangmen Benlida	BLD	V-0, 130°C	UL796	UL (E203640)	

Supplementary information:

<sup>1)</sup> Provided evidence ensures the agreed level of compliance. See OD-CB2039.

The codes above have the following meaning:

- A - The component is replaceable with another one, also certified, with equivalent characteristics
- B - The component is replaceable if authorised by the test house
- C - Integrated component tested together with the appliance
- D - Alternative component

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 2	TABLE: Temperature measurements, thermal tests of Section 12					P	
	Type reference .....	Led lighting				—	
	Lamp used.....	LDLS 560				—	
	Lamp control gear used.....					—	
	Mounting position of luminaire.....					—	
	Supply wattage (W) .....	18W				—	
	Supply current (A).....	0.08A				—	
	Calculated power factor.....					—	
	Table: measured temperatures corrected for ta = 25°C:					P	
	- abnormal operating mode .....	--				—	
	- test 1: rated voltage.....	230Vac				—	
	- test 2: 1,06 times rated voltage or 1,05 times rated wattage .....	244Vac				—	
	- test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage .....	--				—	
	- test 4: 1,1 times rated voltage or 1,05 times rated wattage .....	253Vac				—	
	Through wiring or looping-in wiring loaded by a current of A during the test .....	--				—	
Temperature measurements, (°C)							
Part	Ambient	Clause 12.4 – normal				Clause 12.5 – abnormal	
		test 1	test 2	test 3	limit	test 4	limit
Connector phase L	25	31.1	33.7	31.4	130	--	--
PCB near Led D1	25	50.8	53.8	56.0	105	--	--
PCB near Led D62	25	44.2	44.7	45.9	105	--	--
Led D27	25	58.4	59.3	61.2	130	--	--
Supplementary information:							

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 3	Screw terminals (part of the luminaire)		NA
<b>(14)</b>	<b>SCREW TERMINALS</b>	No such parts	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 (mm <sup>2</sup> )..... :		—
(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
(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

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 4	Screwless terminals (part of the luminaire)		P
(15)	<b>SCREWLESS TERMINALS</b>	Approved connector is used	P
(15.2)	Type of terminal..... :	Screwless terminals	—
	Rated current (A)..... :	9A	—
(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)	Terminals and connections for internal wiring		N/A
(15.5.1)	Mechanical tests		N/A
(15.5.1.1.1)	Pull test spring-type terminals (4 N, 4 samples) .....		N/A
(15.5.1.1.2)	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
	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 and connections for external wiring		N/A
(15.6.1)	Conductors		N/A
	Terminal size and rating		N/A

TRF No. IEC60598\_2\_1E

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

15.6.2	Mechanical tests		N/A
(15.6.2.1)	Pull test spring-type terminals or welded connections (4 samples); pull (N) .....		N/A
(15.6.2.2)	Pull test pin or tab terminals (4 samples); pull (N) .....		N/A
(15.6.3)	Electrical tests		N/A
	Tests according 15.6.3.1 + 15.6.3.2 in IEC 60598-1		N/A

<b>(15.6.3.1)</b> <b>(15.6.3.2)</b>	<b>TABLE: Contact resistance test / Heating tests</b>										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)											
Supplementary information:											



**List of test equipment used:**

Clause	Measurement / testing	Testing / measuring equipment / material used				Range used	Calibration date	
		SII Ref. No.	Instrument Type	Manufacturer	Model		Last	Due
1.5 (3)	Marking durability	--	n-Hexane for marking durability test	Bio-Lab	CAS No. 110-54-3	--	--	--
1.7 (11)	Creepage distance and clearance	6501334	Digital Caliper	Signet	75430	--	11/16	11/17
1.7 (11)	Creepage distance and clearance	6503169	Creepage and clearance gauge	ED & D	CC-23 S/N R03470184	--	04/17	04/20
1.8 (7)	Provision to earthing	6501576	Ground Bond Tester	Associated Research	3140 (S/N 9500519)	auto	08/16	08/17
1.12 (12)	Endurance test and thermal test	6501298	Data Acquisition/Switch Unit with Thermocouples Type J	Agilent	34972A S/N MY49014129	auto	12/16	12/17
		6501301	20-Channel Armature Multiplexer		34901A S/N MY41178852			
		6501302	20-Channel Armature Multiplexer		34901A S/N MY41178868			
1.13 (9.3)	Humidity preconditioning	6365	Temperature/Humidity Cabinet	Thermotron	SE-300-2-2	--	04/16	30/04/17
1.13 (9.3) 1.14 (13)	Moisture resistance and insulation	6501660	AC/DC Withstand Voltage Tester	Associated Research	3770 (S/N 9634484)	auto	08/16	08/17

TRF No. IEC60598\_2\_1E



## APPENDIX 1 PHOTOGRAPHS

Fig. 1  
LED lighting fixture - top view

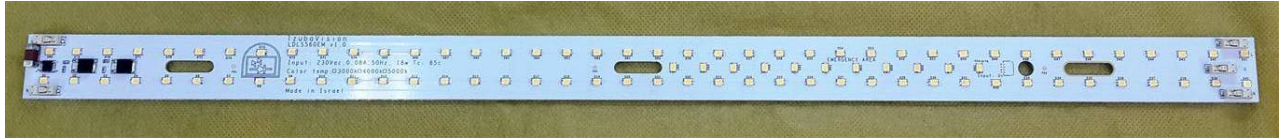


Fig. 2  
LED lighting fixture - bottom view





## **APPENDIX 2 EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES**

IEC60598_2_1E - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

<b>ATTACHMENT TO TEST REPORT IEC 60598-2-1</b> <b>EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES</b> Luminaires Part 2: Particular requirements Section 1: Fixed general purpose luminaires			
<b>Differences according to</b> .....: EN 60598-2-1:1989 used in conjunction with EN 60598-1:2015			
<b>Annex Form No</b> .....: EU_GD_IEC60598_2_1E			
<b>Annex Form Originator</b> .....: OVE			
<b>Master Annex Form</b> .....: 2015-04			
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	<b>GENELEC COMMON MODIFICATIONS (EN)</b>		P
--	--	--	---

<b>1.5 (3)</b>	<b>MARKING</b>		N/A
1.5 (3.3.101)	For luminaires not supplied with terminal block: Adequate warning on the package		N/A

<b>1.6 (4)</b>	<b>CONSTRUCTION</b>		N/A
1.6 (4.11.6)	Electro-mechanical contact systems		N/A

<b>1.10 (5)</b>	<b>EXTERNAL AND INTERNAL WIRING</b>		N/A
1.10 (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
1.10 (5.2.2)	Cables equal to EN 50525		N/A
	Replace table 5.1 – Supply cord		N/A

<b>1.12 (12)</b>	<b>ENDURANCE TESTS AND THERMAL TESTS</b>		P
1.12 (12.4.2c)	Thermal test (normal operation) see footnote c to table 12.2 relating to unsleeved fixed wiring		P

IEC60598_2_1E - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

<b>ZB</b>	<b>ANNEX ZB, SPECIAL NATIONAL CONDITIONS (EN)</b>		N/A
(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>		N/A
(4 & 5)	FR: Shuttered socket-outlets 10/16A		N/A
	FR: Safety requirements for high buildings  (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)  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



**APPENDIX 3**  
**TEST REPORT ACCORDING TO IEC62031**



(22 pages attached)



<b>TEST REPORT</b> <b>IEC 62031</b> <b>LED modules for general lighting – Safety specifications</b>	
Report Number. ....:	9712302106
Date of issue .....	08/05/2017
Total number of pages .....	21
Name of Testing Laboratory preparing the Report .....	The Standards Institution of Israel 42 Chaim Levanon St., Tel Aviv 6997701, Israel
Applicant's name .....	Tzuba Vision ECO Light Systems Ltd.
Address .....	Kibbutz Tzuba, 9087000, Israel
<b>Test specification:</b>	
Standard .....	IEC 62031:2008/ AMD1:2012/AMD2:2014 EN 62031:2008/A1:2013/A2:2015
Test procedure.....	N/A
Non-standard test method.....	N/A
Test Report Form No.....	IEC62031D
Test Report Form(s) Originator.....	Intertek Semko AB
Master TRF .....	2016-10
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<b>General disclaimer:</b>	
<p>The test results presented in this report relate only to the object tested.            This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.</p>	
Test item description .....	Led Lighting Fixture
Trade Mark .....	
Manufacturer .....	Tzuba Vision ECO Light Systems Ltd.
Model/Type reference .....	LDLS 140, LDLS 280, LDLS 560, LDLS 1120
Ratings .....	LDLS 140: 4.5W, 25mA, 230Vac, 50Hz; LDLS 280: 9W, 45mA, 230Vac, 50Hz; LDLS 560: 18W, 90mA, 230Vac, 50Hz; LDLS 1120: 36W, 180mA, 230Vac, 50Hz (All models can be following by the suffix "EM")





<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>	
<input checked="" type="checkbox"/> <b>Testing Laboratory:</b>	The Standards Institution of Israel
<b>Testing location/ address .....</b>	42 Chaim Levanon St., Tel Aviv 6997701, Israel
<b>Tested by (name, function, signature) .....</b>	ANATOLY OIMATOV 
<b>Approved by (name, function, signature) ..</b>	VLADIMIR CHERNIKH 
<b>Testing procedure: CTF Stage 1:</b>	
<b>Testing location/ address .....</b>	
<b>Tested by (name, function, signature) .....</b>	
<b>Approved by (name, function, signature) ..</b>	
<b>Testing procedure: 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>	
<b>Testing procedure: CTF Stage 3:</b>	
<b>Testing procedure: CTF Stage 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>	

<b>List of Attachments (including a total number of pages in each attachment):</b> N/A	
<b>Summary of testing:</b> All testing was performed on model LDLS 560 and considered representative of all other models covered by this report.	
<b>Tests performed (name of test and test clause):</b> 7. Marking 9. Provision for earthing 11. Moisture resistance and insulation 12. Electric strength 13. Fault conditions 16. Creepage distance and clearances	<b>Testing location:</b> The Standards Institution of Israel 42 Chaim Levanon St., Tel Aviv 6997701, Israel
<b>Summary of compliance with National Differences:</b> List of countries addressed: N/A  <input checked="" type="checkbox"/> The product fulfils the requirements of IEC 62031: 2008 + A1:2012 + A2: 2014 and EN 62031:2008 + A1:2013 + A2: 2015	

**Copy of marking plate:**  
The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



<b>Test item particulars</b> .....: Led module	
<b>Classification of installation and use</b> .....: Independent module, Class I, indoor use	
<b>Supply Connection</b> .....: Permanent connection .....:	
<b>Possible test case verdicts:</b> - test case does not apply to the test object.....: N/A - test object does meet the requirement.....: P (Pass) - test object does not meet the requirement.....: F (Fail)	
<b>Testing</b> .....:	
<b>Date of receipt of test item</b> .....: 15/01/2017	
<b>Date (s) of performance of tests</b> .....: 15/01/2017-24/04/2017	
<b>General remarks:</b> "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.  <b>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</b>  <b>Clause numbers between brackets refer to clauses in IEC 61347-1</b>	
<b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:</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"/> <b>Yes</b> <input checked="" type="checkbox"/> <b>Not applicable</b>
<b>When differences exist; they shall be identified in the General product information section.</b>	
<b>Name and address of factory (ies)</b> .....: Tzuba Vision ECO Light Systems Ltd. Kibuz Tzuba, 9087000, Israel	
<b>General product information:</b> 1. The equipment under test is a PCB board, intended for use with compact LED module. LED module powered by from AC mains. The unit incorporates PCB, LED, terminal for connection to AC mains. The LED was separately evaluated for eye safety aspects (IEC62471) as specified in appended SII test report Ref. No. 9712301837. 2. All models have the similar appearance and construction, but different dimension, power and LED quantities. 3. The equipment is intended for indoor use only.	

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>GENERAL REQUIREMENTS</b>		P
4.4	Integral modules tested assembled in the luminaire	Built-in integral module tested stand-alone	P
4.5	Independent modules complies with requirements in IEC 60598-1		N/A
<b>5</b>	<b>GENERAL TEST REQUIREMENTS</b>		N/A
5.5	SELV-operated LED modules comply with Annex I of IEC 61347-2-13	(see Annex 1)	N/A
	General conditions for tests in Annex A	(see Annex A)	N/A
<b>6</b>	<b>CLASSIFICATION</b>		P
	Built-in module .....	Yes <input checked="" type="checkbox"/> No <input 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.		—
<b>7</b>	<b>MARKING</b>		P
<b>7.1</b>	<b>Mandatory markings for built-in or independent modules</b>		P
	a) mark of origin	See title page	P
	b) model number, type reference	See title page	P
	c1) constant voltage module; rated supply voltage and supply frequency		N/A
	c2) constant current module; rated supply current and supply frequency		N/A
	d) nominal power		P
	e) indication of connections, wiring diagram	Permanent connection to the LED module	N/A
	f) value of $t_c$ and place on the module		N/A
	g) $E_{thr}$ if required		N/A
	h) symbol for built-in modules		N/A
	i) heat transfer temperature $t_d$		N/A
	j) power for heat-conduction $P_d$		N/A
	k) working voltage for insulation		N/A
<b>7.2</b>	<b>Location of marking</b>		P
	- marking of a), b), c) and f) on the modules	a) and b) on the Led module	P

TRF No. IE62031D

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	- marking of d), e), g), h), i) and j) on the modules or data sheet	d), e) on the Led module	P
	- marking of k) in manufactures literature		N/A
	- integral modules a) to g) in literature		N/A
<b>7.3</b>	<b>Durable and legibility of marking</b>		P
	- marking of a), b), c) and f) legible after test with water		P
	- marking of d) to j) inspection of compliance		P
<b>8</b>	<b>TERMINALS</b>		P
	Screw terminals according section 14 of IEC 60598-1:	No such screw terminals	N/A
	Separately approved; component list	(see Annex 2)	P
	Part of the luminaire		P
	Screwless terminals according section 15 of IEC 60598-1:	Approved screwless terminal is used	P
	Separately approved; component list	(see Annex 2)	P
	Part of the luminaire		P
	Connectors according IEC 60838-2-2:		N/A
	Separately approved; component list	(see Annex 2)	N/A
<b>9 (9)</b>	<b>PROVISION FOR PROTECTIVE EARTHING</b>		P
<b>- (9.1)</b>	<b>Provisions for protective earthing</b>		P
	Terminal complying with clause 8		P
	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		P
	Earthing terminal only used for the earthing of the control gear		P
	All parts of material minimizing the danger of electrolytic corrosion		N/A
	Made of brass or equivalent material	Copper and aluminium	P
	Contact surface bare metal		N/A
<b>- (9.2)</b>	<b>Provision for functional earthing</b>		N/A
	Comply with clause 8 and 9.1		N/A
<b>- (9.3)</b>	<b>Earth contact via the track on the printed board</b>		P

TRF No. IE62031D

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	Test with a current of 25 A between earthing terminal and each of the accessible metal parts; measured resistance ( $\Omega$ ) at $\geq 10$ A according 7.2.3 of IEC 60598-1: $< 0,5 \Omega$ .....	0.039 $\Omega$ , 25A test current	P
<b>- (9.4)</b>	<b>Earthing of built-in lamp controlgear</b>		P
	Earth by means of fixing to earthed metal of luminaire in compliance of 7.2 of IEC 60598-1		P
	Earthing terminal only for earthing the built-in controlgear		P
<b>- (9.5)</b>	<b>Earthing via independent controlgear</b>		N/A
- (9.5.1)	Earth connection to other equipment		N/A
	Looping or through connection, conductor min. 1,5 mm <sup>2</sup> and of copper or equivalent		N/A
	Protective earthing wires in line with 5.3.1.1 and clause 7		N/A
- (9.5.2)	Earthing of the lamp compartments powered via the independent lamp controlgear		N/A
	Test with a current of 25 A between input and output earth terminals; measured resistance ( $\Omega$ ) between earthing terminal and each of the accessible metal parts at $\geq 10$ A according 7.2.3 of IEC 60598-1: $< 0,5 \Omega$ .....		N/A
	Output earthing terminal marked as in 7.1 t) of IEC 61347-1		N/A
<b>10 (10)</b>	<b>PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS</b>		P
- (10.1)	Controlgear protected against accidental contact with live parts	To be evaluated after installation in the end product	N/A
- (A2)	The current flowing between the part concerned and earth is measured and does not exceed 0,7 mA (peak) or 2 mA d.c. ....	0.07mA	P
- (A2)	For frequencies above 1 kHz, the current does not exceed 0,7 mA (peak) multiplied by the value of the frequency in kilohertz or 70 mA (peak) .....		P
- (A3)	The voltage between the part concerned and any accessible part is measured and does not exceed 34 V (peak).....		N/A
- (10.1)	Lacquer or enamel not used for protection or insulation		P
	Adequate mechanical strength on parts providing protection	Evaluated in end use product	N/A
- (10.2)	Capacitors $> 0,5 \mu\text{F}$ : voltage after 1 min (V): $< 50$ V .....	No such capacitor	N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
- (10.3)	Controlgear providing SELV	No such part	N/A
	Accessible conductive parts are insulated from live parts by double or reinforced insulation in SELV controlgear		N/A
	No connection between output circuit and the body or protective earthing circuit		N/A
	No possibility of connection between output circuit and the body or protective earthing circuit through other conductive parts		N/A
	SELV outputs separated by at least basic insulation		N/A
	ELV conductive parts insulated as live parts		N/A
	Tests according Annex L of IEC 61347-1		N/A
- (10.4)	Accessible conductive parts in SELV circuits	No such part	N/A
	Output voltage under load $\leq 25$ V r.m.s. or $\leq 60$ V d.c.	The unit receives "emergency" 3Vdc supply from an external SELV source	N/A
	If output voltage $> 25$ V r.m.s. or $> 60$ V d.c. ; No load output $\leq 35$ V peak or $\leq 60$ V d.c and touch current does not exceed 0,7 mA (peak) or 2 mA d.c. .... :		N/A
	One conductive part is insulated if output voltage or current exceeding the values above and withstand test voltage 500 V		N/A
	Double or reinforced insulation bridged by appropriate and at least two resistors or two Y2 capacitors or one Y1 capacitor		N/A
	Y1 or Y2 capacitors comply with IEC 60384-14		N/A
	Resistors comply with test (a) in 14.1 of IEC 60065		N/A

11 (11)	MOISTURE RESISTANCE AND INSULATION		P
	After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance with d.c. 500 V (M $\Omega$ ):		P
	For basic insulation $\geq 2$ M $\Omega$ ..... :	$>10G\Omega$ between mains and GND	P
	For double or reinforced insulation $\geq 4$ M $\Omega$ ..... :	$>10G\Omega$ between mains and SELV	P
	Between primary and secondary circuits in controlgear providing SELV, values in Annex L in IEC 61347-1	No such parts	N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
<b>12 (12)</b>	<b>ELECTRIC STRENGTH</b>		<b>P</b>
	Immediately after clause 11 electric strength test for 1 min		P
	Basic insulation for SELV, test voltage 500 V	500V	P
	Working voltage $\leq 50$ V, test voltage 500 V		N/A
	Working voltage $> 50$ V $\leq 1000$ V, test voltage (V):		P
	Basic insulation, 2U + 1000 V	1460Vac	P
	Supplementary insulation, 2U + 1000 V		N/A
	Double or reinforced insulation, 4U + 2000 V	2920Vac	P
	No flashover or breakdown		P
	Solid or thin sheet insulation for double or reinforced insulation fulfil the requirements in Annex N in IEC 61347-1		N/A
<b>13 (14)</b>	<b>FAULT CONDITIONS</b>		<b>P</b>
- (14)	When operated under fault conditions the controlgear:		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	No such part	N/A
	Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected	No such part	N/A
- (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)	Creepage and clearance distance comply with the requirements of Clause 16	N/A
	Creepage distances on printed boards less than specified in clause 16 in Part 1 provided with coating according to IEC 60664-3	Creepage and clearance distance comply with the requirements of Clause 16	N/A
- (14.2)	Short-circuit or interruption of semiconductor devices	(see appended table)	P
- (14.3)	Short-circuit across insulation consisting of lacquer, enamel or textile	No such part	N/A
- (14.4)	Short-circuit across electrolytic capacitors	No such part	N/A
- (14.5)	After the tests has been carried out on three samples:		P
	The insulation resistance $\geq 1$ M $\Omega$ .....		P
	No flammable gases		P
	No accessible parts have become live		N/A

TRF No. IE62031D



<b>IEC 62031</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	During the tests, a five-layer tissue paper, where the test specimen is wrapped, does not ignite		P
- (14.6)	Relevant fault condition tests with high-power supply	Creepage and clearance distance comply with the requirements of Clause 16	N/A
<b>13.2</b>	<b>Overpower condition</b>		N/A
	Module withstands overpower condition >15 min.		N/A
	Module with automatic protective device or power limiter, test performed 15 min. at limit.		N/A
	No fire, smoke or flammable gas is produced		N/A
	Molten material does not ignite tissue paper, spread below the module		N/A
<b>15</b>	<b>CONSTRUCTION</b>		P
	Wood, cotton, silk, paper and similar fibrous material not used as insulation		P
<b>16 (16)</b>	<b>CREEPAGE DISTANCES AND CLEARANCES</b>		P
- (16)	Creepage and distances and clearances in compliance with IEC 61347-1	(see appended table)	P
	Insulating lining of metallic enclosures		
	Basic insulation on printed boards tested according to clause 14		P
	Distances subjected to both sinusoidal voltage as non-sinusoidal pulses not less than value in Table 16		P
	Creepage distances not less than minimum clearance		P
16 (-)	Conductive accessible parts in compliance with applicable parts of IEC 60598-1		N/A
<b>17 (17)</b>	<b>SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS</b>		P
	Cl. 17 refer to Cl. 17 of IEC 61347-1 which refer to Cl. 4.11 and 4.12 of IEC 60598-1 (clause numbers between parentheses refer to IEC 60598-1)		—
<b>(4.11)</b>	<b>Electrical connections</b>		P
(4.11.1)	Contact pressure	Approved terminal used	P
(4.11.2)	Screws:	No such parts	N/A
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
(4.11.3)	Screw locking:	No such parts	N/A
	- spring washer		N/A

TRF No. IE62031D

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	- rivets		N/A
(4.11.4)	Material of current-carrying parts	Approved PCB used	N/A
(4.11.5)	No contact to wood or mounting surface	To be evaluated after installation in the end product	N/A
(4.11.6)	Electro-mechanical contact systems	No such parts	N/A
<b>(4.12)</b>	<b>Mechanical connections and glands</b>		N/A
(4.12.1)	Screws not made of soft metal	No such parts	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
(4.12.2)	Screws with diameter < 3 mm screwed into metal		N/A
(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
(4.12.5)	Screwed glands; force (Nm)..... :		N/A
<b>18 (18)</b>	<b>RESISTANCE TO HEAT, FIRE AND TRACKING</b>		P
- (18.1)	Ball-pressure test .....	No such parts, approved terminals used	N/A
- (18.3)	Glow-wire test (650°C) .....	Test waived, terminals are rated V-0	N/A
- (18.4)	Needle-flame test (10 s) .....	Test waived, terminals are rated V-0	N/A
- (18.5)	Proof tracking test .....	Regarded IIIb	P
<b>19 (19)</b>	<b>RESISTANCE TO CORROSION</b>		P
	- test according 4.18.1 of IEC 60598-1	Evaluated by inspection, no ferrous parts	N/A
	- adequate varnish on the outer surface		N/A
<b>20</b>	<b>INFORMATION FOR LUMINAIRE DESIGN</b>		N/A
	Information in Annex D (informative)		—
<b>21</b>	<b>HEAT MANAGEMENT</b>		N/A
<b>21.1</b>	<b>General</b>		N/A
	Exchangeability is safeguarded by cap or base		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
<b>21.2</b>	<b>Heat-conducting foil and paste</b>		N/A
	Heat-conducting foil delivered with the module if necessary		N/A
<b>22</b>	<b>PHOTOBIOLOGICAL SAFETY</b>		P
<b>22.1</b>	<b>UV radiation</b>		P
	Luminous radiation not exceed 2mW/klm	Refer to appended SII test report Ref. No. 9712301837 (IEC62471)	P
<b>22.2</b>	<b>Blue light hazard</b>		P
	Assessed according to IEC TR 62778	Refer to appended SII test report Ref. No. 9712301837 (IEC62471)	P
<b>22.3</b>	<b>Infrared radiation</b>		N/A
	Requirements for infrared radiation when required		N/A
<b>A</b>	<b>ANNEX A - TESTS</b>		P
	All tests performed in accordance with the advice given in Annex H of IEC 61347-1, if applicable		P
<b>13 (14)</b>	<b>TABLE: tests of fault conditions</b>		P
<b>Part</b>	<b>Simulated fault</b>		Hazard
IC U2	Shorted pins 2 and 3 to 1. Test results: During test was 120 min. Short circuit current was 150mA. Max temperature measured on LED D69 was 106°C. No flame, no flammable gas, no molten parts.		No
IC D81	Shorted pins 3 to 2. Test results: Fuse opened immediately. Short circuit current was 50A. No flame, no flammable gas, no molten parts.		No

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

16 (16)		TABLE: clearance and creepage distance measurements (mm)						P
Applicable part of IEC 61347-1 Table 7 – 11*								
Distances	Insulation type **	Measured clearance	Required		Measured creepage	Required		
			clearance	*Table		creepage	*Table	
Distance 1: between trace PE to pad of LED (Live parts)	B	2.6	1.5	9	2.6	2.5	7	
Working voltage (V) .....					230Vac		—	
Frequency if applicable (kHz) .....					N/A		—	
PTI .....					< 600 <input checked="" type="checkbox"/> ≥ 600 <input type="checkbox"/>		—	
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV) .....					N/A		—	
Pulse voltage if applicable (kV) .....					N/A		—	
Reinforced information:								
Distance 2: between pad “+” (SELV) to pad of LED (Live parts)	R	6.0	3.0	9	6.0	5.0	7	
between trace “+” and“-“ (Live parts) to pad of LED (SELV)	R	6.4	3.0	9	6.4	5.0	7	
between pad “+” and “- “ (Live parts) to pad of LED (SELV)	R	5.1	3.0	9	5.1	5.0	7	
Working voltage (V) .....					230Vac		—	
Frequency if applicable (kHz) .....					N/A		—	
PTI .....					< 600 <input checked="" type="checkbox"/> ≥ 600 <input type="checkbox"/>		—	
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV) .....					N/A		—	
Pulse voltage if applicable (kV) .....					N/A		—	
Supplementary information:								
Distance 3:	--	--	--	--	--	--	--	
Working voltage (V) .....					--		—	
Frequency if applicable (kHz) .....					--		—	
PTI .....					< 600 <input type="checkbox"/> ≥ 600 <input type="checkbox"/>		—	
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV) .....					--		—	
Pulse voltage if applicable (kV) .....					--		—	
Supplementary information: ** Insulation type: B – Basic; S – Supplementary; R – Reinforced								

TRF No. IE62031D

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

18 (18.1)	TABLE: Ball Pressure Test of Thermoplastics			N/A
Allowed impression diameter (mm) .....				—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	
Supplementary information:				

18 (18.3)	TABLE: Glow-wire test				N/A
Glow wire temperature .....		650°C		—	
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
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) .....					
Supplementary information:					

18 (18.4)	TABLE: Needle-flame test				N/A
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Supplementary information:					

18 (18.5)	TABLE: Proof tracking test		Approved PCB is used		N/A
Test voltage PTI .....		175 V		—	
Object/ Part No./ Material	Manufacturer/ trademark	Withstand 50 drops without failure on three places or on three specimens			Verdict
Supplementary information:					

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
<b>ANNEX 1</b>	<b>SELV-operated LED modules</b>		N/A
	Cl. 5.5 refer to ANNEX I of IEC 61347-2-13 which refer to ANNEX L of IEC 61347-1 (clause numbers between parentheses refer to ANNEX L of IEC 61347-1)		—
<b>(L.3)</b>	<b>Classification</b>		N/A
	Class I	Yes <input type="checkbox"/> No <input type="checkbox"/>	—
	Class II	Yes <input type="checkbox"/> No <input type="checkbox"/>	—
	Class III	Yes <input type="checkbox"/> No <input type="checkbox"/>	—
	non-inherently short circuit proof controlgear	Yes <input type="checkbox"/> No <input type="checkbox"/>	—
	inherently short circuit proof controlgear	Yes <input type="checkbox"/> No <input type="checkbox"/>	—
	fail safe controlgear	Yes <input type="checkbox"/> No <input type="checkbox"/>	—
	non-short-circuit proof controlgear	Yes <input type="checkbox"/> No <input type="checkbox"/>	—
<b>(L.4)</b>	<b>Marking</b>		N/A
	Adequate symbols are used		N/A
<b>(L.5)</b>	<b>Protection against electric shock</b>		N/A
	Comply with 9.2 of IEC 61558-1		N/A
<b>(L.6)</b>	<b>Heating</b>		N/A
	No excessive temperatures in normal use		N/A
	Value if capacitor tc marked .....		—
	Winding insulation classified as Class .....		—
	Comply with tests of clause 14 of IEC 61558-1 with adjustments		N/A
<b>(L.7)</b>	<b>Short-circuit and overload protection</b>		N/A
	Comply with tests of clause 15 of IEC 61558-1 with adjustments		N/A
<b>(L.8)</b>	<b>Insulation resistance and electric strength</b>		N/A
(L.8.1)	Conditioned 48 h between 91 % and 95 %		N/A
(L.8.2)	Insulation resistance		N/A
	Between input- and output circuits not less than 5 MΩ .....		N/A
	Between metal parts of class II convertors which are separated from live parts by basic insulation only and the body not less than 5 MΩ .....		N/A
	Between metal foil in contact with the inner and outer surfaces of enclosures of insulating material not less than 2 MΩ .....		N/A
(L.8.3)	Electric strength		N/A
	1) Between live parts of input circuits and live parts of output circuits .....		N/A

TRF No. IE62031D

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	2) Over basic or supplementary insulation between:		N/A
	a) live parts having different polarity .....		N/A
	b) live parts and body if intended to be connected to protective earth .....		N/A
	c) accessible metal parts and a metal rod of the same diameter as the flexible cable or cord .....		N/A
	d) live parts and an intermediate metal part .....		N/A
	e) intermediate metal parts and the body .....		N/A
	f) each input circuit and all other input circuits .....		N/A
	3) Over reinforced insulation between the body and live parts .....		N/A
<b>(L.9)</b>	<b>Construction</b>		N/A
(L.9.1)	Transformer comply with 19.12 of IEC 61558-1 and 19 of IEC 61558-2-6	No such part	N/A
	HF transformer comply with 19 of IEC 61558-2-16	No such part	N/A
<b>(L.10)</b>	<b>Components</b>		N/A
	Protective devices comply with 20.6 – 20.11 of IEC 61558-1		N/A
<b>(L.11)</b>	<b>Creepage distances, clearances and distances through insulation</b>		N/A
	Creepage distances and clearances not less than in Clause 16		N/A
	Distance through insulation according Table L.5 in IEC 61347-1		N/A
	1) Basic distance through insulation		N/A
	Required distance (mm) .....		—
	Measured (mm) .....		N/A
	Supplementary information		—
	2) Supplementary distance through insulation		N/A
	Required distance (mm) .....		—
	Measured (mm) .....		N/A
	Supplementary information		—
	3) Reinforced distance through insulation		N/A
	Required distance (mm) .....		—
	Measured (mm) .....		N/A
	Supplementary information		—

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 2 TABLE: Critical components information						P
Object / part No.	Code	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>
Connectors J1-J5	A	Molex	104188-0110	300Vac, 9A, V-0, 130°C	UL1977	UL (E29179)
Fuse F1	A	Bel Fuse	0679H	F 0.5A, 350Vac	UL 248-1 UL248-14 IEC/EN60127-1 IEC/EN60127-7	UL (E20624) TUV (R50368185)
Led	A	Lumileds (Phillips)	L128-4080CA35z00T1	6.8Vdc, 0.7W, 240mA	IEC62471	Tested by DEKRA (see appended report); Additionally tested in appliance, see appended SII report 9712301837)
PCB	A	Jiangmen Benlida	BLD	V-0, 130°C	UL796	UL (E203640)

Supplementary information:

<sup>1)</sup> Provided evidence ensures the agreed level of compliance. See OD-CB2039.

The codes above have the following meaning:

- A - The component is replaceable with another one, also certified, with equivalent characteristics
- B - The component is replaceable if authorised by the test house
- C - Integrated component tested together with the appliance
- D - Alternative component



IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

<b>ANNEX 3</b>	<b>Screw terminals (part of the luminaire)</b>		N/A
<b>(14)</b>	<b>SCREW TERMINALS</b>		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 (mm <sup>2</sup> )..... :		—
(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
(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

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

<b>ANNEX 4</b>	<b>Screwless terminals (part of the luminaire)</b>		P
<b>(15)</b>	<b>SCREWLESS TERMINALS</b>	Approved connector is used	P
(15.2)	Type of terminal..... :	Screwless terminals	—
	Rated current (A)..... :	9A	—
(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
	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 and connections for external wiring		N/A
(15.6.1)	Conductors		N/A
	Terminal size and rating		N/A
(15.6.2)	Mechanical tests		N/A

TRF No. IE62031D

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
(15.6.2.1)	Pull test spring-type terminals or welded connections (4 samples); pull (N) .....		N/A
(15.6.2.2)	Pull test pin or tab terminals (4 samples); pull (N) .....		N/A
(15.6.3)	Electrical tests		N/A
	Tests according 15.6.3.1 + 15.6.3.2 in IEC 60598-1		N/A

<b>(15.6.3.1)</b> <b>(15.6.3.2)</b>	<b>TABLE: Contact resistance test / Heating tests</b>										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)											
Supplementary information:											

**List of test equipment used:**



Clause	Measurement / testing	Testing / measuring equipment / material used				Range used	Calibration date	
		SII Ref. No.	Instrument Type	Manufacturer	Model		Last	Due
9	Provision for earthing	6501576	Ground Bond Tester	Associated Research	3140 (S/N 9500519)	auto	08/16	08/17
11	Humidity preconditioning	6365	Temperature/Humidity Cabinet	Thermotron	SE-300-2-2	--	04/16	30/04/17
11	Moisture resistance and insulation	6501660	AC/DC Withstand Voltage Tester	Associated Research	3770 (S/N9634484)	auto	08/16	08/17
12	Electric strength	6501660	AC/DC Withstand Voltage Tester	Associated Research	3770 (S/N 9634484)	auto	08/16	08/17
13	Fault conditions	605364	True RMS Multimeter	Fluke	87V	auto	08/16	08/17
13	Fault conditions	6500744	DC/AC Clamp Meter	Prova Instruments	CM-01 S/N 12330446	auto	08/16	08/17
16	Creepage distance and clearance	6501334	Digital Caliper	Signet	75430	--	11/16	11/17
16	Creepage distance and clearance	6503169	Creepage and clearance gauge	ED & D	CC-23 S/N R03470184	--	04/17	04/20
--	Ambient conditions monitoring	6501243	Humidity/Baro/ Temperature Data Recorder	Lutron	MHB-382SD S/N Q655831	auto	12/16	12/17



**APPENDIX 4**  
**SII TEST REPORT 9712301837**  
**ACCORDING TO IEC62471**

(20 pages attached)



	<b>Test Report issued under the responsibility of:</b> The Standard Institution of Israel
<b>TEST REPORT</b> <b>IEC 62471</b> <b>Photobiological safety of lamps and lamp systems</b>	
<b>Report Reference No.</b> ..... :	9712301837
Date of issue ..... :	24.04.2017
Total number of pages ..... :	19
<b>CB Testing Laboratory</b> ..... :	The Standards Institution of Israel
Address ..... :	42 Chaim Levanon St., Tel Aviv 69977, Israel
<b>Applicant's name</b> ..... :	TzubaVision Eco Light Systems Ltd
Address ..... :	Kibbutz Tzuba, 9087000, Israel
<b>Test specification:</b>	
Standard..... :	IEC 62471:2006 (First Edition)
Test procedure ..... :	CB
Non-standard test method..... :	N/A
<b>Test Report Form No.</b> ..... :	IEC62471A
TRF Originator ..... :	VDE Testing and Certification Institute
Master TRF ..... :	Dated 2009-05
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If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.	
<b>This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.</b>	
<b>Test item description</b> ..... :	Self-Ballasted Linear LED Light Modules
Trade Mark..... :	
Manufacturer ..... :	TzubaVision Eco Light Systems Ltd
Model/Type reference ..... :	LDLS 1120, LDLS 560, LDLS 280, LDLS 140
Ratings ..... :	220/240Va.c 50/60 Hz: 180 mA 36W, 90 mA 18W, 45 mA 9W, 25 mA 4.5W



Testing procedure and testing location:		
<input type="checkbox"/>	<b>Testing Laboratory:</b>	The Standards Institution of Israel
Testing location/ address .....		42 Chaim Levanon St., Tel Aviv 69977, Israel
<input type="checkbox"/>	<b>Associated CB Laboratory:</b>	
Testing location/ address .....		
	Tested by (name + signature).....:	Daniel Gottreich <i>Daniel Gottreich</i>
	Approved by (+ signature) .....	Irina Antonov <i>Irina Antonov</i>
<input type="checkbox"/>	Testing procedure: TMP	
	Tested by (name + signature).....:	
	Approved by (+ signature) .....	
Testing location/ address .....		
<input type="checkbox"/>	Testing procedure: WMT	
	Tested by (name + signature).....:	
	Witnessed by (+ signature).....:	
	Approved by (+ signature) .....	
Testing location/ address .....		
<input type="checkbox"/>	Testing procedure: SMT	
	Tested by (name + signature).....:	
	Approved by (+ signature) .....	
	Supervised by (+ signature).....:	
Testing location/ address .....		
<input type="checkbox"/>	Testing procedure: RMT	
	Tested by (name + signature).....:	
	Approved by (+ signature) .....	
	Supervised by (+ signature).....:	
Testing location/ address .....		

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

4.3.3 Retinal blue light hazard exposure limit  
4.3.5 Retinal thermal hazard exposure limit  
4.3.7 Infrared radiation hazard exposure limits for the eye

**Testing location: SII**

42 Chaim Levanon St., Tel Aviv 69977, Israel

**Summary of compliance with National Differences: N / A****Copy of marking plate : N/A**



<b>Test item particulars</b> .....	
Tested lamp .....	<input checked="" type="checkbox"/> continuous wave lamps <input type="checkbox"/> pulsed lamps
Tested lamp system .....	
Lamp classification group .....	<input checked="" type="checkbox"/> exempt <input type="checkbox"/> risk 1 <input type="checkbox"/> risk 2 <input type="checkbox"/> risk 3
Lamp cap .....	
Bulb .....	LED
Rated of the lamp .....	Electrical:- 220/240Va.c 50/60 Hz: 180 mA 36W, 90 mA 18W, 45 mA 9W, 25 mA 4.5W
Furthermore marking on the lamp.....	
Seasoning of lamps according IEC standard .....	
Used measurement instrument.....	
Temperature by measurement.....	25 °C
Information for safety use .....	
<b>Possible test case verdicts:</b>	
- test case does not apply to the test object .....	N/A
- test object does meet the requirement .....	P (Pass)
- test object does not meet the requirement.....	F (Fail)
<b>Testing:</b>	
Date of receipt of test item.....	02/04/2017
Date (s) of performance of tests.....	04/2017
<b>General remarks:</b>	
<p>The test results presented in this report relate only to the object tested.          This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.          "(See Enclosure #)" refers to additional information appended to the report.          "(See appended table)" refers to a table appended to the report.          Throughout this report a comma (point) is used as the decimal separator.          List of test equipment must be kept on file and available for review.</p>	
<b>General product information:</b>	
<p>LDLS          Linear Detachable Light System</p> <ul style="list-style-type: none"> <li>• Self-Ballasted &amp; Self Cooled LED modules</li> <li>• 4800 Lumen/Meter</li> <li>• Dimmable</li> <li>• Emergency Light Included</li> </ul> <p>LED Details:          Manufactured by Lumileds Commercial Shanghai co. LTD.          4000K          240mA, 6.8Vd.c, 0.7W</p> <p>L128-4080CA35Z00T1</p>	

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
<b>4</b>	<b>EXPOSURE LIMITS</b>		
4.1	General		Pass
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure	Not less than 0,01 ms	Pass
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds $10^4 \text{ cd}\cdot\text{m}^{-2}$		N / A
4.3	Hazard exposure limits		
4.3.1	Actinic UV hazard exposure limit for the skin and eye	No UV radiation (LED equipment)	N / A
	The exposure limit for effective radiant exposure is $30 \text{ J}\cdot\text{m}^{-2}$ within any 8-hour period	No UV radiation (LED equipment)	N / A
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broad-band source, the effective integrated spectral irradiance, $E_s$ , of the light source shall not exceed the levels defined by:	No UV radiation (LED equipment)	N / A
	$E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J}\cdot\text{m}^{-2}$	No UV radiation (LED equipment)	N / A
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:	No UV radiation (LED equipment)	N / A
	$t_{\max} = \frac{30}{E_s} \quad \text{s}$	No UV radiation (LED equipment)	N / A
4.3.2	Near-UV hazard exposure limit for eye		
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed $10000 \text{ J}\cdot\text{m}^{-2}$ for exposure times less than 1000 s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, $E_{UVA}$ , shall not exceed $10 \text{ W}\cdot\text{m}^{-2}$ .	No Near-UV radiation (LED equipment)	N / A
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:	No Near-UV radiation (LED equipment)	N / A
	$t_{\max} \leq \frac{10\,000}{E_{UVA}} \quad \text{s}$	No Near-UV radiation (LED equipment)	N / A
4.3.3	Retinal blue light hazard exposure limit		

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, $B(\lambda)$ , i.e., the blue-light weighted radiance, $L_B$ , shall not exceed the levels defined by:		Pass
	$L_B \cdot t = \sum_{300}^{700} \sum_t L_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 10^6 \quad \text{J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t < 10^4$ s	N / A
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t > 10^4$ s	Pass
4.3.4	Retinal blue light hazard exposure limit - small source		
	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:	Not small source	N / A
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{J} \cdot \text{m}^{-2}$		N / A
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \quad \text{W} \cdot \text{m}^{-2}$	for $t > 100$ s	N / A
4.3.5	Retinal thermal hazard exposure limit		
	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:	See Appendix 1	Pass
	$L_{IR} = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50\,000}{\alpha \cdot t^{0,25}} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		Pass
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, $L_{IR}$ , as viewed by the eye for exposure times greater than 10 s shall be limited to:		N / A
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6\,000}{\alpha} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	$t > 10$ s	N / A
4.3.7	Infrared radiation hazard exposure limits for the eye		N / A

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis), ocular exposure to infrared radiation, $E_{IR}$ , over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		N / A
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 18000 \cdot t^{-0,75} \quad W \cdot m^{-2}$	$t \leq 1000 \text{ s}$	N / A
	For times greater than 1000 s the limit becomes:		
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2}$	$t > 1000 \text{ s}$	N / A
4.3.8	Thermal hazard exposure limit for the skin		
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:		Pass
	$E_H \cdot t = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta\lambda \leq 20000 \cdot t^{0,25} \quad J \cdot m^{-2}$		Pass
<b>5</b>	<b>MEASUREMENT OF LAMPS AND LAMP SYSTEMS</b>		
5.1	Measurement conditions		
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		Pass
5.1.1	Lamp ageing (seasoning)		N / A
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N / A
5.1.2	Test environment		N / A
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		N / A
5.1.3	Extraneous radiation		N / A
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.		N / A
5.1.4	Lamp operation		Pass
	Operation of the test lamp shall be provided in accordance with:		Pass
	– the appropriate IEC lamp standard, or		N / A
	– the manufacturer's recommendation		Pass

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
5.1.5	Lamp system operation		Pass
	The power source for operation of the test lamp shall be provided in accordance with:		Pass
	– the appropriate IEC standard, or		N / A
	– the manufacturer' s recommendation		Pass
5.2	Measurement procedure		
5.2.1	Irradiance measurements		Pass
	Minimum aperture diameter 7mm.		Pass
	Maximum aperture diameter 50 mm.	7mm used	N / A
	The measurement shall be made in that position of the beam giving the maximum reading.		Pass
	The measurement instrument is adequate calibrated.		Pass
5.2.2	Radiance measurements	Alternative method	N / A
5.2.2.1	Standard method	Alternative method	N / A
	The measurements made with an optical system.		N / A
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		N / A
5.2.2.2	Alternative method		Pass
	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.		Pass
5.2.3	Measurement of source size	LED matrix	N / A
	The determination of $\alpha$ , the angle subtended by a source, requires the determination of the 50% emission points of the source.	$\alpha_{matrix\ LED} = D/r = [(114+3.5)/2]/200 = 293.75\text{mrad}$ $\alpha_{matrix\ LED} > \alpha_{max} = 100\text{ mrad}$	N / A
5.2.4	Pulse width measurement for pulsed sources	CW LED	N / A
	The determination of $\Delta t$ , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N / A
5.3	Analysis methods		
5.3.1	Weighting curve interpolations	Curve interpolations	Pass
	To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.		Pass
5.3.2	Calculations		Pass

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		Pass
5.3.3	Measurement uncertainty	Uncertainty 7.5%,K=2	Pass
	The quality of all measurement results must be quantified by an analysis of the uncertainty.		Pass
<b>6</b>	<b>LAMP CLASSIFICATION</b>		
	For the purposes of this standard it was decided that the values shall be reported as follows:	See table 6.1	N / A
	– for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		N / A
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm		Pass
6.1	Continuous wave lamps		
6.1.1	Exempt Group		
	In the exempt group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:	Exempt Group	Pass
	– an actinic ultraviolet hazard ( $E_S$ ) within 8-hours exposure (30000 s), nor	Exempt Group	Pass
	– a near-UV hazard ( $E_{UVA}$ ) within 1000 s, (about 16 min), nor	Exempt Group	Pass
	– a retinal blue-light hazard ( $L_B$ ) within 10000 s (about 2,8 h), nor	Exempt Group	Pass
	– a retinal thermal hazard ( $L_R$ ) within 10 s, nor	Exempt Group	Pass
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 1000 s	Exempt Group	Pass
6.1.2	Risk Group 1 (Low-Risk)		
	In this group are lamps, which exceeds the limits for the exempt group but that does not pose:		N / A
	– an actinic ultraviolet hazard ( $E_S$ ) within 10000 s, nor	Exempt Group	N / A
	– a near ultraviolet hazard ( $E_{UVA}$ ) within 300 s, nor	Exempt Group	N / A
	– a retinal blue-light hazard ( $L_B$ ) within 100 s, nor	Exempt Group	Pass
	– a retinal thermal hazard ( $L_R$ ) within 10 s, nor	Exempt Group	N / A

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 100 s	Exempt Group	N / A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard ( $L_{IR}$ ), within 100 s are in Risk Group 1.		N / A
6.1.3	Risk Group 2 (Moderate-Risk)		
	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 ( $E_S$ ) within 1000 s exposure, nor		N / A
	– a near ultraviolet hazard ( $E_{UVA}$ ) within 100 s, nor		N / A
	– a retinal blue-light hazard ( $L_B$ ) within 0,25 s (aversion response), nor		N / A
	– a retinal thermal hazard ( $L_R$ ) within 0,25 s (aversion response), nor		N / A
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 10 s		N / A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard ( $L_{IR}$ ), within 10 s are in Risk Group 2.		N / A
6.1.4	Risk Group 3 (High-Risk)		
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N / A
6.2	Pulsed lamps		
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.	CW operation	N / A
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.	CW operation	N / A
	The risk group determination of the lamp being tested shall be made as follows:	CW operation	N / A
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)	CW operation	N / A
	– for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group	CW operation	N / A
	– for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission	CW operation	N / A

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

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



IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Wavelength nm	Blue-light hazard function B (λ)	Burn hazard function R (λ)
300	0,01	
305	0,01	
310	0,01	
315	0,01	
320	0,01	
325	0,01	
330	0,01	
335	0,01	
340	0,01	
345	0,01	
350	0,01	
355	0,01	
360	0,01	
365	0,01	
370	0,01	
375	0,01	
380	0,01	0,1
385	0,013	0,13
390	0,025	0,25
395	0,05	0,5
400	0,10	1,0
405	0,20	2,0
410	0,40	4,0
415	0,80	8,0
420	0,90	9,0
425	0,95	9,5
430	0,98	9,8
435	1,00	10,0
440	1,00	10,0
445	0,97	9,7
450	0,94	9,4
455	0,90	9,0
460	0,80	8,0
465	0,70	7,0
470	0,62	6,2
475	0,55	5,5
480	0,45	4,5
485	0,40	4,0
490	0,22	2,2
495	0,16	1,6
500-600	$10^{[(450-\lambda)/50]}$	1,0
600-700	0,001	1,0
700-1050		$10^{[(700-\lambda)/500]}$
1050-1150		0,2
1150-1200		$0,2 \cdot 10^{0,02(1150-\lambda)}$
1200-1400		0,02

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

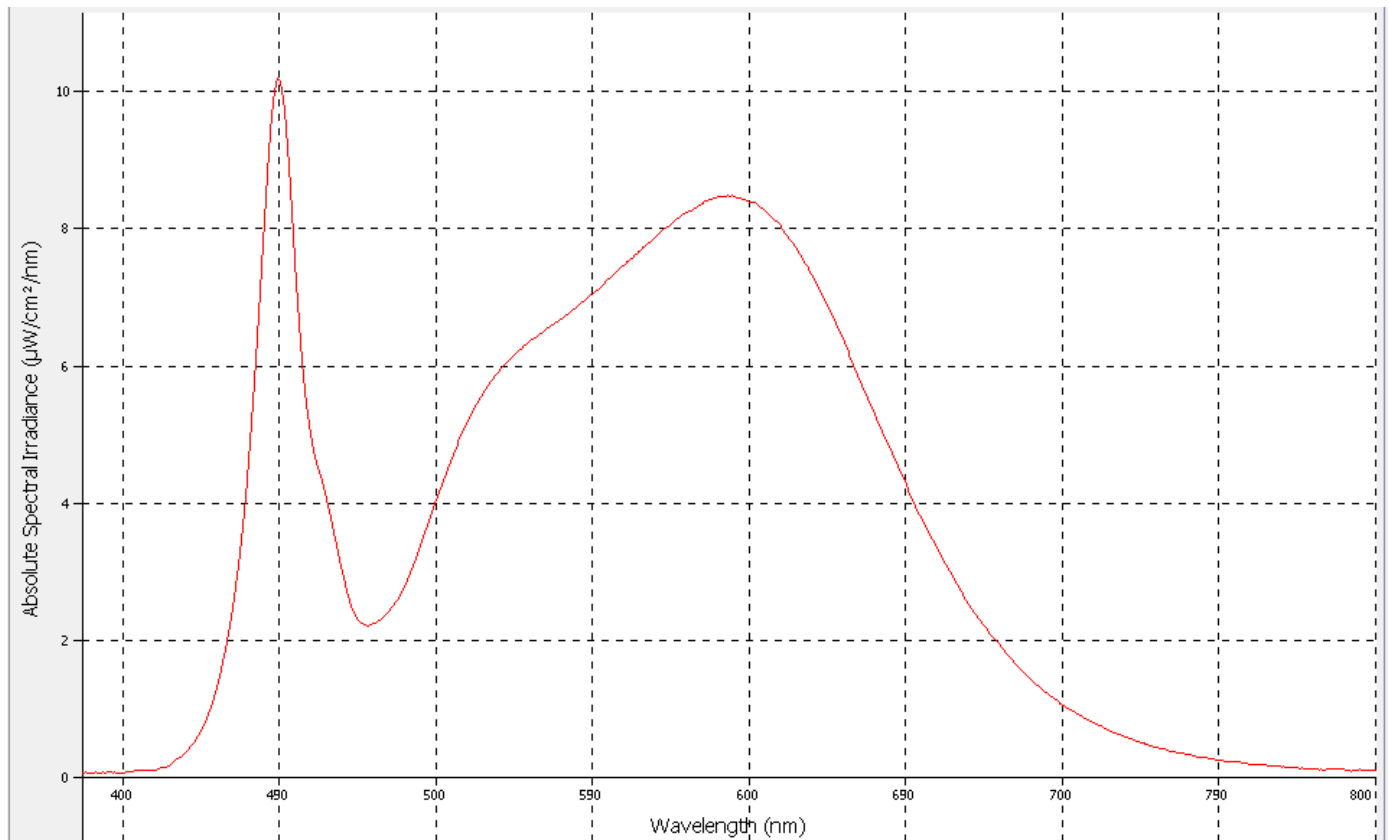
Table 5.4 Summary of the ELs for the surface of the skin or cornea (irradiance based values)					-
Hazard Name	Relevant equation	Wavelength range nm	Exposure duration sec	Limiting aperture rad (deg)	EL in terms of constant irradiance $W \cdot m^{-2}$
Actinic UV skin & eye	$E_S = \sum E_\lambda \cdot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

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

# Appendix 1

## Spectral Irradiance test and calculations

### Spectral irradiance for 1.4rad



Measurements were performed at a distance of 200mm from LED

## Calculation for classification With diffuser

IEC 62471									
Clause	Requirement + Test	Result – Remark							Verdict
<b>Table 6.1</b>	Emission limits for risk groups of continuous wave lamps- <b>Tested at 200mm</b>							Pass	
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	SUV( $\lambda$ )	Es	W•m-2	0,001	N/A	0,003	N/A	0,03	N/A
Near UV		EUVA	W•m-2	10	N/A	33	N/A	100	N/A
Blue light	B( $\lambda$ )	LB	W•m-2•sr-1	100	<b>14</b>	10000	N/A	4000000	N/A
Blue light, small source	B( $\lambda$ )	EB	W•m-2	1,0*	N/A	1,0	N/A	400	N/A
Retinal thermal	R( $\lambda$ )	LR	W•m-2•sr-1	$28,000/\alpha$ $=2,8E5$	<b>1122</b>	$28000/\alpha$	N/A	$71000/\alpha$	N/A
Retinal thermal, weak visual stimulus**	R( $\lambda$ )	LIR	W•m-2•sr-1	$6000/\alpha$	N/A	$6000/\alpha$	N/A	$6000/\alpha$	N/A
IR radiation, eye		EIR	W•m-2	100	N/A	N/A	N/A	N/A	N/A
Skin thermal		EH	W•m-2	3556	<b>14.95</b>	N/A	N/A	N/A	N/A
* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. ** Involves evaluation of non-GLS source									

## Calculation for classification Without diffuser

IEC 62471									
Clause	Requirement + Test	Result – Remark							Verdict
<b>Table 6.1</b>	Emission limits for risk groups of continuous wave lamps- <b>Tested at 200mm</b>							Pass	
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	SUV( $\lambda$ )	Es	W•m-2	0,001	N/A	0,003	N/A	0,03	N/A
Near UV		EUVA	W•m-2	10	N/A	33	N/A	100	N/A
Blue light	B( $\lambda$ )	LB	W•m-2•sr-1	100	<b>40</b>	10000	N/A	4000000	N/A
Blue light, small source	B( $\lambda$ )	EB	W•m-2	1,0*	N/A	1,0	N/A	400	N/A
Retinal thermal	R( $\lambda$ )	LR	W•m-2•sr-1	$28,000/\alpha$ $=2,8E5$	<b>11447</b>	$28000/\alpha$	N/A	$71000/\alpha$	N/A
Retinal thermal, weak visual stimulus**	R( $\lambda$ )	LIR	W•m-2•sr-1	$6000/\alpha$	N/A	$6000/\alpha$	N/A	$6000/\alpha$	N/A
IR radiation, eye		EIR	W•m-2	100	N/A	N/A	N/A	N/A	N/A
Skin thermal		EH	W•m-2	3556	<b>23.2</b>	N/A	N/A	N/A	N/A
* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. ** Involves evaluation of non-GLS source									

## Appendix 2

### Photos

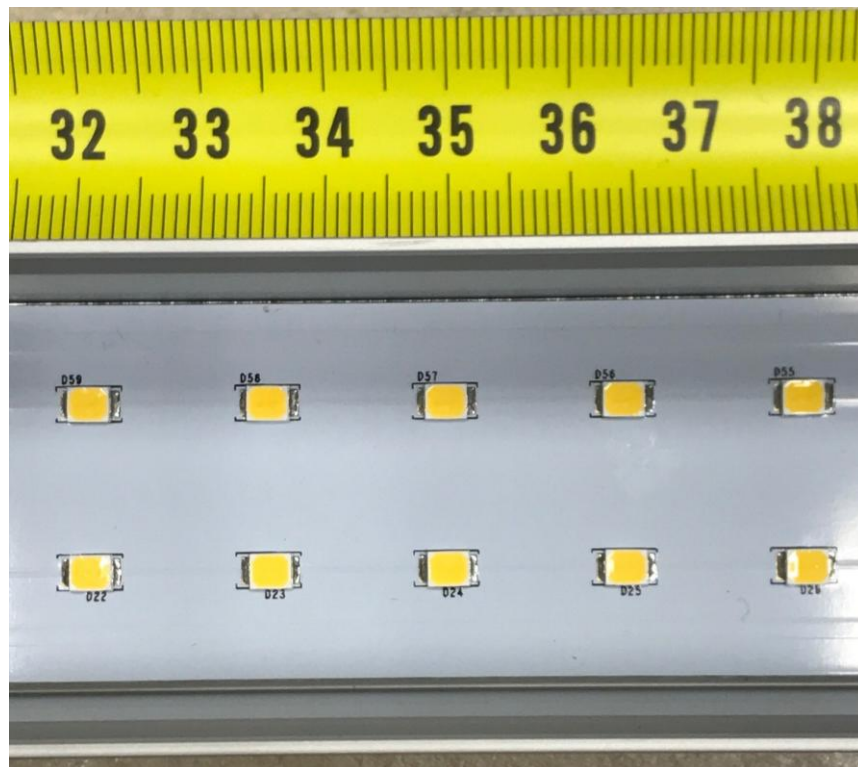
#### Source without diffuser



#### Source with diffuser



#### Distance between led's



### Led side



### Dilates about source



### Appendix 3 Test instruments

SII Ref. No.	Instrument Type	Manufacturer	Model	Expire Cal. Date	SII Location	Accreditation Lab
6501633	Photodiode sensors and integrating spheres	Ophir Optronics	3A-IS	08/17	Telem. Lab	√
6501988	Thermal Head	Ophir Optronics	3A-P-FS-RoHS	12/17	Telem. Lab	√
6500711	CCD Camera	Spiricon	USB-SP620U	-	Telem. Lab	√
606686	Laser Power/Energy Monitor	Ophir Optronics	VEGA Display	08/17	Telem. Lab	√
6501928	Spectro radiometer	OceanOptics	HR2000+ES	--	Telem. Lab	-
5517	Calibration lamp Deuterium +Halogen	OceanOptics	DH-2000	50 h operation	Telem. Lab	√
6501632	Spectro radiometer	Control Development	NIR-256-1.7 T1	05/17	Telem. Lab	-

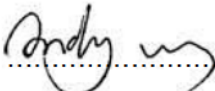
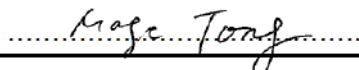




**APPENDIX 5  
DEKRA TEST REPORT ACCORDING TO  
IEC62471 FOR THE LED PACKAGE**

(22 pages attached)

<b>TEST REPORT</b> <b>IEC 62471</b> <b>Photobiological safety of lamps and lamp systems</b>	
<b>Report Reference No.</b> .....	4326433.51
<b>Date of issue</b> .....	2016-03-30
<b>Total number of pages</b> .....	21 Pages
<b>Testing Laboratory</b> .....	DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou branch
<b>Address</b> .....	Building A3, No. 3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P. R. China
<b>Applicant's name</b> .....	Lumileds Commercial(Shanghai) Co., Ltd.
<b>Address</b> .....	No. 9, Lane 888, Tianlin Road, Shanghai, China
<b>Test specification:</b>	
<b>Standard</b> .....	IEC 62471: 2006 (First Edition)
<b>Test procedure</b> .....	Type test
<b>Non-standard test method</b> .....	N/A
<b>Test Report Form No.</b> .....	IEC62471A
<b>TRF Originator</b> .....	VDE Testing and Certification Institute
<b>Master TRF</b> .....	Dated 2009-05
<b>Test item description</b> .....	LED Package
<b>Trade Mark</b> .....	--
<b>Manufacturer</b> .....	21447 (21447 is Manufacturer/ Factory tracking code at DEKRA.)
<b>Address</b> .....	--
<b>Factory</b> .....	21447 (21447 is Manufacturer/ Factory tracking code at DEKRA.)
<b>Address</b> .....	--
<b>Model/Type reference</b> .....	L128-xx80CB35z0001, L128-xx80CA35z0001 ("xx" can be 27, 30, 35, 40, 50, 57, 65, represents different CCT 2700K, 3000K, 3500K, 4000K, 5000K, 5700K, 6500K respectively, "z" means different customer base)
<b>Ratings</b> .....	240 mA, 6,8 Vdc, 0,7 W

<b>Testing procedure and testing location:</b>	
<input checked="" type="checkbox"/> <b>Testing Laboratory:</b> Testing location/ address.....:	DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou branch Building A3, No. 3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P. R. China  Tested by (name + signature) .....: Andy Wang Approved by (name + signature)..: Fair Deng
 	
<b>Summary of testing:</b>	
<b>Tests performed (name of test and test clause):</b> 4326433.50: L128-6580CB35z0001 was subjected to full test. Other models were subjected to construction check.  4326433.50 V1.0: No additional test is needed.  4326433.51: No additional test is needed.	<b>Testing location:</b> DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou branch Building A3, No. 3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P. R. China
<b>Summary of compliance with National Differences:</b> Not checked.	

<b>Copy of marking plate:</b>	N/A
-------------------------------	-----

<b>Test item particulars</b> .....	LED Package
Tested lamp .....	<input checked="" type="checkbox"/> continuous wave lamps <input type="checkbox"/> pulsed lamps
Tested lamp system .....	N/A
Lamp classification group .....	<input checked="" type="checkbox"/> exempt <input checked="" type="checkbox"/> risk 1 <input type="checkbox"/> risk 2 <input type="checkbox"/> risk 3
Lamp cap .....	--
Bulb .....	--
Rated of the lamp .....	Same as the Ratings in page 1
Furthermore marking on the lamp .....	N/A
Seasoning of lamps according IEC standard .....	N/A
Used measurement instrument .....	Spectroradiometer
Temperature by measurement .....	25 °C
Information for safety use .....	--
<b>Possible test case verdicts:</b>	
– test case does not apply to the test object .....	N/A
– test object does meet the requirement .....	P (Pass)
– test object does not meet the requirement .....	F (Fail)
<b>Testing:</b>	
Date of receipt of test item .....	2015-12-15
Date (s) of performance of tests .....	2015-12-15 to 2015-12-17
<b>General remarks:</b>	
<p>The test results presented in this report relate only to the object tested.          This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.          "(See Enclosure #)" refers to additional information appended to the report.          "(See appended table)" refers to a table appended to the report.          Throughout this report a comma is used as the decimal separator.          List of test equipment must be kept on file and available for review.</p>	
<b>General product information:</b>	
Attachment 1: List of test equipment used (1 page)      Attachment 2: Photos (1 page)	
Attachment 3: Test Result (1 page)      Attachment 4: LED chip specification (1 page)	
Attachment 5: The difference between IEC 62471:2006 and EN 62471:2008 (1 page)	
<p>The products in this report were tested and compliant with following standards:          -IEC 62471: 2006          -EN 62471: 2008          -IEC/TR 62471-2: 2009</p>	
<p>L128-6580CB35z0001 was tested and classified as Exempt Group. Other models were evaluated and classified as Exempt Group. Therefore all these models do not pose any photobiological hazard according to IEC62471. No warning labelling is required.</p>	
<p>For the blue light hazard required by IEC TR 62778:2014, model L128-6580CB35z0001 was tested and met Group 1. So all these models need not mark Ethr.</p>	

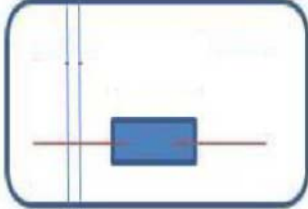
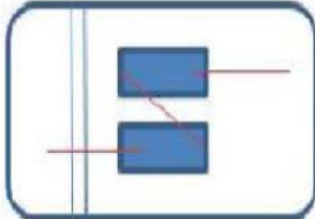
This report replaces report 4326433.50 (Issued on 2015-12-18) due to the below change:

1. Add family models into the model list: L128-xx80CA35z0001
2. Describe the difference of the models.

This report replaces report 4326433.50V1.0 (Issued on 2016-01-11) due to the below change:

1. Change model name and circuit graph.

Model No.	CCT (K)	No. of LED Die.
L128-2780CA35z00T1	2700	1
L128-3080CA35z00T1	3000	1
L128-3580CA35z00T1	3500	1
L128-4080CA35z00T1	4000	1
L128-5080CA35z00T1	5000	1
L128-5780CA35z00T1	5700	1
L128-6580CA35z00T1	6500	1
L128-2780CB35z00T1	2700	2
L128-3080CB35z00T1	3000	2
L128-3580CB35z00T1	3500	2
L128-4080CB35z00T1	4000	2
L128-5080CB35z00T1	5000	2
L128-5780CB35z00T1	5700	2
L128-6580CB35z00T1	6500	2

 <p>2835 1D-MP</p>	<table border="1"> <tbody> <tr><td>L128-2780CA3500001</td></tr> <tr><td>L128-3080CA3500001</td></tr> <tr><td>L128-3580CA3500001</td></tr> <tr><td>L128-4080CA3500001</td></tr> <tr><td>L128-5080CA3500001</td></tr> <tr><td>L128-5780CA3500001</td></tr> <tr><td>L128-6580CA3500001</td></tr> </tbody> </table>	L128-2780CA3500001	L128-3080CA3500001	L128-3580CA3500001	L128-4080CA3500001	L128-5080CA3500001	L128-5780CA3500001	L128-6580CA3500001
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 <p>2835 2D-MP</p>	<table border="1"> <tbody> <tr><td>L128-2780CB3500001</td></tr> <tr><td>L128-3080CB3500001</td></tr> <tr><td>L128-3580CB3500001</td></tr> <tr><td>L128-4080CB3500001</td></tr> <tr><td>L128-5080CB3500001</td></tr> <tr><td>L128-5780CB3500001</td></tr> <tr><td>L128-6580CB3500001</td></tr> </tbody> </table>	L128-2780CB3500001	L128-3080CB3500001	L128-3580CB3500001	L128-4080CB3500001	L128-5080CB3500001	L128-5780CB3500001	L128-6580CB3500001
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L128-5080CB35000T1								
L128-5780CB35000T1								
L128-6580CB35000T1								

No additional test is needed for the adding models.

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
4	<b>EXPOSURE LIMITS</b>		P
4.1	General		P
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure		P
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds $10^4 \text{ cd m}^{-2}$	see clause 4.3	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 $30 \text{ J m}^{-2}$ within any 8-hour period		P
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broadband source, the effective integrated spectral irradiance, $E_s$ , of the light source shall not exceed the levels defined by:		P
	$E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J m}^{-2}$		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{\max} = \frac{30}{E_s} \quad \text{s}$		P
4.3.2	Near-UV hazard exposure limit for eye		P
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed $10000 \text{ J m}^{-2}$ for exposure times less than 1000 s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, $E_{UVA}$ , shall not exceed $10 \text{ W m}^{-2}$ .		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		P
	$t_{\max} \leq \frac{10\,000}{E_{UVA}} \quad \text{s}$		P
4.3.3	Retinal blue light hazard exposure limit		P

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, $B(\lambda)$ , i.e., the blue-light weighted radiance, $L_B$ , shall not exceed the levels defined by:		P
	$L_B \cdot t = \sum_{300}^{700} \sum_t L_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \cdot \Delta t \leq 10^6 \quad \text{J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t \leq 10^4$ s $t_{\max} = \frac{10^6}{L_B}$	P
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t > 10^4$ s	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:	see table 4.2	N/A
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \cdot \Delta t \leq 100 \quad \text{J} \cdot \text{m}^{-2}$	for $t \leq 100$ s	N/A
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \quad \text{W} \cdot \text{m}^{-2}$	for $t > 100$ s	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
	$I_R = \sum_{380}^{1400} I_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50\,000}{\alpha \cdot t^{0,25}} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	( $10 \mu\text{s} \leq t \leq 10$ s)	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		N/A
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, $L_{IR}$ , as viewed by the eye for exposure times greater than 10 s shall be limited to:		N/A
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6\,000}{\alpha} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	$t > 10$ s	N/A
4.3.7	Infrared radiation hazard exposure limits for the eye		P



IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis), ocular exposure to infrared radiation, $E_{IR}$ , over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		P
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 18\,000 \cdot t^{-0,75} \quad W \cdot m^{-2}$	$t \leq 1000 \text{ s}$	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 3000 nm) of the skin shall be limited to:		P
	$E_{H \cdot t} = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta\lambda \leq 20\,000 \cdot t^{0,25} \quad J \cdot m^{-2}$		P

5	<b>MEASUREMENT OF LAMPS AND LAMP SYSTEMS</b>		P
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		N/A
	Seasoning of lamps shall be done as 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 or manufacturer's recommendations.		P
5.1.3	Extraneous radiation		P
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		N/A
	Operation of the test lamp shall be provided in accordance with:		N/A
	– the appropriate IEC lamp standard, or		N/A
	– the manufacturer's recommendation		N/A

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
5.1.5	Lamp system operation		P
	The power source for operation of the test lamp shall be provided in accordance with:		P
	– the appropriate IEC standard, or		N/A
	– the manufacturer' s recommendation		P
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	Maximum aperture diameter 50 mm.		P
	The measurement shall be made in that position of the beam giving the maximum reading.		P
	The measurement instrument is adequate calibrated.		P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		P
	The measurements made with an optical system.		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		P
5.2.2.2	Alternative method		N/A
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		N/A
5.2.3	Measurement of source size		P
	The determination of $\alpha$ , the angle subtended by a source, requires the determination of the 50% emission points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N/A
	The determination of $\Delta t$ , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N/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.	see table 4.1	P

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

5.3.2	Calculations		P
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		P
5.3.3	Measurement uncertainty		P
	The quality of all measurement results must be quantified by an analysis of the uncertainty.		P

<b>6</b>	<b>LAMP CLASSIFICATION</b>		P
	For the purposes of this standard it was decided that the values shall be reported as follows:	see table 6.1	P
	– for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm	330 mm	P
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm	For blue light hazard measurement required by IEC TR 62778:2014: Risk Group 1 ( $L_B = 7424,16 \text{ W sr}^{-1} \text{ m}^{-2}$ );	P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group (for IEC 62471 part)		P
	In the exempt group are lamps, which do not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		P
	– an actinic ultraviolet hazard ( $E_S$ ) within 8-hours exposure (30000 s), nor		P
	– a near-UV hazard ( $E_{UVA}$ ) within 1000 s, (about 16 min), nor		P
	– a retinal blue-light hazard ( $L_B$ ) within 10000 s (about 2,8 h), nor		P
	– a retinal thermal hazard ( $L_R$ ) within 10 s, nor		P
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 1000 s		P
6.1.2	Risk Group 1 (Low-Risk) (for IEC TR 62778 part)		P
	In this group are lamps, which exceeds the limits for the except group but that does not pose:		P

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	– an actinic ultraviolet hazard ( $E_S$ ) within 10000 s, nor		N/A
	– a near ultraviolet hazard ( $E_{UVA}$ ) within 300 s, nor		N/A
	– a retinal blue-light hazard ( $L_B$ ) within 100 s, nor		P
	– a retinal thermal hazard ( $L_R$ ) within 10 s, nor		N/A
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 100 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard ( $L_{IR}$ ), within 100 s are in Risk Group 1.		P
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 ( $E_S$ ) within 1000 s exposure, nor		N/A
	– a near ultraviolet hazard ( $E_{UVA}$ ) within 100 s, nor		N/A
	– a retinal blue-light hazard ( $L_B$ ) within 0,25 s (aversion response), nor		N/A
	– a retinal thermal hazard ( $L_R$ ) within 0,25 s (aversion response), nor		N/A
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 10 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard ( $L_{IR}$ ), within 10 s are in Risk Group 2.		N/A
6.1.4	Risk Group 3 (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 0,25 s.		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

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	– for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N/A
	– for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N/A

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

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

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

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P
Wavelength nm	Blue-light hazard function B ( $\lambda$ )	Burn hazard function R ( $\lambda$ )
300	0,01	
305	0,01	
310	0,01	
315	0,01	
320	0,01	
325	0,01	
330	0,01	
335	0,01	
340	0,01	
345	0,01	
350	0,01	
355	0,01	
360	0,01	
365	0,01	
370	0,01	
375	0,01	
380	0,01	0,1
385	0,013	0,13
390	0,025	0,25
395	0,05	0,5
400	0,10	1,0
405	0,20	2,0
410	0,40	4,0
415	0,80	8,0
420	0,90	9,0
425	0,95	9,5
430	0,98	9,8
435	1,00	10,0
440	1,00	10,0
445	0,97	9,7
450	0,94	9,4
455	0,90	9,0
460	0,80	8,0
465	0,70	7,0
470	0,62	6,2
475	0,55	5,5
480	0,45	4,5
485	0,40	4,0
490	0,22	2,2
495	0,16	1,6
500-600	$10^{[(450-\lambda)/50]}$	1,0
600-700	0,001	1,0
700-1050		$10^{[(700-\lambda)/500]}$
1050-1150		0,2

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources		P
	1150-1200		$0,2 \cdot 10^{0,02(1150-\lambda)}$
	1200-1400		0,02

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

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



<b>IEC 62471</b>	
Requirement + Test	Result – Remark
Clause	Verdict

Risk	Action spectrum	Symbol	Units	Emission Measurement						P
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	$S_{UV}(\lambda)$	$E_s$	$W \cdot m^{-2}$	0,001	0,00019	0,003	--	0,03	--	--
Near UV		$E_{UVA}$	$W \cdot m^{-2}$	10	0,00074	33	--	100	--	--
Blue light	$B(\lambda)$	$L_B$	$W \cdot m^{-2} \cdot sr^{-1}$	100	--	10000	--	4000000	--	--
Blue light, small source	$B(\lambda)$	$E_B$	$W \cdot m^{-2}$	1,0*	0,25	1,0	--	400	--	--
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ $\alpha$	57726,11 ( $\alpha=7,6$ mrad)	28000/ $\alpha$	--	71000/ $\alpha$	--	--
Retinal thermal, weak visual stimulus**	$R(\lambda)$	$L_{IR}$	$W \cdot m^{-2} \cdot sr^{-1}$	6000/ $\alpha$	--	6000/ $\alpha$	--	6000/ $\alpha$	--	--
IR radiation, eye		$E_{IR}$	$W \cdot m^{-2}$	100	0,07	570	--	3200	--	--

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

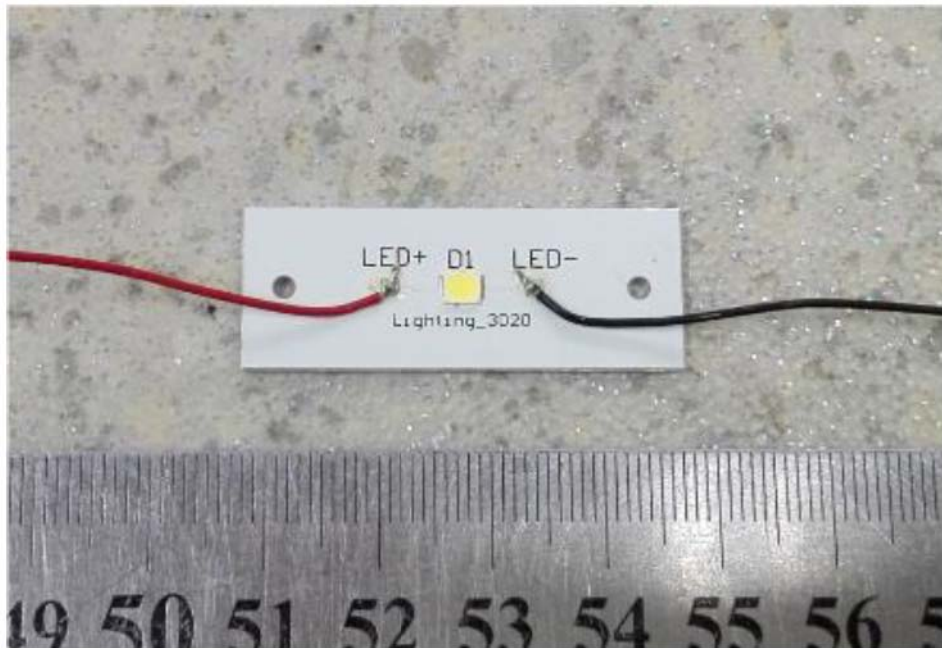
\*\* Involves evaluation of non-GLS source

**Attachment 1: Furthermore remarks:**

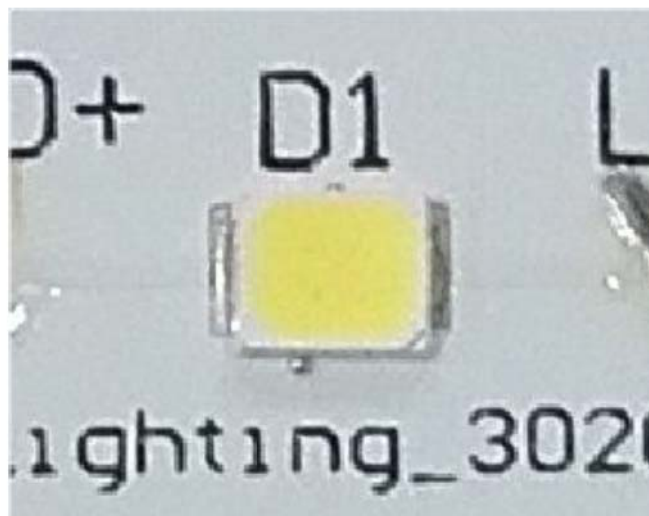
List of test equipment used:

<b>Clause</b>	<b>Measurement/ testing</b>	<b>Registration Number</b>	<b>Testing/measuring equipment/material used</b>	<b>Range used</b>
5	Irradiance measurements Radiance measurements	G/L655	Spectroradiometer	200-3000nm

**Attachment 2: Photos**

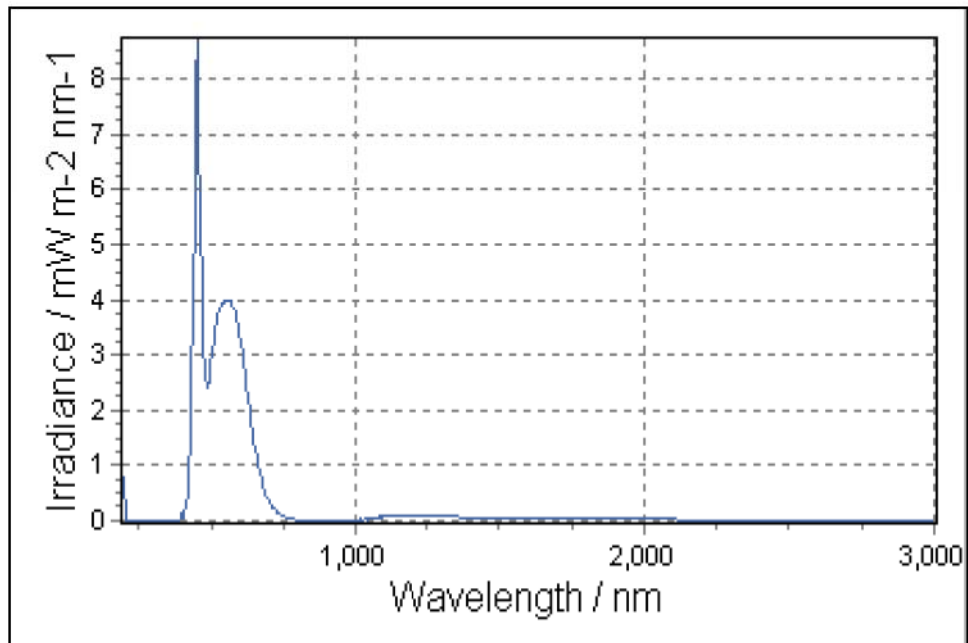


Overview

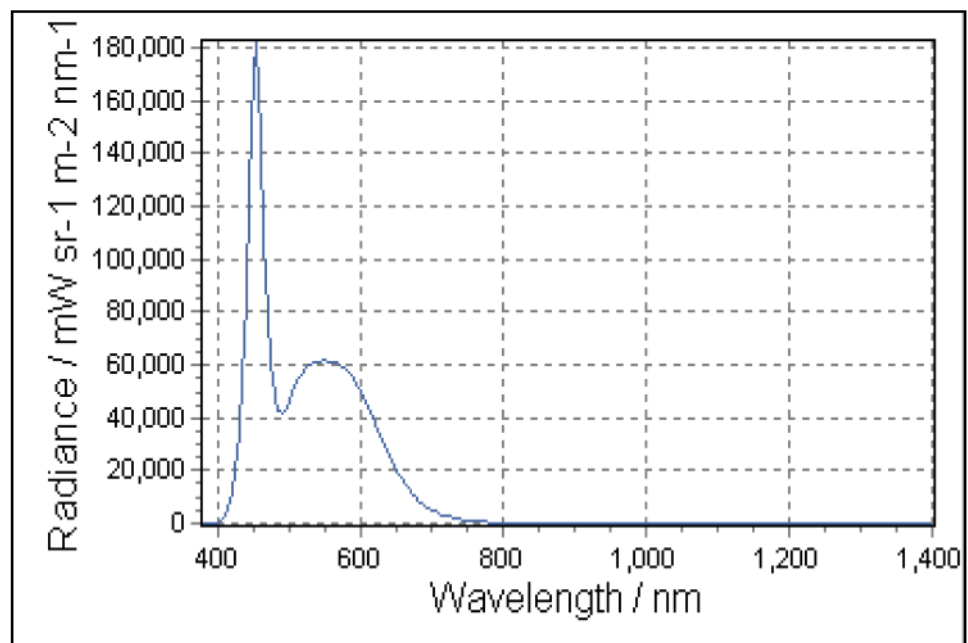


Overview

Attachment 3: Test Result



Measured spectral irradiance distribution



Measured spectral radiance distribution

**Attachment 4: LED chip specification**

<b>Manufacturer</b>	<b>LED type no.</b>	<b>Technical Data</b>	<b>Remark</b>
Lumileds	L128-6580CB35z0001	6,8 Vdc, Max If: 240 mA, 6500 K	--

**Attachment 5: The difference between IEC 62471: 2006 and EN 62471: 2008**

Table 4.1 wavelength step of the  $SUV(\lambda)$  is 1nm listed according to EN 62471 and 5nm listed according to IEC 62471. The system is calculated according to both IEC 62471 and EN 62471, so that the results which calculated have no influence to the issued result, especially for the lamp classification. As the result, EN 62471 can be covered for the tested items in this report.

About the starting wavelength from 180nm of EN 62471 and starting wavelength from 200nm of IEC 62471, it is very difficult to the radiation below 200nm at common condition and also from the behaviour of samples which are tested. However, there should be no any output below 200nm for the normal lamps. As the result, EN 62471 can be covered for the tested items in this report.

About Blue Light Small Source, the limit of Exempt Group is 0, 01  $W \cdot m^{-2}$  according to EN 62471 and 1, 0  $W \cdot m^{-2}$  according to IEC 62471. Since the evaluation of Blue Light in this report do not consider as small source, so there are no influence to the Blue Light hazard classification also.

-END-