



**TEST REPORT**  
**IEC 62031**  
**LED modules for general lighting – Safety specifications**

**Report Number** ..... : 611401607501  
**Date of issue** ..... : 2016-11-10  
**Total number of pages** ..... : 23 pages (excluding enclosures)

**Name of Testing Laboratory preparing the Report** ..... : TÜV SÜD Asia Ltd. Taiwan Branch  
7F., No. 37, Sec. 2, Zhongyang S., Rd., Beitou District, Taipei City, 11270, Taiwan

**Applicant's name** ..... : Top Win Optoelectronics Corp.  
**Address** ..... : 5F, -2, No. 120, Qiaohe Rd., Zhonghe Dist., New Taipei City, New Taipei City

**Test specification:**

**Standard** ..... : IEC 62031:2008 (First Edition) + A1:2012 + A2:2014  
**Test procedure** ..... : CE (LVD)  
**Non-standard test method** ..... : N/A

**Test Report Form No.** ..... : IEC62031C  
**Test Report Form(s) Originator** .... : Intertek Semko AB  
**Master TRF** ..... : 2014-11


**Copyright © 2014 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved.**

This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

**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.**

**General disclaimer:**

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.

<b>Test item description</b> .....:	SLITE module
<b>Trade Mark</b> .....:	
<b>Manufacturer</b> .....	Same as applicant
<b>Model/Type reference</b> .....:	MD5T01
<b>Ratings</b> .....:	32-42 Vdc, 1.5 A Max., 55 W Max ta=60°C, IP66



<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>		
<input checked="" type="checkbox"/>	<b>Testing Laboratory:</b>	TÜV SÜD Asia Ltd. Taiwan Branch
	<b>Testing location/ address .....</b>	7F., No. 37, Sec. 2, Zhongyang S., Rd., Beitou District, Taipei City, 11270, Taiwan
<input type="checkbox"/>	<b>Associated CB Testing Laboratory:</b>	
	<b>Testing location/ address .....</b>	
	<b>Tested by (name, function, signature)..... :</b>	Ellen Yuan <i>Ellen Yuan</i>
	<b>Approved by (name, function, signature) .. :</b>	Alin Hung <i>Alin Hung</i>
<input type="checkbox"/>	<b>Testing procedure: TMP/CTF Stage 1:</b>	
	<b>Testing location/ address .....</b>	
	<b>Tested by (name, function, signature)..... :</b>	
	<b>Approved by (name, function, signature) .. :</b>	
<input type="checkbox"/>	<b>Testing procedure: WMT/CTF Stage 2:</b>	
	<b>Testing location/ address .....</b>	
	<b>Tested by (name + signature)..... :</b>	
	<b>Witnessed by (name, function, signature) . :</b>	
	<b>Approved by (name, function, signature) .. :</b>	
<input type="checkbox"/>	<b>Testing procedure: SMT/CTF Stage 3 or 4:</b>	
	<b>Testing location/ address .....</b>	
	<b>Tested by (name, function, signature)..... :</b>	
	<b>Witnessed by (name, function, signature) . :</b>	
	<b>Approved by (name, function, signature) .. :</b>	
	<b>Supervised by (name, function, signature) :</b>	

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

This report contains a total of 40 pages, including the attachment which consist of:

Enclosure 1: Test report for EN 62471:2008 (9 pages)

Enclosure 2: Test report for IEC/TR 62778:2014 (2 pages)

Enclosure 3: Test report for EN 62493:2015 (2 pages)

Enclosure 4: Photograph of the items tested. (4 pages)

**Summary of testing:**

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

1. All tests were found to be in conformity with the following standards: IEC 62031: 2008+A1: 2012+A2: 2014 and EN 62031: 2008+A1: 2013+A2:2015
2. The LED luminaires complies with the requirements of Risk group 1 as specified in EN 62471:2008. See Enclosure 1 of test report for details.
3. The assessment of blue light hazard was tested according to IEC/TR 62778:2014. See Enclosure 2 of test report for details.
4. The LED luminaires complies with the requirements of EN 62493:2015 See Enclosure 3 of test report for details.
5. The test conditions in this report were performed at max output load condition as indicated in the instruction manual.

**Testing location:**

TÜV SÜD Asia Ltd. Taiwan Branch  
7F., No. 37, Sec. 2, Zhongyang S., Rd., Beitou District, Taipei City, 11270, Taiwan

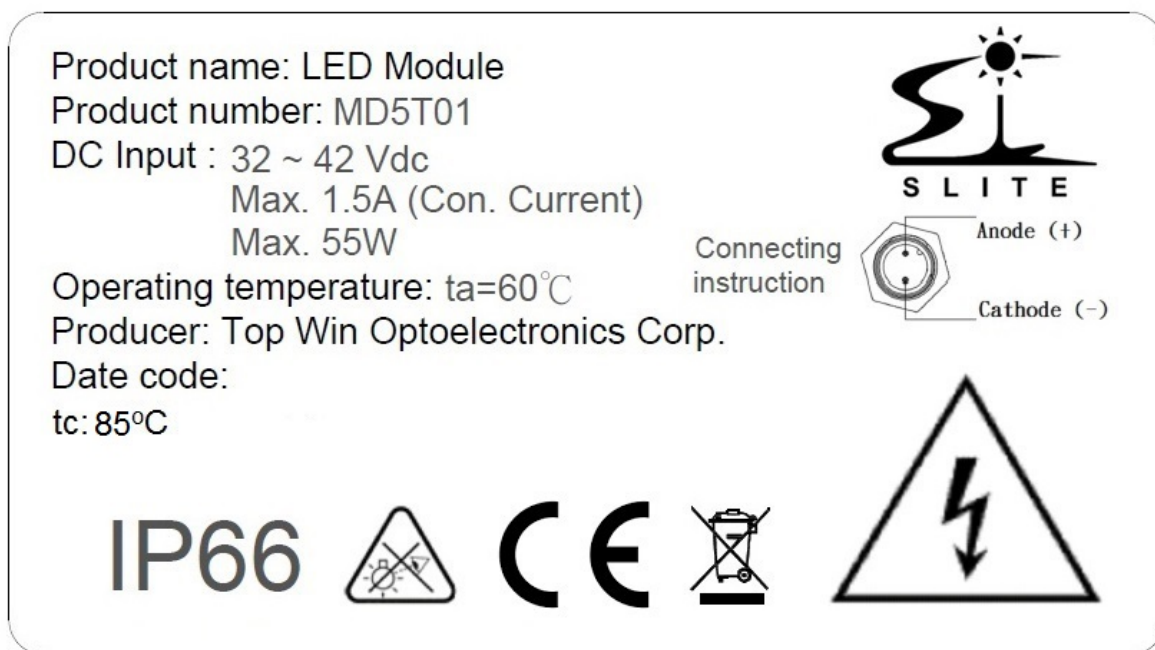
**Summary of compliance with National Differences:**

N/A



**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.**

Example label



Remark on above marking:

1. The height of graphical symbols shall not be less than 5 mm, the height of  shall be at least 7 mm and the minimum height of  shall be 15 mm.
2. The height of letters and numerals shall not be less than 2 mm.
3. Customer verified they are aware of requirement to include importer full name and address with product.



<b>Test item particulars</b> ..... :	
<b>Classification of installation and use</b> ..... : Independent LED module	
<b>Supply Connection</b> ..... : Detachable SELV connector for connecting to certified adapter	
<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> ..... : 2016-10-06	
<b>Date (s) of performance of tests</b> ..... : 2016-10-24 to 2016-11-09	
<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 61347-1	
<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"/> 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> ..... : Top Win Optoelectronics Corp. 5F, -2, No. 120, Qiaohe Rd., Zhonghe Dist., New Taipei City, New Taipei City	
<b>General product information:</b>	
1. Independent LED module for outdoor use, supplied by constant current.	

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>GENERAL REQUIREMENTS</b>		
4.4	Integral modules tested assembled in the luminaire		N/A
4.5	Independent modules complies with requirements in IEC 60598-1		P
<b>5</b>	<b>GENERAL TEST REQUIREMENTS</b>		
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>		
	Built-in module .....	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Independent module .....	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	—
	Integral module .....	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	For Integral module; Note to 1.2.1 in IEC 60598-1 applies.		—
<b>7</b>	<b>MARKING</b>		
<b>7.1</b>	<b>Mandatory markings for built-in or independent modules</b>		<b>P</b>
	a) mark of origin		P
	b) model number, type reference		P
	c1) constant voltage module; rated supply voltage and supply frequency		N/A
	c2) constant current module; rated supply current and supply frequency		P
	d) nominal power		P
	e) indication of connections, wiring diagram		P
	f) value of $t_c$ and place on the module		P
	g) $E_{thr}$ if required		P
	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>		<b>P</b>
	- marking of a), b), c) and f) on the modules		P
	- marking of d), e), g), h), i) and j) on the modules or data sheet		P
	- marking of k) in manufactures literature		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	- integral modules a) to g) in literature		N/A
<b>7.3</b>	<b>Durable and legibility of marking</b>		<b>P</b>
	- 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>		
	Screw terminals according section 14 of IEC 60598-1:		N/A
	Separately approved; component list	(see Annex 2)	N/A
	Part of the luminaire	(see Annex 3)	N/A
	Screwless terminals according section 15 of IEC 60598-1:		P
	Separately approved; component list	(see Annex 2)	P
	Part of the luminaire	(see Annex 4)	N/A
	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>		
<b>- (9.1)</b>	<b>Provisions for protective earthing</b>		<b>N/A</b>
	Terminal complying with clause 8		N/A
	Locked against loosening and not possible to loosen by hand		N/A
	Not possible to loosen clamping means unintentionally on screwless terminals		N/A
	Earthing via means of fixing		N/A
	Earthing terminal only used for the earthing of the control gear		N/A
	All parts of material minimizing the danger of electrolytic corrosion		N/A
	Made of brass or equivalent material		N/A
	Contact surface bare metal		N/A
<b>- (9.2)</b>	<b>Provision for functional earthing</b>		<b>N/A</b>
	Comply with clause 8 and 9.1		N/A
<b>- (9.3)</b>	<b>Earth contact via the track on the printed board</b>		<b>N/A</b>
	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: $< 0,5 \Omega$ .....		N/A
<b>- (9.4)</b>	<b>Earthing of built-in lamp controlgear</b>		<b>N/A</b>



IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	Earth by means of fixing to earthed metal of luminaire in compliance of 7.2 of IEC 60598-1		N/A
	Earthing terminal only for earthing the built-in controlgear		N/A
<b>- (9.5)</b>	<b>Earthing via independent controlgear</b>		<b>N/A</b>
- (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>		
- (10.1)	Controlgear protected against accidental contact with live parts	LED module provided with enclosure	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. ....		N/A
- (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) .....		N/A
- (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		N/A
	Adequate mechanical strength on parts providing protection		P
- (10.2)	Capacitors > 0,5 $\mu$ F: voltage after 1 min (V): < 50 V .....		N/A
- (10.3)	Controlgear providing SELV		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

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	Output voltage under load $\leq 25$ V r.m.s. or $\leq 60$ V d.c.		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		
	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 $\Omega$ ..... :	Between live parts and outer metal parts; 3.6 M $\Omega$	P
	For double or reinforced insulation $\geq 4$ M $\Omega$ ..... :		N/A
	Between primary and secondary circuits in controlgear providing SELV, values in Annex L in IEC 61347-1		N/A

12 (12)	ELECTRIC STRENGTH		
	Immediately after clause 11 electric strength test for 1 min		P
	Basic insulation for SELV, test voltage 500 V	500 V	P
	Working voltage $\leq 50$ V, test voltage 500 V		N/A
	Working voltage $> 50$ V $\leq 1000$ V, test voltage (V):		N/A
	Basic insulation, 2U + 1000 V		N/A
	Supplementary insulation, 2U + 1000 V		N/A

<b>IEC 62031</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	Double or reinforced insulation, 4U + 2000 V		N/A
	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>		
- (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		N/A
	Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected	(see appended table)	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)	(see appended table)	N/A
	Creepage distances on printed boards less than specified in clause 16 in Part 1 provided with coating according to IEC 60664-3		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	(see appended table)	N/A
- (14.4)	Short-circuit across electrolytic capacitors	(see appended table)	N/A
- (14.5)	After the tests has been carried out on three samples:		P
	The insulation resistance $\geq 1 \text{ M}\Omega$ .....	$> 10 \text{ M}\Omega$	P
	No flammable gases		P
	No accessible parts have become live		P
	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		N/A
<b>13.2</b>	<b>Overpower condition</b>		<b>P</b>
	Module withstands overpower condition $>15$ min.		P
	Module with automatic protective device or power limiter, test performed 15 min. at limit.		N/A
	No fire, smoke or flammable gas is produced		P

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	Molten material does not ignite tissue paper, spread below the module		P
<b>15</b>	<b>CONSTRUCTION</b>		
	Wood, cotton, silk, paper and similar fibrous material not used as insulation	Such material not used	P
<b>16 (16)</b>	<b>CREEPAGE DISTANCES AND CLEARANCES</b>		
- (16)	Creepage and distances and clearances in compliance with IEC 61347-1	(see appended table)	P
	Insulating lining of metallic enclosures		N/A
	Basic insulation on printed boards tested according to clause 14		N/A
	Distances subjected to both sinusoidal voltage as non-sinusoidal pulses not less than value in Table 16		N/A
	Creepage distances not less than minimum clearance		P
16 (-)	Conductive accessible parts in compliance with applicable parts of IEC 60598-1		P
<b>17 (17)</b>	<b>SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS</b>		
	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>		<b>P</b>
(4.11.1)	Contact pressure	No contact pressure	P
(4.11.2)	Screws:		N/A
	- self-tapping screws	No self-tapping screws	N/A
	- thread-cutting screws	No thread-cutting screws	N/A
(4.11.3)	Screw locking:		N/A
	- spring washer		N/A
	- rivets		N/A
(4.11.4)	Material of current-carrying parts		P
(4.11.5)	No contact to wood or mounting surface		P
(4.11.6)	Electro-mechanical contact systems		N/A
<b>(4.12)</b>	<b>Mechanical connections and glands</b>		<b>P</b>
(4.12.1)	Screws not made of soft metal		P
	Screws of insulating material		N/A
	Torque test: torque (Nm); part ..... :	Screw for enclosure fixing; 1.2 Nm	P

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	Torque test: torque (Nm); part .....	Screw for fixing LED board; 0.5 Nm	P
	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>		
- (18.1)	Ball-pressure test .....	See Test Table 18 (18.1)	P
- (18.3)	Glow-wire test (650°C) .....	See Test Table 18 (18.3)	N/A
- (18.4)	Needle-flame test (10 s) .....	See Test Table 18 (18.4)	P
- (18.5)	Proof tracking test .....	See Test Table 18 (18.5)	N/A
<b>19 (19)</b>	<b>RESISTANCE TO CORROSION</b>		
	- test according 4.18.1 of IEC 60598-1		P
	- adequate varnish on the outer surface		N/A
<b>20</b>	<b>INFORMATION FOR LUMINAIRE DESIGN</b>		
	Information in Annex D (informative)		—
<b>21</b>	<b>HEAT MANAGEMENT</b>		
<b>21.1</b>	<b>General</b>		<b>N/A</b>
	Exchangeability is safeguarded by cap or base		N/A
<b>21.2</b>	<b>Heat-conducting foil and paste</b>		<b>N/A</b>
	Heat-conducting foil delivered with the module if necessary		N/A
<b>22</b>	<b>PHOTOBIOLOGICAL SAFETY</b>		
<b>22.1</b>	<b>UV radiation</b>		<b>N/A</b>
	Luminous radiation not exceed 2mW/klm		N/A
<b>22.2</b>	<b>Blue light hazard</b>		<b>P</b>
	Assessed according to IEC TR 62778	RG2	P
<b>22.3</b>	<b>Infrared radiation</b>		<b>N/A</b>
	Requirements for infrared radiation when required		N/A



<b>IEC 62031</b>			
Clause	Requirement + Test	Result - Remark	Verdict

<b>A</b>	<b>ANNEX A - TESTS</b>		
	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>		
<b>Part</b>	<b>Simulated fault</b>		<b>Hazard</b>
LED	Short-circuited, no hazard		YES/NO
LED module	Overpower condition, no hazard		YES/NO

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

<b>16 (16)</b>	<b>TABLES: Creepage distances and clearances</b>	
<b>Table 3</b>	<b>Minimum distances (mm) for a.c. (50/60 Hz) sinusoidal voltages</b>	<b>P</b>

RMS working voltage (V) not exceeding	50	150	250	500	750	1000	
<b>Creepage distances</b>							
Required basic insulation, PTI $\geq$ 600	0,6	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required basic insulation, PTI $<$ 600	1,2	1,6	2,5	5	8	10	
Measured between live parts of LED board and metal enclosure	6.45	-	-	-	-	-	
Required supplementary insulation PTI $\geq$ 600	-	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required supplementary insulation PTI $<$ 600	-	1,6	2,5	5	8	10	
Measured	-	-	-	-	-	-	
Required reinforced insulation	-	3,2	5	6	8	11	
Measured	-	-	-	-	-	-	
<b>Clearances</b>							
Required basic insulation	0,2	0,8	1,5	3	4	5,5	
Measured between live parts of LED board and metal enclosure	4.85	-	-	-	-	-	
Required supplementary insulation	-	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required reinforced insulation	-	1,6	3	6	8	11	
Measured	-	-	-	-	-	-	
<b>Table 4</b>	<b>Minimum distances (mm) for non-sinusoidal pulse voltages</b>						<b>N/A</b>
Rated pulse voltage (peak kV)	2,0	2,5	3,0	4,0	5,0	6,0	8,0
Required clearances	1,0	1,5	2	3	4	5,5	8
Measured	-	-	-	-	-	-	-
Rated pulse voltage (peak kV)	10	12	15	20	25	30	40
Required clearances	11	14	18	25	33	40	60
Measured	-	-	-	-	-	-	-
Rated pulse voltage (peak kV)	50	60	80	100	-	-	-
Required clearances	75	90	130	170	-	-	-
Measured	-	-	-	-	-	-	-

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

18 (18.1)	TABLE: Ball Pressure Test of Thermoplastics			P
Allowed impression diameter (mm) .....		2		—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	
External DC output connector (Male connector)	Unicable Co., Ltd. / UT-SD170F8-UC-2P	125	1.3	
Supplementary information: N/A				

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: N/A					

18 (18.4)	TABLE: Needle-flame test				P
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
External DC output connector (Male connector)	Unicable Co., Ltd. / UT-SD170F8-UC-2P	10	No	0	P
Supplementary information: N/A					

18 (18.5)	TABLE: Proof tracking test			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: N/A				



IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
<b>ANNEX 1</b>	<b>SELV-operated LED modules</b>		
	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>		<b>N/A</b>
	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>		<b>N/A</b>
	Adequate symbols are used		N/A
<b>(L.5)</b>	<b>Protection against electric shock</b>		<b>N/A</b>
	Comply with 9.2 of IEC 61558-1		N/A
<b>(L.6)</b>	<b>Heating</b>		<b>N/A</b>
	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>		<b>N/A</b>
	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>		<b>N/A</b>
(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

<b>IEC 62031</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	1) Between live parts of input circuits and live parts of output circuits .....		N/A
	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>		<b>N/A</b>
(L.9.1)	Transformer comply with 19.12 of IEC 61558-1 and 19 of IEC 61558-2-6		N/A
	HF transformer comply with 19 of IEC 61558-2-16		N/A
<b>(L.10)</b>	<b>Components</b>		<b>N/A</b>
	Protective devices comply with 20.6 – 20.11 of IEC 61558-1		N/A
<b>(L.11)</b>	<b>Creepage distances and clearances</b>		<b>N/A</b>
	1. Insulation between input and output circuits, basic insulation:		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A
	2. Insulation between input and output circuits, double or reinforced insulation:		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A
	3. Insulation between adjacent <u>output</u> circuits		N/A
	- measured values $\geq$ specified values (mm) .....		N/A
	4. Insulation between terminals for external connection:		N/A
	- measured values $\geq$ specified values (mm) .....		N/A
	5. Basic or supplementary insulation:		N/A
	a) measured values $\geq$ specified values (mm) .....		N/A
	b) measured values $\geq$ specified values (mm) .....		N/A
	c) measured values $\geq$ specified values (mm) .....		N/A



IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	d) measured values $\geq$ specified values (mm) ..... :		N/A
	e) measured values $\geq$ specified values (mm) ..... :		N/A
	6. Reinforced insulation or insulation:		N/A
	Between body and output circuit: measured values $\geq$ specified values (mm) ..... :		N/A
	Between body and output circuit if provision against transient voltages: measured values $\geq$ specified values (mm) ..... :		N/A
	7. Distance through insulation:		N/A
	a) measured values $\geq$ specified values (mm) ..... :		N/A
	b) measured values $\geq$ specified values (mm) ..... :		N/A
	c) measured values $\geq$ specified values (mm) ..... :		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 2		TABLE: Critical components information					
Object / part No.	Code	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
Metal enclosure	C	--	--	Aluminium	--	--	
External DC output connector (Male connector)	B	Unicable Co., Ltd.	UT-SD170F8-UC-2P	250 V, 5 A	UL 1977	UL	
Internal output wiring	A	Eassan Electric Wire & Cable Co., Ltd.	3135	200°C, 600 V, 22 AWG	UL 758	UL	
- Alt.	D	--	3135	200°C, 600 V, 22 AWG	UL 758	UL	
Connector on LED board	B	WAGO	2059-302	2-poles, 3 A, 160 V, 150°C	EN 60998-2-2	Dekra	
LED	C	Cree	XLamp XP-G2	V <sub>F</sub> : 35.9 V, I <sub>F</sub> : 1.5 A, CCT=5000K	IEC/EN 62471 IEC/TR 62778	Tested with appliance	
PCB of LED board	C	Top Win Optoelectronics Corp.	MB2G02	MCPCB, V-0, 130 °C	EN 62031	Tested with appliance	
Wire potting for output wiring	B	Covestro Deutschland AG [Pc Resins]	6557+(z)(f1)	V-2, 125°C	UL 94	UL	

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

ANNEX 3	Screw terminals (part of the luminaire)		
<b>(14)</b>	<b>SCREW TERMINALS</b>		<b>N/A</b>
(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

ANNEX 4	Screwless terminals (part of the luminaire)		
<b>(15)</b>	<b>SCREWLESS TERMINALS</b>		<b>N/A</b>
(15.2)	Type of terminal .....		—
	Rated current (A) .....		—
(15.3.1)	Material		N/A
(15.3.2)	Clamping		N/A
(15.3.3)	Stop		N/A
(15.3.4)	Unprepared conductors		N/A
(15.3.5)	Pressure on insulating material		N/A
(15.3.6)	Clear connection method		N/A
(15.3.7)	Clamping independently		N/A
(15.3.8)	Fixed in position		N/A
(15.3.10)	Conductor size		N/A
	Type of conductor		N/A
(15.5.1)	Terminals internal wiring		N/A
(15.5.1.1)	Pull test spring-type terminals (4 N, 4 samples) .....		N/A
(15.5.1.2)	Pull test pin or tab terminals (4 N, 4 samples) .....		N/A
	Insertion force not exceeding 50 N		N/A
(15.5.1.2)	Permanent connections: pull-off test (20 N)		N/A
(15.5.2)	Electrical tests		N/A
	Voltage drop (mV) after 1 h (4 samples).....		N/A
	Voltage drop of two inseparable joints		N/A
	Number of cycles:		—
	Voltage drop (mV) after 10th alt. 25th cycle (4 samples) .....		N/A
	Voltage drop (mV) after 50th alt. 100th cycle (4 samples) .....		N/A
	After ageing, voltage drop (mV) after 10th alt. 25th cycle (4 samples) .....		N/A
	After ageing, voltage drop (mV) after 50th alt. 100th cycle (4 samples) .....		N/A
(15.6)	Terminals external wiring		N/A
	Terminal size and rating		N/A
(15.6.2.1)	Pull test spring-type terminals or welded connections (4 samples); pull (N) .....		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	Pull test pin or tab terminals (4 samples); pull (N) .....		N/A

<b>(15.6.3.1) TABLE: Contact resistance test</b>										
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: N/A										



**Test report for EN 62471:2008**

**Summary of testing:**

All tests were performed according to EN 62471:2008

The product was measured under normal conditions noted in details of measurement procedure and measurement results

All models were complied with the requirements of Risk Group 1 for LED module according to EN 62471:2008.

MD5T01 (Tested with certified LED driver Mean Well / HLG-80H-42A): see page 9

**Test item particulars:**

Tested lamp ..... :  continuous wave lamps       pulsed lamps

Tested lamp system ..... : LED module

Lamp classification group..... :  exempt     risk 1     risk 2     risk 3

Lamp cap ..... : N/A

Bulb ..... : LED

Rated of the lamp ..... : 32-42 Vdc

Furthermore marking on the lamp ..... : N/A

Seasoning of lamps according IEC standard ..... : Aging 1h

Used measurement instrument..... : According to standard instruments of EN 62471:2008

Temperature by measurement ..... : 25 °C

Information for safety use..... : Risk Group 1





EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict
<b>4</b>	<b>EXPOSURE LIMITS</b>		P
	Contents of the whole Clause 4 of IEC 62471:2006 moved into a new informative Annex ZB		—
	Limits of the Artificial Optical Radiation Directive (2006/25/EC) have been applied instead of those fixed in IEC 62471:2006		P
4.1	General		P
	First paragraph deleted		—
<b>5</b>	<b>MEASUREMENT OF LAMPS AND LAMP SYSTEMS</b>		P
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		P
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.	Sample was stable after being operated with 1 Hr.	P
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
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		P
	– the manufacturer' s recommendation		N/A
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	Maximum aperture diameter 50 mm.		P



EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	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		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		P
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		P
5.2.3	Measurement of source size		P
	The determination of $\alpha$ , the angle subtended by a source, requires the determination of 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
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.	Wavelength accuracy: 1 nm Optical power: 5 %	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



EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	– 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		P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group		P
	In the exempt group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		P
	– an actinic ultraviolet hazard ( $E_S$ ) within 8-hours exposure (30000 s), nor	No emission for wavelength less than 400 nm	P
	– a near-UV hazard ( $E_{UVA}$ ) within 1000 s, (about 16 min), nor	No emission for wavelength less than 400 nm	P
	– a retinal blue-light hazard ( $L_B$ ) within 10000 s (about 2,8 h), nor		N/A
	– a retinal thermal hazard ( $L_R$ ) within 10 s, nor		P
	– an infrared radiation hazard for the eye ( $E_{IR}$ ) within 1000 s	No emission for wavelength more than 780 nm	P
6.1.2	Risk Group 1 (Low-Risk)		P
	In this group are lamps, which exceeds the limits for the exempt group but that does not pose:		P
	– 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.		N/A
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



EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	– 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
	– 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



EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict

**Table 4.1** Spectral weighting function for assessing ultraviolet hazards for skin and eye -

λ in nm	S (λ)	λ in nm	S (λ)	λ in nm	S (λ)	λ in nm	S (λ)	λ in nm	S (λ)
180	0,0120	228	0,1737	276	0,9434	324	0,000520	372	0,000086
181	0,0126	229	0,1819	277	0,9272	325	0,000500	373	0,000083
182	0,0132	230	0,1900	278	0,9112	326	0,000479	374	0,000080
183	0,0138	231	0,1995	279	0,8954	327	0,000459	375	0,000077
184	0,0144	232	0,2089	280	0,8800	328	0,000440	376	0,000074
185	0,0151	233	0,2188	281	0,8568	329	0,000425	377	0,000072
186	0,0158	234	0,2292	282	0,8342	330	0,000410	378	0,000069
187	0,0166	235	0,2400	283	0,8122	331	0,000396	379	0,000066
188	0,0173	236	0,2510	284	0,7908	332	0,000383	380	0,000064
189	0,0181	237	0,2624	285	0,7700	333	0,000370	381	0,000062
190	0,0190	238	0,2744	286	0,7420	334	0,000355	382	0,000059
191	0,0199	239	0,2869	287	0,7151	335	0,000340	383	0,000057
192	0,0208	240	0,3000	288	0,6891	336	0,000327	384	0,000055
193	0,0218	241	0,3111	289	0,6641	337	0,000315	385	0,000053
194	0,0228	242	0,3227	290	0,6400	338	0,000303	386	0,000051
195	0,0239	243	0,3347	291	0,6186	339	0,000291	387	0,000049
196	0,0250	244	0,3471	292	0,5980	340	0,000280	388	0,000047
197	0,0262	245	0,3600	293	0,5780	341	0,000271	389	0,000046
198	0,0274	246	0,3730	294	0,5587	342	0,000263	390	0,000044
199	0,0287	247	0,3865	295	0,5400	343	0,000255	391	0,000042
200	0,0300	248	0,4005	296	0,4984	344	0,000248	392	0,000041
201	0,0334	249	0,4150	297	0,4600	345	0,000240	393	0,000039
202	0,0371	250	0,4300	298	0,3989	346	0,000231	394	0,000037
203	0,0412	251	0,4465	299	0,3459	347	0,000223	395	0,000036
204	0,0459	252	0,4637	300	0,3000	348	0,000215	396	0,000035
205	0,0510	253	0,4815	301	0,2210	349	0,000207	397	0,000033
206	0,0551	254	0,5000	302	0,1629	350	0,000200	398	0,000032
207	0,0595	255	0,5200	303	0,1200	351	0,000191	399	0,000031
208	0,0643	256	0,5437	304	0,0849	352	0,000183	400	0,000030
209	0,0694	257	0,5685	305	0,0600	353	0,000175		
210	0,0750	258	0,5945	306	0,0454	354	0,000167		
211	0,0786	259	0,6216	307	0,0344	355	0,000160		
212	0,0824	260	0,6500	308	0,0260	356	0,000153		
213	0,0864	261	0,6792	309	0,0197	357	0,000147		
214	0,0906	262	0,7098	310	0,0150	358	0,000141		
215	0,0950	263	0,7417	311	0,0111	359	0,000136		
216	0,0995	264	0,7751	312	0,0081	360	0,000130		
217	0,1043	265	0,8100	313	0,0060	361	0,000126		
218	0,1093	266	0,8449	314	0,0042	362	0,000122		
219	0,1145	267	0,8812	315	0,0030	363	0,000118		
220	0,1200	268	0,9192	316	0,0024	364	0,000114		
221	0,1257	269	0,9587	317	0,0020	365	0,000110		
222	0,1316	270	1,0000	318	0,0016	366	0,000106		
223	0,1378	271	0,9919	319	0,0012	367	0,000103		
224	0,1444	272	0,9838	320	0,0010	368	0,000099		
225	0,1500	273	0,9758	321	0,000819	369	0,000096		
226	0,1583	274	0,9679	322	0,000670	370	0,000093		



EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict
<b>Table 4.2</b>	Spectral weighting functions for assessing retinal hazards from broadband optical sources		-
Wavelength nm	Blue-light hazard function B ( $\lambda$ )	Burn hazard function R ( $\lambda$ )	
$300 \leq \lambda < 380$	0,01		
380	0,01	0,1	
385	0,013	0,13	
390	0,025	0,25	
395	0,05	0,5	
400	0,1	1	
405	0,2	2	
410	0,4	4	
415	0,8	8	
420	0,9	9	
425	0,95	9,5	
430	0,98	9,8	
435	1	10	
440	1	10	
445	0,97	9,7	
450	0,94	9,4	
455	0,9	9	
460	0,8	8	
465	0,7	7	
470	0,62	6,2	
475	0,55	5,5	
480	0,45	4,5	
485	0,32	3,2	
490	0,22	2,2	
495	0,16	1,6	
500	0,1	1	
$500 < \lambda \leq 600$	$10^{0,02(450-\lambda)}$	1	
$600 < \lambda \leq 700$	0,001	1	
$700 < \lambda \leq 1050$		$10^{0,002(700-\lambda)}$	
$1050 < \lambda \leq 1150$		0,2	
$1150 < \lambda \leq 1200$		$0,2 \cdot 10^{0,02(1150-\lambda)}$	
$1200 < \lambda \leq 1400$		0,02	



## EN 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	$E_{eff} = \sum E_{\lambda} \cdot S(\lambda) \cdot \Delta\lambda$	180 – 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	$\leq 10000$ > 10000	< 0,011	100/t 0,01
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	$E_{skin} = \sum E_{\lambda} \cdot \Delta\lambda$	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 $\cdot\sqrt{(t/10)}$	10 <sup>6</sup> /t
			10-100	0,011	10 <sup>6</sup> /t
			100-10000	0,0011 $\cdot\sqrt{t}$	10 <sup>6</sup> /t
			$\geq 10000$	0,1	100
Retinal thermal	$L_R = \sum L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0,25	0,0017	50000/( $\alpha \cdot t^{0,25}$ )
			0,25 – 10	0,011 $\cdot\sqrt{(t/10)}$	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/ $\alpha$



EN 62471									
Clause	Requirement + Test			Result – Remark					Verdict
<b>Table 6.1</b>	<b>Emission limits for risk groups of continuous wave lamps</b>								<b>P</b>
	Model no.....			MD5T01 (321.96 cm, $\alpha = 82.6$ mrad.)					-
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	$E_s$	$W \cdot m^{-2}$	0,001	$1.6 \times 10^{-6}$	-	-	-	-
Near UV		$E_{UVA}$	$W \cdot m^{-2}$	0,33	$9.8 \times 10^{-6}$	-	-	-	-
Blue light	$B(\lambda)$	$L_B$	$W \cdot m^{-2} \cdot sr^{-1}$	100	-	10000	$4.8 \times 10^2$	4000000	-
Blue light, small source	$B(\lambda)$	$E_B$	$W \cdot m^{-2}$	0,01*	-	1,0	-	400	-
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha$	$5.9 \times 10^3$	$28000/\alpha$	-	$71000/\alpha$	-
Retinal thermal, weak visual stimulus**	$R(\lambda)$	$L_{IR}$	$W \cdot m^{-2} \cdot sr^{-1}$	545000	-				
				$0,0017 \leq \alpha \leq 0,011$					
				$6000/\alpha$	-				
				$0,011 \leq \alpha \leq 0,1$					
IR radiation, eye		$E_{IR}$	$W \cdot m^{-2}$	100	$1.1 \times 10^{-4}$	570	-	3200	-
<p>* Small source defined as one with <math>\alpha &lt; 0,011</math> radian. Averaging field of view at 10000 s is 0,1 radian.</p> <p>** Involves evaluation of non-GLS source</p> <p>NOTE The action functions: see Table 4.1 and Table 4.2  The applicable aperture diameters: see 4.2.1  The limitations for the angular subtenses: see 4.2.2  The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5</p>									





### Test report for IEC/TR 62778:2014

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict
<b>7</b>	<b>MEASUREMENT INFORMATION FLOW</b>		
<b>7.1</b>	<b>Basic flow</b>		<b>P</b>
	'Law of conservation of luminance' applied		P
	Use of only true luminance/radiance values	MD5T01: $2.596 \times 10^7$ cd/m <sup>2</sup>	P
	In case of luminaire: The light source is operated in the luminaire under similar conditions as when tested as a component		P
	In case E <sub>thr</sub> value for RG2 was established the peak value was derived from angular light distribution		P
<b>7.2</b>	<b>Conditions for the radiance measurement</b>		<b>P</b>
	Standard condition applied (200mm distance, 0,011rad field of view)	200 mm distance 0.011 rad field of view	P
	Non-standard condition applied		N/A
<b>7.3</b>	<b>Special cases (I): Replacement by a lamp or LED module of another type</b>		<b>N/A</b>
	Light source is a white light source		N/A
	Evaluation done based on highest luminance		N/A
	Evaluation done based on CCT value		N/A
<b>7.4</b>	<b>Special cases (II): Arrays and clusters of primary light sources</b>		<b>N/A</b>
	LED package is evaluated as ..... :	<input type="checkbox"/> RG0 unlimited <input type="checkbox"/> RG1 unlimited	N/A
	E <sub>thr</sub> of LED package applies to array		N/A



<b>8</b>	<b>RISK GROUP CLASSIFICATION</b>				
	Risk group achieved:				P
	- ..Risk Group 0 unlimited				N/A
	- ..Risk Group 1 unlimited				N/A
	- E <sub>thr</sub> ..... (lx) : <b>1197 lx</b> Distance to reach RG1 ..... (m) : <b>0.823 m</b>				P
	<b>TABLE: Spectroradiometric measurement</b>				<b>P</b>
	<b>Measurement performed on:</b>		<input type="checkbox"/> LED package <input checked="" type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire		
	<b>Model number</b> .....		MD5T01		
	<b>Test voltage (V)</b> .....		240 Vac (Tested with certified LED driver Mean Well / HLG-80H-42A)		—
	<b>Test current (mA)</b> .....		--		—
	<b>Test frequency (Hz)</b> .....		60 Hz		—
	<b>Ambient, t (°C)</b> .....		21.6		—
	<b>Measurement distance</b> .....		<input checked="" type="checkbox"/> 20 cm <input type="checkbox"/> ... cm		—
	<b>Source size</b> .....		<input checked="" type="checkbox"/> Non-small <input type="checkbox"/> Small : .... mm		—
	<b>Field of view</b> .....		<input type="checkbox"/> 100 mrad <input checked="" type="checkbox"/> 11 mrad <input type="checkbox"/> 1,7 mrad (for small sources)		—
Item	Symbol	Units	Result	Remark	
Correlated colour temperature	CCT	K	5000 K	LED spec	
Blue light hazard radiance	L <sub>B</sub>	W/(m <sup>2</sup> •sr <sup>1</sup> )	21682		
Blue light hazard irradiance	E <sub>B</sub>	W/m <sup>2</sup>	-		
Luminance	L	cd/m <sup>2</sup>	2.596 x 10 <sup>7</sup>		
Illuminance	E	lx	20253		
Supplementary information: N/A					



## Test report for EN 62493:2015

<b>4</b>	<b>LIMITS</b>		
<b>4.1</b>	<b>General</b>		<b>P</b>
	Comply with Van der Hoofden test limit in 4.2.3 or inherently compliant in 4.2.2 and pass assessment procedure for intentional radiators in 4.3		<b>P</b>
<b>4.2</b>	<b>Unintentional radiating part of lighting equipment</b>		<b>P</b>
4.2.2	Lighting equipment deemed to comply with the Van der Hoofden test without testing		<b>P</b>
	1) no electronic controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	2) incandescent-lamp technology	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	3) LED-light-source technology	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	—
	4) OLED-light-source technology	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	5) high-pressure discharge lamp LED-light-source technologies	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	6) low-pressure discharge lamp technologies with exposure distance $\geq 50$ cm	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	7) independent auxiliary	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Not fulfil any of 1-7 above subject to 4.2.3		—
4.2.3	Applications of limits		<b>N/A</b>
	Not fulfil any of 1-7 in 4.2.2 but the compliance factor $F$ is $\leq 1$		<b>N/A</b>
<b>4.3</b>	<b>Intentional radiating part of lighting equipment</b>		<b>N/A</b>
	Comply with one of methods in Clause 7 if intentional radiator		<b>N/A</b>
<b>5</b>	<b>GENERAL</b>		
<b>5.1</b>	<b>Measurand</b>		<b>N/A</b>
	Test head, measuring instrumentation and measuring conditions according Clause 5.1 – 5.8		<b>N/A</b>
<b>6</b>	<b>MEASUREMENT PROCEDURE FOR THE VAN DER HOOFDEN TEST</b>		
<b>6.1</b>	<b>General</b>		<b>N/A</b>
	Measurements carried out under conditions according Clause 6.1 – 6.6	See Table 6	<b>N/A</b>
<b>7</b>	<b>ASSESSMENT PROCEDURE INTENTIONAL RADIATORS</b>		
<b>7.2</b>	<b>Low-power exclusion method</b>		<b>N/A</b>
7.2.1	Input $P_{\text{int,rad}}$ .....		—
	Exclusion level $P_{\text{max}}$ .....		—
	Input power $P_{\text{int,rad}} < \text{exclusion level } P_{\text{max}}$		<b>N/A</b>
<b>7.3</b>	<b>Application of the EMF product standard for body worn-equipment</b>		<b>N/A</b>

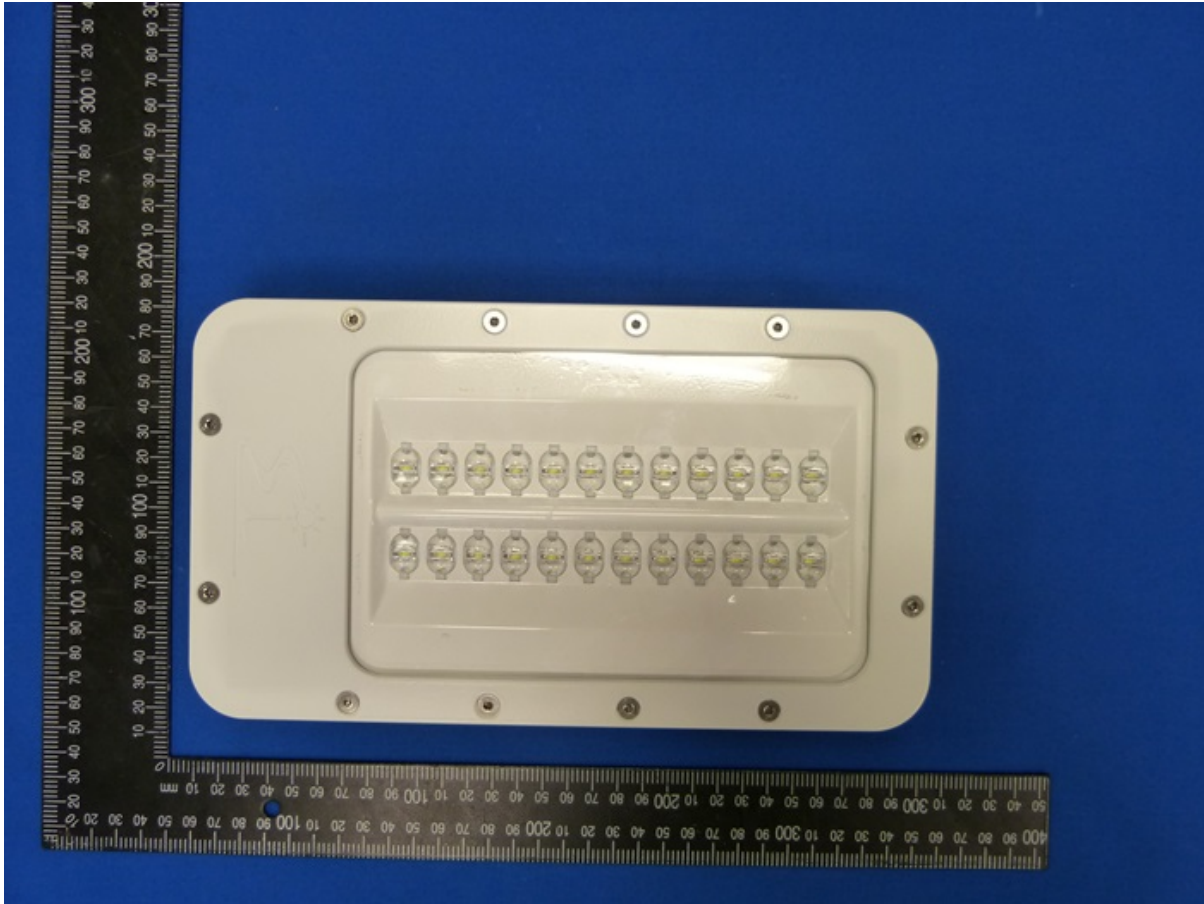


<b>7</b>	<b>ASSESSMENT PROCEDURE INTENTIONAL RADIATORS</b>		
<b>7.2</b>	<b>Low-power exclusion method</b>		<b>N/A</b>
	If not Clause 7.2 is met and expose distance $\leq 0.05$ m, comply with IEC 62209-2		N/A
<b>7.4</b>	<b>Application of the EMF product standard for base stations</b>		<b>N/A</b>
	If not Clause 7.2 is met and if intentional radiator is base station, comply with IEC 62232		N/A
<b>7.5</b>	<b>Application of another EMF standard</b>		<b>N/A</b>
	If not Clause 7.2 is met and if intentional radiator cannot be considered as in Clause 7.3 or 7.4, comply with IEC 62311		N/A

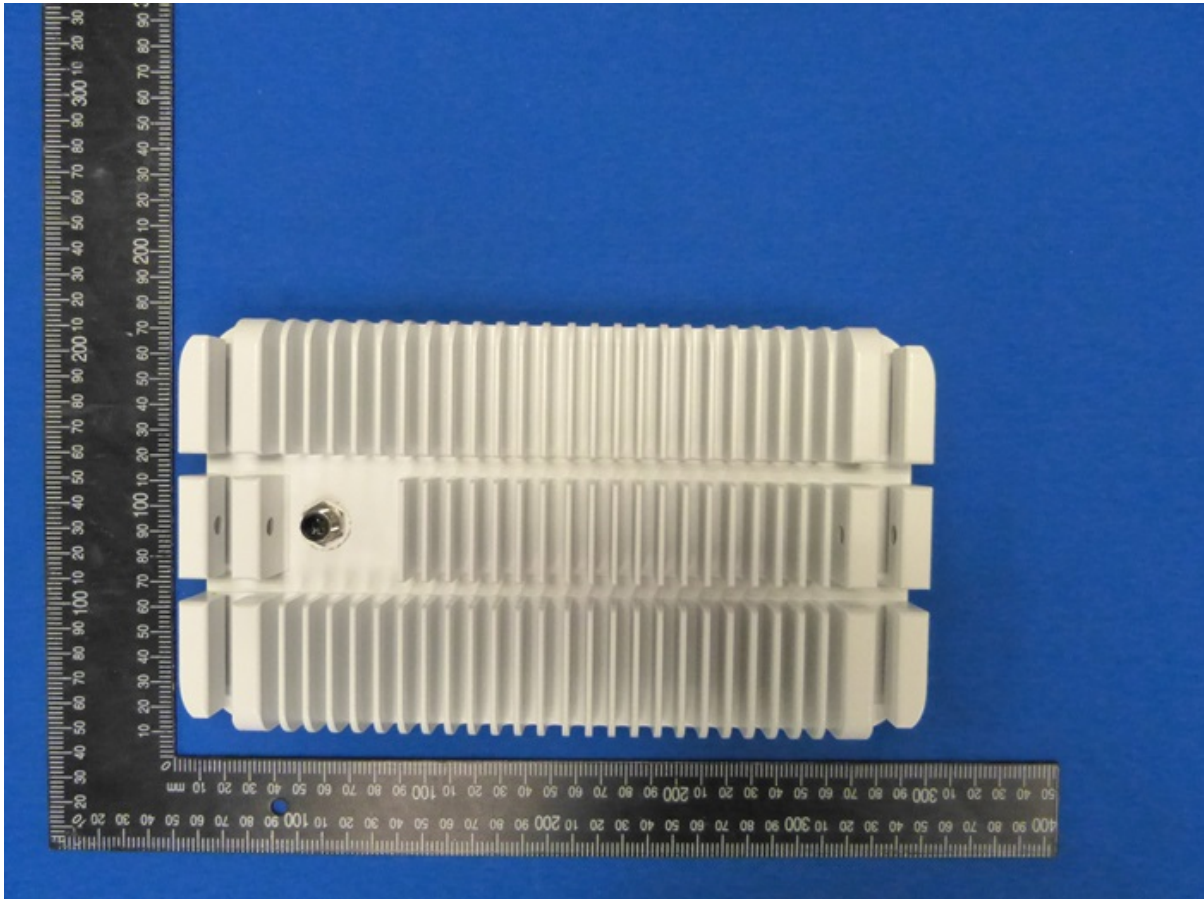
<b>6</b>	<b>TABLE: Measurement results with Van der Hoofden test head</b>				
	<b>Location of EuT</b>	<b>Measuring distance</b>	<b>Result (F)</b>	<b>Limit (F)</b>	<b>Verdict</b>
	—	—	—	—	—
	—	—	—	—	—

<b>6</b>	<b>TABLE: Equipment used during test with Van der Hoofden test head</b>			
	<b>Equipment</b>	<b>Manufacturer</b>	<b>Type</b>	<b>Id. No.</b>
	—	—	—	—
	—	—	—	—

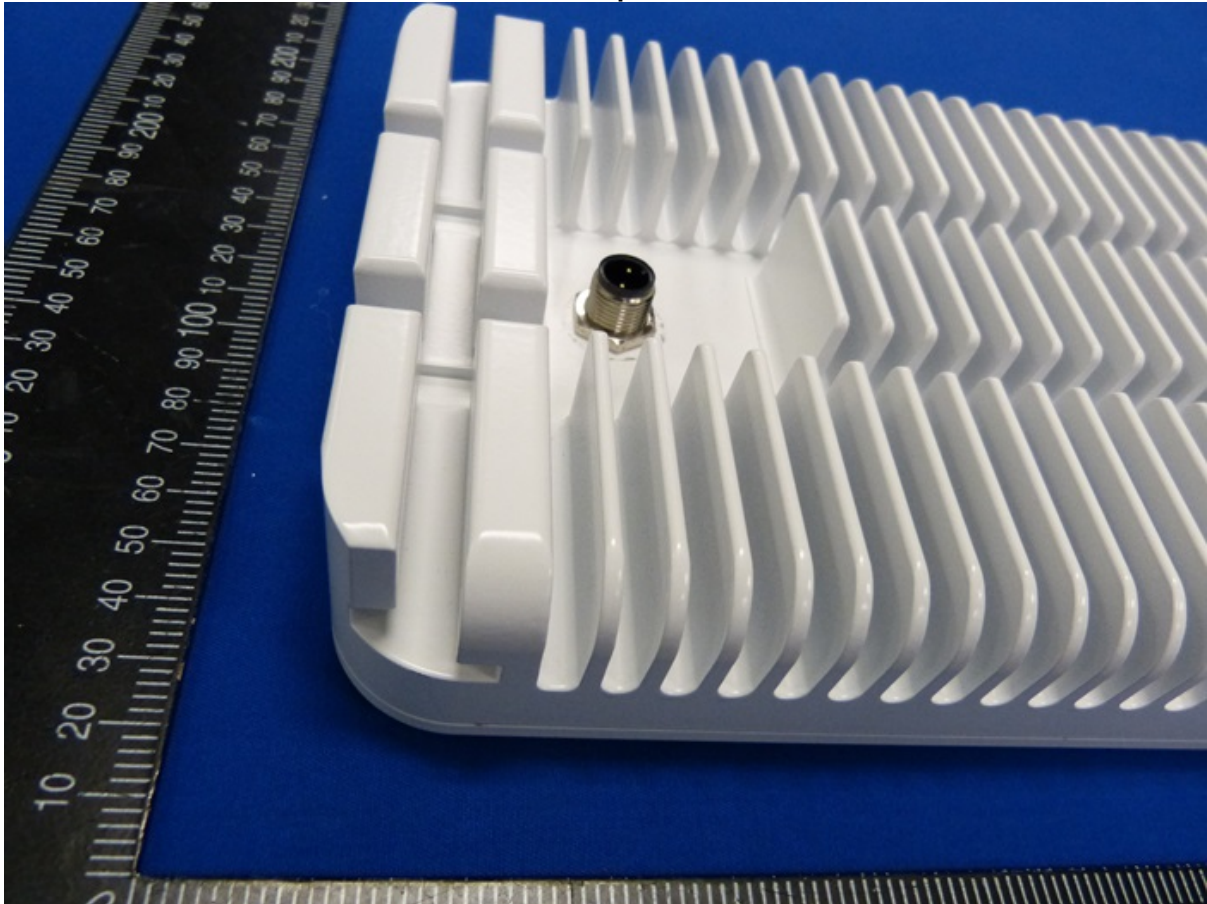
Front of MD5T01



Back of MD5T01



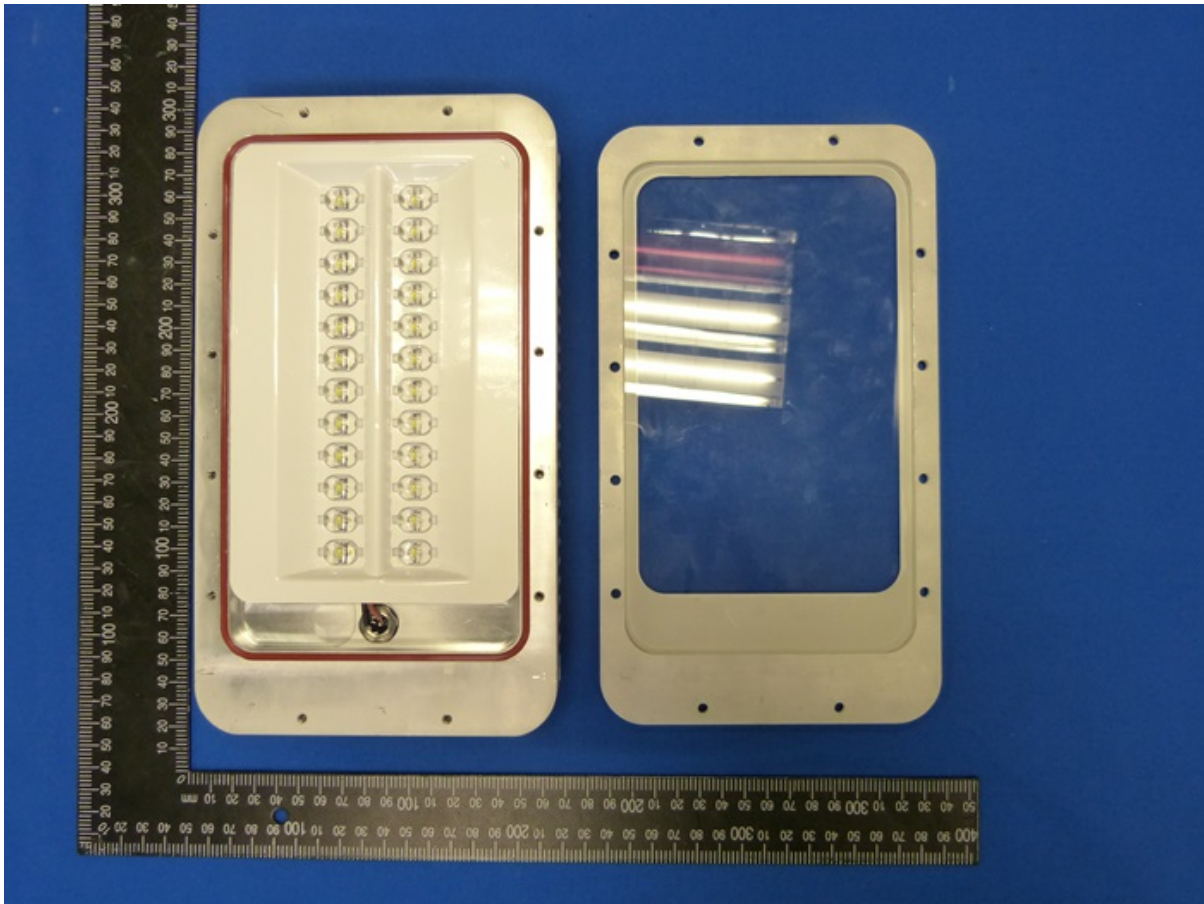
External DC output connector



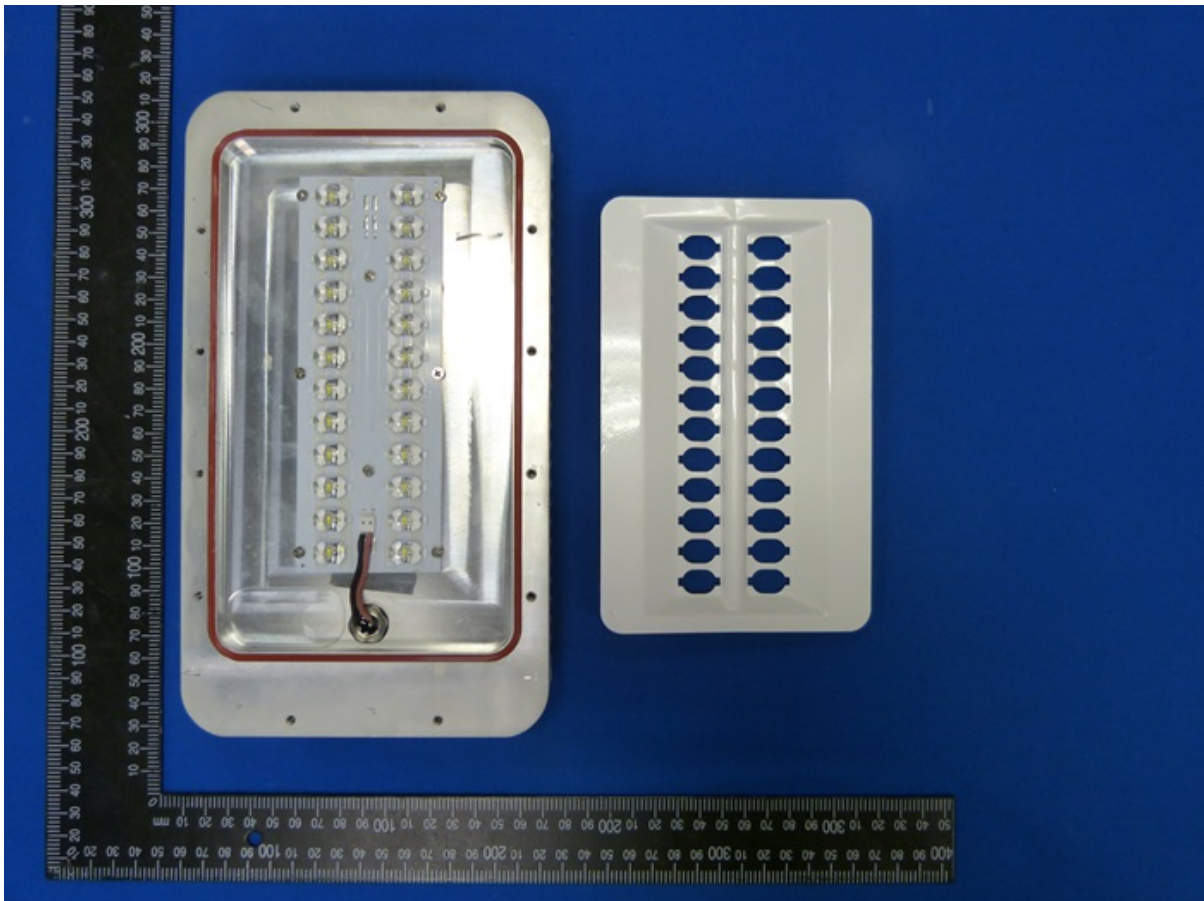
External DC output connector



Model no. MD5T01



Model no. MD5T01



**Wiring potting compound for output wiring**

