

APPLICATION REPORT

On Behalf of

Tea-Energy China Limited

LED Down Light

**Model: DOWN-YYY-XX-AA-BB. (YYY-Stands for Power (035-35W),
XX-Stands for Dimmability (ND-not dimmable, D-dimmable),
AA-Stands for color temperature (CW- Cool White, NW-Neutral
White, WW-Warm White), BB-stands for flow Code (00-99).)**



**Prepared For : Tea-Energy China Limited
4th Floor, 0100029 Building, Xiawei Industrial Zone, Xiahu
Community, Guanlan Town, Longhua District, Shenzhen, China**

**Prepared By : Shenzhen LCS Compliance Testing Laboratory Ltd.
1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an
District, Shenzhen, Guangdong, China**

Date of Test : May 22, 2014 – June 05, 2014

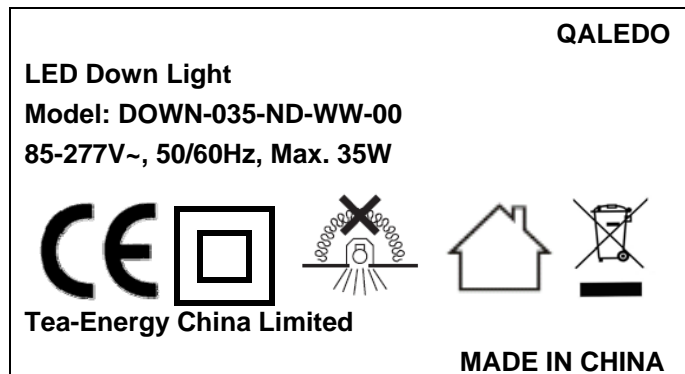
Date of Report : June 05, 2014

Report Number : LCS1405261173S

TEST REPORT EN 60598-2-2 Luminaires Part 2: Particular requirements Section 2: Recessed luminaires	
Report reference No.....	LCS1405261173S
Tested by(name + signature).....	Liberal Li 
Approved by(name +signature).....	Hart Qiu 
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Contents	49 pages
Testing laboratory	
Name.....	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing location	As above
Client	
Name	Tea-Energy China Limited
Address	4th Floor, 0100029 Building, Xiawei Industrial Zone, Xiahu Community, Guanlan Town, Longhua District, Shenzhen, China
Manufacturer	
Name	Tea-Energy China Limited
Address	4th Floor, 0100029 Building, Xiawei Industrial Zone, Xiahu Community, Guanlan Town, Longhua District, Shenzhen, China
Test specification	
Standard.....	EN 60598-2-2: 2012; EN 60598-1: 2008+A11: 2009; EN 62471: 2008; EN 62031: 2008+A1: 2013; EN 62493: 2010
Test procedure	Compliance with EN 60598-2-2: 2012; EN 60598-1: 2008+A11: 2009; EN 62471: 2008; EN 62031: 2008+A1: 2013; EN 62493: 2010
Non-standard test method	N/A
Test item Description	
LED Down Light	
Trademark	QALEDO
Model and/or type reference.....	DOWN-YYY-XX-AA-BB. (YYY-Stands for Power (035-35W), XX-Stands for Dimmability (ND-not dimmable, D-dimmable), AA-Stands for color temperature (CW- Cool White, NW-Neutral White, WW-Warm White), BB-stands for flow Code (00-99).)
Rating(s).....	85-277V~, 50/60Hz, Max. 35W; ClassII

<p>Test item particulars</p> <p>Classification of installation and use: Class II</p> <p>Supply Connection: Connector leads</p>
<p>Test case verdicts</p> <p>Test case does not apply to the test object : N(N/A)</p> <p>Test item does meet the requirement: P(Pass)</p> <p>Test item does not meet the requirement ...: F(Fail)</p>
<p>Testing</p> <p>Date of receipt of test item.....: May 22, 2014</p> <p>Date(s) of performance of test.....: May 22, 2014 – June 05, 2014</p>
<p>General remarks</p> <p>This report shall not be reproduced except in full without the written approval of the testing laboratory.</p> <p>The test results presented in this report relate only to the item tested.</p> <p>Clause numbers between brackets refer to clauses in EN 60598-1.</p> <p>"(see remark #)" refers to a remark appended to the report.</p> <p>"(see Annex #)" refers to an annex appended to the report.</p> <p>Throughout this report a comma is used as the decimal separator.</p>
<p>Remark</p> <ol style="list-style-type: none"> 1. All models are similar except their power and appearance. All tests are conducted on model DOWN-035-ND-WW-00. 2. The laboratory ambient for testing: 22.0-28.0°C, 60%-73%R.H. 3. The report includes Attachment No. 1: Report of EN 62471. Attachment No. 2: Report of EN 62031. Attachment 3: 1 pages of product photos.

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EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
2.1 (0)	SCOPE		----
	Working voltage (V)	85-277V~	P
2.4 (2)	CLASSIFICATION		—
2.4 (2.2)	Type of protection	Class II	P
2.4 (2.3)	Degree of protection	IP20	N
2.4 (2.4)	Portable and handheld luminaire	Recessed luminaires	N
	Fixed luminaire suitable for normally flammable surfaces.....	Yes	P
	Fixed luminaire suitable for non-combustible materials only	No	N
2.4 (2.5)	Luminaire for normal use	Yes	P
	Luminaire for rough service	No	N
2.5 (3)	MARKING		—
2.5.1 (-)	Warning notice, if not suitable for insulating ceiling		N
2.5 (3.2)	Mandatory markings	See the label	P
	Position of the marking	Under the product	P
	Format of symbols/text	The height of symbols more than 5mm, text more than 2mm	P
2.5 (3.3)	Additional information		P
	Language of instructions	In English	P
2.5 (3.3.1)	Combination luminaires	Not such luminaires	N
2.5 (3.3.2)	Nominal frequency in Hz	50/60Hz	P
2.5 (3.3.3)	Operating temperatures		N
2.5 (3.3.4)	Symbol or warning notice	No such warning notice	N
2.5 (3.3.5)	Wiring diagram		N
2.5 (3.3.6)	Special conditions		N
2.5 (3.3.7)	Metal halid lamp luminaire – warning	Not such luminaires	N
2.5 (3.3.8)	Limitation for semi-luminaires		N
2.5 (3.3.9)	Power factor and supply current		N
2.5 (3.3.10)	Suitability for use indoor	See the label	P
2.5 (3.3.11)	Luminaires with remote control	No remote	N
2.5 (3.3.12)	Clip-mounted luminaire-warning		P
2.5 (3.3.13)	Specifications of protective shields	No protective shields	N

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
2.5 (3.3.14)	Symbol for nature of supply	~	P
2.5 (3.3.15)	Rated current of socket outlet	No such socket outlet	N
2.5 (3.3.16)	Rough service luminaire	Ordinary luminaire	N
2.5 (3.4)	Test of marking		P
	Test with water	15s	P
	Test with hexane	15s	P
	Legible after test	Still legible	P
	Label attached	Still attached	P

2.6 (4)	CONSTRUCTION		—
2.6 (4.2)	Components replaceable without difficulty		N
2.6 (4.3)	Wireways smooth and free from sharp edges		P
2.6 (4.4)	Lampholders		—
2.6 (4.4.1)	Integral lampholder		N
2.6 (4.4.2)	Wiring connection		N
2.6 (4.4.3)	Lampholder for end-to-end mounting		N
2.6 (4.4.4)	Positioning		N
2.6 (4.4.5)	Peak pulse voltage	No ignitors	N
2.6 (4.4.6)	Centre contact	No ignitors	N
2.6 (4.4.7)	Rough service luminaires	Ordinary luminaires	N
2.6 (4.4.8)	Lamp connectors	No such component	N
2.6 (4.5)	Starter holders		N
	Starter holders in luminaires other than class II	No such component	N
	Starter holder class II construction		N
2.6 (4.6)	Terminal blocks		N
	Tails		N
	Unsecured blocks		N
2.6 (4.7)	Terminals and supply connections		N
2.6 (4.7.1)	Contact to metal parts		N
2.6 (4.7.2)	Location stranded wires		N
	8 mm test live conductor		N
	8 mm test earth conductor		N
2.6 (4.7.3)	Terminals for supply conductors		N

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
2.6 (4.7.4)	Terminals other than supply connection		N
2.6 (4.7.5)	Heat-resistant wiring/sleeves		N
2.6 (4.7.6)	Multi-pole plug	No such plug	N
2.6 (4.8)	Switches:		N
	- adequate rating		N
	- adequate fixing		N
	- polarized supply		N
2.6 (4.9)	Insulating lining and sleeves		P
2.6 (4.9.1)	Retainment		P
	Method of fixing:		N
2.6 (4.9.2)	Insulated linings and sleeves		P
	a) & c) Insulation resistance and electric strength		P
	b) Ageing test. Temperature (°C)		N
2.6 (4.10)	Insulation of Class II luminaires		—
2.6 (4.10.1)	No contact, mounting surface - accessible metal parts - wiring of basic insulation		P
	Safe installation fixed luminaires		P
	Capacitors		P
	Interference suppression capacitors according to IEC 60384-14		N
2.6 (4.10.2)	Assembly joints:		P
	- not coincidental		P
	- no straight access		P
	- degree of protection		N
2.6 (4.10.3)	Retainment of insulation:		P
	- fixed		P
	- unable to be replaced; luminaire inoperative		P
	- sleeves retained in position		P
	- lining in lampholder		N
2.6 (4.11)	Electrical connections		P
2.6 (4.11.1)	Contact pressure		P
2.6 (4.11.2)	Screws:		P
	- spaced threaded screws		P
	- thread-cutting screws		N

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Clause	Requirement - Test	Result - Remark	Verdict
	- earth continuity		N
	- at least two screws		P
2.6 (4.11.3)	Screw locking:		P
	- spring washer	No such parts	N
	- rivets	No rivet provided	N
2.6 (4.11.4)	Material of current-carrying parts	> 50% copper	P
2.6 (4.11.5)	No contact to wood	No wood	P
2.6 (4.11.6)	Electro-mechanical contact systems	No such construction	N
2.6 (4.12)	Mechanical connections and glands		P
2.6 (4.12.1)	Mechanical stress		P
	Not made of soft metal		P
	Screws of insulating material		N
	Torque test: torque (Nm); part	3.2mm, 0.6Nm,	P
	Torque test: torque (Nm); part		N
2.6 (4.12.2)	Screw diameter up to 3 mm		P
2.6 (4.12.3)	Screws in insulation		P
2.6 (4.12.4)	Locked connections:		N
	- fixed arms; torque (Nm)	No such part	N
	- lampholder; torque (Nm)		N
	- push-button switches; torque (Nm)	No such part	N
2.6 (4.12.5)	Screwed glands; force (N)		N
2.6 (4.13)	Mechanical strength		P
2.6 (4.13.1)	Impact tests:		P
2.6.1 (-)	- recessed parts (see Table I); energy (Nm):		P
2.6 (4.13.1)	- fragile parts; energy (Nm)	0.2 Nm	P
	- other parts; energy (Nm)	0.35Nm	P
	1) live parts	Not accessible live parts	P
	2) linings		P
	3) protection		P
	4) covers		P
2.6 (4.13.3)	Straight test finger	30N	P
2.6 (4.13.4)	Rough service luminaires	(Normal service luminaires)	—
	a) fixed		N
	b) hand-held		N

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Clause	Requirement - Test	Result - Remark	Verdict
	c) delivered with a stand		N
	d) for temporary installations and suitable for mounting on a stand		N
2.6 (4.13.6)	Tumbling barrel	No such part or construction	N
2.6 (4.14)	Suspensions and adjusting devices		N
2.6 (4.14.1)	Mechanical load:		P
	A) four times the weight		P
	B) torque 2.5 Nm		N
	C) bracket arm; force (N).....:		N
	D) load track-mounted luminaires		N
	E) clip-mounted luminaires, glass-shelve. Thickness (mm):		N
	metal rod. Diameter (mm)		N
2.6 (4.14.2)	Load to flexible cables		—
	Mass (kg)		N
	Stress in conductors (N/mm ²)		N
	Semi-luminaires - mass (kg)		N
	Semi-luminaires - bending moment (Nm)		N
2.6 (4.14.3)	Adjusting devices:		—
	- rotating test; number of cycles		N
	- strands broken		N
	- high voltage test	(see 10.2)	N
2.6 (4.14.4)	Telescopic tubes: cords not fixed to tube; no strain on conductors	No such tubes	N
2.6 (4.14.5)	Guide pulleys	No such construction	N
2.6 (4.14.6)	Strain on socket-outlets	Not such unit	N
2.6 (4.15)	Flammable materials:		P
	- glow-wire test 650°C		P
	- spacing \geq 30 mm		N
	- screen withstanding test of 13.3.1		N
	- screen dimensions		N
	- no fiercely burning material		N
	- thermal protection		N
	- electronic circuits exempted		N
1.6 (4.15.2)	Luminaires made of thermoplastic material		—

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
	a) construction		N
	b) temperature sensing control		N
	c) surface temperature		N
2.6 (4.16)	Luminaires marked with "F" symbol		N
	No lamp control gear		N
2.6 (4.16.1)	Lamp control gear spacing:		P
	- spacing 35 mm		P
	- spacing 10 mm		N
2.6 (4.16.2)	Thermal protection:		—
	- in lamp control gear	No such component	N
	- external		N
	- fixed position		N
	- temperature marked lamp control gear		N
2.6 (4.16.3)	"F" curve measured	(see 12.6)	P
2.6 (4.17)	Drain holes		N
	Clearance at least 5 mm		N
2.6 (4.18)	Resistance to corrosion:		—
2.6 (4.18.1)	- rust-resistance		P
2.6 (4.18.2)	- season cracking in copper		N
2.6 (4.18.3)	- corrosion of aluminium		P
2.6 (4.19)	Igniters compatible with ballast		N
2.6 (4.20)	Rough service vibration	Normal service luminaires	N
2.6 (4.21)	Protective shield:		—
2.6 (4.21.1)	Shield fitted		N
2.6 (4.21.2)	Particles from a shattering lamp not impair safety		N
2.6 (4.21.3)	No direct path		N
2.6 (4.21.4)	Impact test on shield		N
	Glow-wire test on lamp compartment		N
2.6 (4.22)	Attachments to lamps		N
2.6 (4.23)	Semi-luminaires comply class II		N
2.6 (4.24)	UV radiation, metal halide lamps		N
2.6 (4.25)	No sharp point or edges		P
2.6 (4.26)	Short-circuit protection:		N
2.6 (4.26.1)	Uninsulated accessible SELV parts		N

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Clause	Requirement - Test	Result - Remark	Verdict
2.6 (4.26.2)	Short-circuit test		N
2.6 (4.26.3)	Test chain according to IEC 61032		N
2.7 (11)	CREEPAGE DISTANCES AND CLEARANCES		—
	Class of protection	Class II	P
	Working voltage (V)	85-277V~	P
	Voltage form	Sinusoidal [√] Non-sinusoidal []	P
	PTI	< 600 [√] ≥ 600 []	P
	Rated pulse voltage (kV)	Category II<2.0kV	P
	(1) Live parts of different polarity: cr (mm); cl (mm)	cl>3.4mm, limit: 1.6mm cr>3.4mm, limit: 2.7mm	P
	(2) Live parts and accessible parts: cr (mm); cl (mm)	cl>4.5mm, limit: 3.1mm cr>6.3mm, limit: 5.2mm	P
	(3) Parts becoming live: cr (mm); cl (mm) ...:		P
	(4) Outer surface of cable: cr (mm); cl (mm).....:		N
	(5) Live parts of switches: cr (mm); cl (mm):		N
	(6) Live parts and supporting surface: cr (mm); cl (mm)	cl>4.5mm, limit: 3.1mm cr>6.3mm, limit: 5.2mm	P
2.8 (7)	PROVISION FOR EARTHING		—
2.8 (7.2.1 + 7.2.3)	Metal parts	Class II	N
	Accessible metal parts		N
	Metal parts and supporting surface		N
	Resistance < 0,5 Ω		N
	Two spaced threaded screws used		N
	Thread-forming screws		N
	Connector earthing first		N
2.8 (7.2.2 + 7.2.3)	Earth continuity		N
2.8 (7.2.4)	Locking of clamping means		N
	Compliance with 4.7.3		N
	Adequate locking		N
	Loosening of clamping means		N

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
2.8 (7.2.5 + 7.2.9)	Connector socket	No socket	N
2.8 (7.2.6 + 7.2.9)	Position of the earth terminal		N
2.8 (7.2.7 + 7.2.9)	Corrosion of the earth terminal		N
2.8 (7.2.8 + 7.2.9)	Material of earth terminal		N
	Contact surface bare metal		N
2.8 (7.2.10)	Class II luminaire for looping-in		N
2.8 (7.2.11)	Earthing core coloured green-yellow		N
	Length of earth conductor		N
2.9 (14)	SCREW TERMINALS		—
	Separately approved; component list	(see Annex 1)	N
	Part of the luminaire		N
2.9 (15)	SCREWLESS TERMINALS		—
	Separately approved; component list	(see Annex 1)	N
	Part of the luminaire		N
2.10 (5)	EXTERNAL AND INTERNAL WIRING		—
2.10 (5.2)	Supply connection and external wiring		—
2.10 (5.2.1 + 5.2.4)	Means of connection.....:	Connector leads	P
2.10 (5.2.2 + 5.2.4)	Type of cable	H03VV-F	P
	Nominal cross-sectional area (mm ²)	2x0.75 mm ²	P
2.10 (5.2.3 + 5.2.4)	Replacement of non-detachable cable and cords		P
2.10 (5.2.5)	Non-rewirable connection		P
2.10 (5.2.6)	Cable entries:		N
	- suitable for introduction		N
	- adequate degree of protection		N
2.10 (5.2.7)	Cable entries through rigid material have rounded edges		N
2.10 (5.2.8)	Insulating bushings:		—
	- suitably fixed		N

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
	- material in bushings		N
	- tubes or guards made of insulating material		N
2.10 (5.2.9)	Locking of bushings		N
2.10 (5.2.10)	Cord anchorage:		—
	- covering protected from abrasion		N
	- clear how to be effective		N
	- no mechanical or thermal stress		N
	- no tying of cables into knots etc.		N
	- insulating material or lining		N
	a) at least one part fixed		N
	b) types of cable		N
	c) no damaging of the cable		N
	d) whole cable can be mounted		N
	e) no touching of clamping screws		N
	f) metal screw not directly on cable		N
	g) replacement without special tool		N
	Glands not used as anchorage		N
	Labyrinth type anchorages		N
2.10 (5.2.10.1)	Tests:		—
	- impossible to push cable; unsafe		P
	- pull test: 25 times; pull (N): 60N		P
	- torque test: torque (Nm): 0.25Nm		P
	- displacement \leq 2 mm	1.2mm	P
	- no movement of conductors		P
	- no damage of cable or cord		P
2.10 (5.2.11)	External wiring passing into luminaire		N
2.10 (5.2.12)	Looping-in terminals		N
2.10 (5.2.13)	Wire ends not tinned		P
	Wire ends tinned: no cold flow		N
2.10 (5.2.14)	Mains plug same protection	No plug	N
	Class III luminaire plug	Not looping-in appliance	N
2.10 (5.2.15)	Colour code low voltage		N
2.10 (5.2.16)	Appliance inlets (IEC 60320)		N

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
	Appliance couplers of class II type		N
2.10 (5.3)	Internal wiring		P
2.10 (5.3.1)	Cross-sectional area (mm ²).....:	18AWG	P
	Insulation thickness	>0.7mm	P
	Temperature resistant		P
	Sleeves suitable for hot spots		P
	Green-yellow for earth only		P
	Through wiring		—
	- cross-sectional area (mm ²).....:		N
	- not delivered/ mounting instruction		N
	- factory assembled		N
	- socket outlet loaded (A).....:		N
	- temperatures		N
2.10 (5.3.2)	Sharp edges etc.		P
	No moving parts of switches etc.		N
	Joints, raising/lowering devices		P
	Telescopic tubes etc. mm ²		N
	No twisting over 360°		P
2.10 (5.3.3)	Openings		P
	Bushings not removable		P
	Bushings in sharp openings		N
	Cables with protective sheath		N
2.10 (5.3.4)	Joints and junctions:		—
	- easily accessible		N
	- effectively insulated		P
2.10 (5.3.5)	Strain on internal wiring	PVC wire	N
2.10 (5.3.6)	Wire carriers		P
2.10 (5.3.7)	Wire ends not tinned		P
	Wire ends tinned: no cold flow		N
2.11 (8)	PROTECTION AGAINST ELECTRIC SHOCK		—
2.11 (8.2.1 + 8.2.5)	Live parts not accessible	Live parts enclosed by enclosure	P
	Protection in any position		P
	Insulation lacquer not reliable		N

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
	Double-ended tungsten filament lamp		N
	Double-ended high pressure discharge lamp		N
2.11 (8.2.2 + 8.2.5)	Portable luminaire	Recessed luminaires	N
2.11 (8.2.3 + 8.2.5)	Class II luminaire:		—
	- insulation-encased, reinforced insulation		P
	- metal-encased, double insulation		P
	- basic insulated metal parts or basic insulated live conductors only accessible during starter or lamp replacement		P
	- glass protective shields not used as supplementary insulation		P
	Class I luminaire with BC lampholder		N
2.11 (8.2.4 + 8.2.5)	Portable luminaire:	(Recessed luminaires)	—
	- non-detachable cable		N
	- terminal block completely covered		N
2.11 (8.2.6)	Covers have adequate strength		—
	Covers reliably secured	Cover not removable without tool	P
2.11 (8.2.7)	Discharging of capacitors $\geq 0.5 \mu\text{F}$		N
	Portable plug connected luminaire with capacitor		N
	Other plug connected luminaire with capacitor		N
	Discharge device on or within capacitor		N
	Discharge device mounted separately		N
2.12 (12)	ENDURANCE TEST AND THERMAL TEST		—
2.12 (12.3)	Endurance test:		—
	- mounting-position	Wall and ceiling	P
	- test temperature ($^{\circ}\text{C}$)	35 $^{\circ}\text{C}$	P
	- total duration (h)	240hrs. Totally 10 cycles, each 24h. Appliance worked as normal	P
	- supply voltage: Un factor; calculated voltage (V).....	1.1x 277V	P
	- lamp used	LED lamp	P

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
2.12 (12.3.2)	After endurance test:		—
	- no part unserviceable		P
	- luminaire not unsafe		P
	- no damage to track system		N
	- marking legible		P
	- no cracks, deformation etc.		P
2.12 (12.4)	Thermal test (normal operation)	(see Annex 2)	P
2.12 (12.5)	Thermal test (abnormal operation)		P
2.12 (12.6)	Thermal test (failed lamp control gear condition):		—
2.12 (12.6.1)	- case of abnormal conditions.....:		N
	- electronic lamp control gear		N
	- measured winding temperature (°C): at 1.1 Un		—
	- measured mounting surface temperature (°C): at 1.1 Un		N
	- calculated mounting surface temperature (°C)		N
	- track-mounted luminaires		N
2.12 (12.6.2)	Temperature sensing control		N
	- thermal link		N
	- manual reset cut-out		N
	- auto reset cut-out		N
	- measured mounting surface temperature (°C):		N
	- track-mounted luminaires		N
2.12 (12.7)	Thermal test (failed lamp control gear in plastic luminaires):		—
	- case of abnormal conditions.....:		N
	- measured winding temperature (°C) at 1,1 Un		—
	- measured temperature of fixing point/ exposed part (°C) at 1,1 Un		N
	- calculated temperature of fixing point/ exposed part (°C)		N
2.12 (12.7.2)	Temperature sensing control		—
	- thermal link		N
	- manual reset cut-out		N
	- auto reset cut-out		N

EN 60598-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
	- measured temperature of fixing point/ exposed part (°C)		N
2.13 (9)	RESISTANCE TO DUST, SOLID OBJECTS AND MOISTURE		—
2.13 (9.2)	Tests for ingress of dust, solid objects and moisture:		P
	- classification according to IP	IP20	—
	- mounting position during test		—
	- fixing screws tightened; torque (Nm).....		—
	- tests according to clauses		—
	- electric strength		N
	a) no deposit in dust-proof luminaire		N
	b) no talcum in dust-tight luminaire		N
	c) no trace of water on live parts		N
	d) no accumulation of water in waterproof luminaire		N
	e) no water in watertight luminaire		N
	f) no contact with live parts (IP 2X)		P
	f) no entry into enclosure (IP 3X and IP 4X)		N
2.13 (9.3)	Humidity test 120 h	Relative humidity 93%, temperature 25°C, 48h, followed by hi-pot test	P

2.14 (10)	INSULATION RESISTANCE AND ELECTRIC STRENGTH		—
2.14 (10.2.1)	Insulation resistance test:		P
	Class of protection	Class II	—
	Insulation resistance (MΩ):		P
	SELV:		P
	- between current-carrying parts of different polarity	>100 MΩ, limits: 1 MΩ	P
	- between current-carrying parts and mounting surface	>100 MΩ, limits: 1 MΩ	P
	- between current-carrying parts and metal parts of the luminaire	>100 MΩ, limits: 1 MΩ	P
	Other than SELV:		P
	- between live parts of different polarity.....	>100 MΩ, limits: 2 MΩ	P
	- between live parts and mounting surface.:	>100 MΩ, limits: 4 MΩ	P
	- between live parts and metal parts.....	>100 MΩ, limits: 4 MΩ	P

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Clause	Requirement - Test	Result - Remark	Verdict
	- between live parts of different polarity through action of a switch		N
2.14 (10.2.2)	Electric strength test:		—
	Class of protection	Class II	—
	Dummy lamp		N
	Luminaires with ignitors after 24 h test		N
	Luminaires with manual ignitors		N
	Test voltage (V):		—
	SELV:		—
	- between current carrying parts of different polarity	500Vac, 1min, no damage	P
	- between current carrying parts and mounting surface	500Vac, 1min, no damage	P
	- between carrying parts parts and metal parts of the luminaire	500Vac, 1min, no damage	P
	Other than SELV:		P
	- between live parts of different polarity	1554Vac, 1min, no damage	P
	- between live parts and mounting surface	3108Vac, 1min, no damage	P
	- between live parts and metal parts	3108Vac, 1min, no damage	P
	- between live parts of different polarity through action of a switch	No switch	N
2.14 (10.3.1)	Leakage current (mA)	0.15mA<0.7mA	P
2.15 (13)	RESISTANCE TO HEAT, FIRE AND TRACKING		—
2.15 (13.2.1)	Ball-pressure test:		P
	- part tested; temperature (°C)	Connector; 125°C, 0.6mm	P
	- part tested; temperature (°C)		N
	- part tested; temperature (°C)		N
	- part tested; temperature (°C)		N
2.15 (13.3.1)	Needle flame test (10 s):		P
	- part tested	Connector; No burning	P
	- part tested		N
	- part tested		N
2.15 (13.3.2)	Glow-wire test (650 °C):		P
	- part tested	Connector; No burning	P
	- part tested		N

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Clause	Requirement - Test	Result - Remark	Verdict
	- part tested.....:		N
2.15 (13.4.1)	Tracking test: part tested		N
	COMMON MODIFICATIONS		—
(5.2.2)	Cables equal to HD 21 S2 or HD 22 S2	No cord used	N
(5.2.15)	Colour code low voltage		N
ZB	ANNEX ZB, SPECIAL NATIONAL CONDITIONS		—
(2.2)	Class 0 not accepted	Class II	P
(3.3)	DK: power supply cord with label		N
	IT: warning label on Class 0 luminaire		N
(4.5.1)	DK: socket-outlets		N
(4.5.1)	FR: socket-outlets		N
(5.2.1)	DK, FI, SE, GB: type of plug		N
ZC	ANNEX ZC, NATIONAL DEVIATIONS		—
(13.3)	DK: Needle flame test or glow-wire test 750°C for luminaires in access routes		N
(13.3)	GB: Requirements according to United Kingdom Building Regulation		N
(13.3.2)	FR: Glow-wire test 850°C alt. 750°C for luminaires in premises open to public and workers		N
EMF			
	The tested product also complies to the requirements of EN 62493: 2010		--
	Limit.....0.85	Measured max.:.....0.021	P

Tables

ANNEX 1: components						P
object/part No.	Code	manufacturer/trade mark	type/model	technical data	standard	mark(s) of conformity
LED driver 1	B	Shenzhen Xiezhen Electronics Co., Ltd	XZ-CG45B-420110	Input:100-277V~,50/60HZ, 0.75A Output: DC 27-42V.1100mA	EN 61347-2-13 EN 61347-1	CE
LED driver 2	B	Shenzhen Xiezhen Electronics Co., Ltd	LP-40-42-1050	Input:100-240V~,50/60HZ, 0.8A Output: DC 30-42V.1050mA	EN 61347-2-13 EN 61347-1	CE
Supply wire	B	Shenzhen Zelongkang Electric Ltd	H03VV-F	300/500V, 2x0.75 mm ²	UL 758	E330488
Output wire	B	Shenzhen Zelongkang Electric Ltd	UL1015, 18AWG	UL1015, 18AWG	UL 758	E330488
Connector	B	Various	Various	Min.V-2, 65°C.	EN 60998-2-1; EN 60998-2-2	UL

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

ANNEX 2: temperature measurements, thermal tests of Section 12			P
Type reference	DOWN-035-ND-WW-00		P
Lamp used	LED lamp		P
Lamp control gear used.....	Independent lamp control		P
Mounting position of luminaire.....	See product manual		P
Supply wattage (W)	Max. 35W		P
Supply current (A)			N
Calculated power factor.....	0.864		P
Table: measured temperatures corrected for ta = 45°C :			P
- abnormal operating mode.....			N
- test 1: rated voltage.....	277V		P
- test 2: 1,06 times rated voltage or 1,05 times Rated wattage	1.06x277V		P

Tables

	- test 3: Load on wiring to socket-outlet, 1.06 times voltage or 1.05 times wattage	---	N			
	- test 4: 1,1 times rated voltage or 1,05 times rated wattage	---	N			
	Through wiring or looping-in wiring loaded by a current of A during the test.....	---	N			
Temperature(°C) of part	Clause 12.4 – normal				Clause 12.5 – abnormal	
	Test 1	Test 2	Test 3	Limits(°C)	Test 4	Limit (°C)
Power supply	52.5	53.6	---	105	---	---
Connector	48.2	59.6	---	65	---	---
Enclosure of driver	63.4	64.2	---	70	---	---
Enclosure of lamp	60.3	62.2	---	85	---	---
Mounting surface	57.3	57.8	---	90	---	---
Ambient	25.1	25.0	---	---	---	---

	ANNEX 3: screw terminals (part of the luminaire)	--
(14)	SCREW TERMINALS	--
(14.2)	Type of terminal.....	---
	Rated current (A).....	---
(14.3.2.1)	One or more conductors	N
(14.3.2.2)	Special preparation	N
(14.3.2.3)	Terminal size	N
	Cross-sectional area (mm ²)	N
(14.3.3)	Conductor space (mm)	N
(14.4)	Mechanical tests	N
(14.4.1)	Minimum distance	N
(14.4.2)	Cannot slip out	N
(14.4.3)	Special preparation	N
(14.4.4)	Nominal diameter of thread (metric ISO thread)	N
	External wiring	N
	No soft metal	N
(14.4.5)	Corrosion	N
(14.4.6)	Nominal diameter of thread (mm)	N
	Torque (Nm)	N
(14.4.7)	Between metal surfaces	N
	Lug terminal	N
	Mantle terminal	N

Tables

	Pull test; pull (N)		N
(14.4.8)	Without undue damage		N

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

Tables

(15.8.1)	Pull test spring-type terminals (4 samples); pull (N)										N
	Pull test pin or tab terminals (4 samples); pull (N)										N
(15.9)	Contact resistance test										N
	Voltage drop (mV) after 1 h										N
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)											

Attachment No.1

TEST REPORT EN 62471 Photobiological safety of lamps and lamp systems	
Report reference No.	See report EN 60598-2-2
Tested by (name + signature).....	See report EN 60598-2-2
Approved by (name +signature)	See report EN 60598-2-2
Date of issue	See report EN 60598-2-2
Contents	See report EN 60598-2-2
Testing laboratory	
Name	See report EN 60598-2-2
Address	See report EN 60598-2-2
Testing location	See report EN 60598-2-2
Client	
Name	See report EN 60598-2-2
Address	See report EN 60598-2-2
Manufacturer	
Name	See report EN 60598-2-2
Address	See report EN 60598-2-2
Test specification	
Standard	EN 62471: 2008
Test procedure	Compliance with EN 62471: 2008
Non-standard test method	N/A
Test item Description	See report EN 60598-2-2
Trademark	See report EN 60598-2-2
Model and/or type reference	See report EN 60598-2-2
Rating(s)	See report EN 60598-2-2

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict
1	SCOPE		P
	More sections applicable	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>]	--
4	EXPOSURE LIMITS		P
4.1	General		P
	The exposure limits in this standard apply to continuous sources where the exposure duration 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. The values should not be regarded as precisely defined lines between safe and unsafe levels.		P
	detailed spectral data of a light source are generally required only if the luminance of the source exceeds 104 cd•m ⁻² .	See clause 4.3	P
4.2	Specific factors involved in the determination and application of retinal exposure limits		N
4.2.1	Pupil diameter		P
4.2.2	Angular subtense of source and measurement field-of-view		P
4.3	Hazard exposure limits		P
4.3.1	Actinic UV hazard exposure limit for the skin and eye	LED light source	N
	The limits for exposure to ultraviolet radiation incident upon the unprotected skin or eye apply to exposure within any 8-hour period.		N
	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:		N
	$E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \Delta t \cdot \Delta \lambda$ J•m ⁻²		N
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		N
	$t_{\max} = \frac{30}{E_s}$		N

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict
4.3.2	Near-UV hazard exposure limit for the eye		N
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 Jm ⁻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, EUVA, shall not exceed 10 Wm ⁻² .		N
	$E_{SUV} \cdot t = \sum_{315}^{400} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 10000 \text{ J} \cdot \text{m}^{-2} \text{ (} t < 1000 \text{ s)}$		N
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for times less than 1000 s, shall be computed by:		N
	$t_{\max} \leq \frac{1000}{E_{UVA}} \text{ S}$		N
4.3.3	Retinal blue light hazard exposure limit		P
	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(λ), i.e., the blue light weighted radiance, LB, shall not exceed the levels defined by:		P
	$L_B \cdot t = \sum_{300}^{700} \sum_t L_{\lambda}(\lambda, t) \cdot B_{(\lambda)} \cdot \Delta t \cdot \Delta \lambda \leq 100 \text{ J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	(for t ≤ 10 ⁴ s)	N
	$L_B = \sum_{300}^{700} L_{\lambda} \cdot B_{(\lambda)} \cdot \Delta \lambda \leq 100 \text{ W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	For t > 10 ⁴ S	P
4.3.4	Retinal blue light hazard exposure limit - small source		P
	Thus the spectral irradiance at the eye Eλ, weighted against the blue-light hazard function B(λ) (see Table 4.2) shall not exceed the levels defined by:		N
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_{\lambda}(\lambda, t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 100$	(for t ≥ 100s)	N

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1$	For t ≤ 100s	N
4.3.5	Retinal thermal hazard exposure limit		N
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_λ , weighted by the burn hazard weighting function $B(\lambda)$ (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:		N
	$L_R = \sum_{380}^{1400} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq \frac{50000}{\alpha \cdot t^{0.25}} \text{ J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	10us ≤ t ≤ 10s	N
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		P
	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:		P
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq \frac{6000}{\alpha} \text{ J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	t > 10s	P
4.3.7	Infrared radiation hazard exposure limits for the eye		N
	To 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
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \leq 1800 \cdot t^{-0.75} \text{ W} \cdot \text{m}^{-2}$	T ≤ 1000s	N
	For times greater than 1000 s the limit becomes:		N
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \leq 100 \text{ W} \cdot \text{m}^{-2}$	T > 1000s	N

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict
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
	$E_H \cdot t = \sum_{380}^{3000} \sum_t E_\lambda(\lambda, t) \cdot \Delta\lambda \leq 20000 \cdot t^{0.25}$		P
5	MEASUREMENT OF LAMPS AND LAMP SYSTEMS		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.		P
5.1.2	Test environment		P
	For specific test conditions, see the appropriate IEC lamp standard or in the absence of such standards, the appropriate national standards or manufacturer's recommendations.		P
5.1.3	Extraneous radiation		N
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		P
	Operation of the test lamp shall be provided in accordance with:		P
	--the appropriate IEC lamp standard.		P
	--the lamp manufacturer's recommendation		P
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.		P
	-- the lamp manufacturer's recommendation		N
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	minimum input aperture diameter of 7 mm		N
	maximum input aperture diameter of 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.....		P
	The measurement made with an optical system		P
	The instrument shall be calibrated to read in absolute incident radiant power per unit receiving area and per unit solid angle of acceptance averaged over the field of view (FOV) of the instrument.		P
5.2.2.2	Alternative method		P
	Alternative 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		
5.2.3	Measurement of source size.....		P
	The determination of α , the angle subtended by a source, requires the determination of the 50% emission point of the source	0.18	P
5.2.4	Pulse width measurement for pulsed sources.....		N
	The determination of Δt , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	The standardized interpolated values, use linear interpolation on the log of given values to obtain intermediate point 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.	See annex C	P

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict
6	LAMP CLASSIFICATION		P
	For the purposes of this standard it was decided that the values shall be reported as follows:		N
	for lamps intended for general lighting service (GLS), the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm;		P
	for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm.		N
6.1	Continuous wave lamps	Class I Laser Product	P
6.1.1	Exempt group		P
	the exempt group are lamps, which does not pose any photobiological. This requirement is met by any lamp that does not pose		P
	--an actinic ultraviolet hazard (<i>E_s</i>) within 8-hours exposure (30000 s), nor		N
	--a near-UV hazard (<i>EUVA</i>) within 1000 s, (about 16 min) nor		N
	--a retinal blue-light hazard (<i>LB</i>) within 10000 s (about 2,8 h), nor		P
	--a retinal thermal hazard (<i>LR</i>) within 10 s, nor		P
	--an infrared radiation hazard for the eye (<i>EIR</i>) within 1000 s.		N
6.1.2	Risk Group 1 (Low-Risk)		N
	In this group are lamps, which exceeds the limited for the except group but that does not pose:		N
	--an actinic ultraviolet hazard (<i>E_s</i>) within 10000 s, nor		N
	--a near ultraviolet hazard (<i>EUVA</i>) within 300 s, nor		N
	--a retinal blue-light hazard (<i>LB</i>) within 100 s, nor		N
	--a retinal thermal hazard (<i>LR</i>) within 10 s, nor		N
	--an infrared radiation hazard for the eye (<i>EIR</i>) within 100 s.		N
	lamps that emit infrared radiation without a strong visual stimulus (i.e., less than 10 cd·m ⁻²) and do not pose a near-infrared retinal hazard (<i>LIR</i>), within 100 s are in Risk Group 1 (Low-Risk).		N
6.1.3	Risk Group 2 (Moderate-Risk)		N

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict
	This requirement is met by any lamp that exceeds the limits for risk Group 1, but that does not pose:		N
	--an actinic ultraviolet hazard (E_s) within 1000 s exposure, nor		N
	--a near ultraviolet hazard (EUVA) within 100 s, nor		N
	--a retinal blue-light hazard (LB) within 0,25 s (aversion response), nor		N
	--a retinal thermal hazard (LR) within 0,25 s (aversion response), nor		N
	--an infrared radiation hazard for the eye (EIR) within 10 s.		N
	lamps that emit infrared radiation without a strong visual stimulus (i.e., less than $10 \text{ cd}\cdot\text{m}^{-2}$) and do not pose a near infrared retinal hazard (LIR) within 10 s are in Risk Group 2 (Moderate-Risk).		N
6.1.4	Risk Group 3 (High-Risk)		N
	Lamps which exceed the limits for Risk Group 2 (Moderate-Risk) are in Risk Group3 (High-Risk).		N
6.2	Pulsed lamps		N
	Pulsed lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 second		N
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer		N
	The risk group determination of the lamp being tested shall be made as follows:		N
	-- A lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk).		N
	-- For single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL shall be classified as belonging to the Exempt Group.		N
	-- For repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the Continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission.		N
ANNEX A	SUMMARY OF BIOLOGICAL EFFECTS		--
	Bioeffect datasheet #1: Infrared cataract		N

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict

A.1	Bioeffect: INFRARED CATARACT also known as "industrial heat cataract, "furnaceman's cataract", or "glassblower's cataract".		N
A.1.1	Organ/Site: Eye/Crystalline Lens.		N
A.1.2	Spectral range: 700 nm to 1400 nm and possibly to 3000 nm.		N
A.1.3	Peak of action spectrum: Not known; probably between 900-1000 nm.		N
A.1.4	State of knowledge: Limited threshold data available for acute cataract for rabbit at 1064 nm (Wolbarsht, 1992) and IR-A region (Pitts and Cullen, 1981); no data for man. Degree of additivity and action spectrum unknown. Good epidemiological evidence (Lydahl, 1984).		N
A.1.5	Time course: Noticeable clouding of the lens generally following years of chronic high-level exposure, the elapsed time depending upon how much difference between exposure and threshold, heavy exposures producing reaction in shortest time.		N
A.1.6	Mechanism: Generally presumed to be thermal, although recent evidence suggests possible photochemical reaction - details not understood. The lens may be heated either from direct irradiation (Vogt, 1919) or by conductive heating from the heated iris (Goldman, 1983).		N
A.1.7	Symptoms: Clouding of vision.		N
A.1.8	Needed information: Action spectrum, if existent, for acute and for effects of concomitant ultraviolet radiation exposure; additivity of multiple exposures, and the possibility of delayed effects from recurrent exposures.		N
A.1.9	Experience with lamps: Accidental injury is not known, even from exposure to heat lamps. Limited population exposed.		N
A.1.10	Key references		N

	Bioeffect datasheet #2		--
A.2	Bioeffect		P
A.2.1	Organ/Site		P
A.2.2	Spectral range		P
A.2.3	Peak of action spectrum		P
A.2.4	State of knowledge		P

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict
A.2.5	Time course		P
A.2.6	Mechanism		P
A.2.7	Symptoms		P
A.2.8	Needed information		P
A.2.9	Experience with lamps		P
A.2.10	Key references		P
	Bioeffect datasheet #3		--
A.3	Bioeffect		N
A.3.1	Organ/Site		N
A.3.2	Spectral range		N
A.3.3	Peak of action spectrum		N
A.3.4	State of knowledge		N
A.3.5	Time course		N
A.3.6	Mechanism		N
A.3.7	Symptoms		N
A.3.8	Needed information		N
A.3.9	Experience with lamps		N
A.3.10	Key references		N
	Bioeffect datasheet #4		--
A.4	Bioeffect		N
A.4.1	Organ/Site		N
A.4.2	Spectral range		N
A.4.3	Peak of action spectrum		N
A.4.4	State of knowledge		N
A.4.5	Time course		N
A.4.6	Mechanism		N
A.4.7	Symptoms		N
A.3.8	Needed information		N
A.4.9	Experience with lamps		N
A.4.10	Key references		N
	Bioeffect datasheet #5		--
A.5	Bioeffect		N
A.5.1	Organ/Site		N
A.5.2	Spectral range		N
A.5.3	Peak of action spectrum		N
A.5.4	State of knowledge		N

EN 62471			
Clause	Requirement - Test	Result - Remark	Verdict
A.5.5	Time course		N
A.5.6	Mechanism		N
A.5.7	Symptoms		N
A.5.8	Needed information		N
A.5.9	Experience with lamps		N
A.5.10	Key references		N
ANNEX B	MEASUREMENT METHOD		N
B.1	Instrumentation		N
B.1.1	Double monochromator: Recommended instrument		N
B.1.2	Broadband detectors		N
B.2	Instrument limitations		N
B.2.1	Noise equivalent irradiance		N
B.2.2	Instrument spectral response		N
B.2.3	Wavelength accuracy		N
B.2.4	Stray radiant power		N
B.2.5	Input optics for spectral irradiance measurements: Recommendation		N
B.2.6	Linearity		N
B.3	Calibration sources		N
ANNEX C	UNCERTAINTY ANALYSIS		P
ANNEX D	GENERAL REFERENCES		P
ANNEX ZA	Normative references to international publications with their corresponding European publications		N
ANNEX ZB	EXPOSURE LIMITS (EL'S)	See ANNEX ZB above	P

Table 4.1		Spectral weighting function for assessing ultraviolet hazards for skin and eye.		P
Wavelength ¹ λ , nm	UV hazard function SUV(λ)	Wavelength λ , nm	UV hazard function SUV(λ)	
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	0,960	350	0,00020	
285	0,880	355	0,00016	
290	0,770	360	0,00013	
295	0,540	370	0,00009	
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	
1 Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.				
* Emission lines of a mercury discharge spectrum.				

Table 4.2		Spectral weighting functions for assessing retinal hazards from broadband optical sources.	P
Wavelength 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	

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources.		P
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	

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	≤ 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	≤ 100 > 100	< 0,011	$100/t$ 1,0
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 – 3000	≤ 1000 > 1000	1,4 (80)	$18000/t^{0,75}$ 100
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2 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 irradiance $W \cdot m^{-2} \cdot sr^{-1}$	
Blue light	$L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	0,25 – 10 10-100 100-10000 ≥ 10000	0,011·√(#10) 0,011 0,0011·√t 0,1	106/t 106/t 106/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·√(#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/ α	

Table 6.6		Emission limits for risk groups of continuous wave lamps.				P
Risk	Action spectrum	Symbol	Emission limits			Units
			Exempt	Low risk	Mod risk	
Actinic UV	$S_{UV}(\lambda)$	E_S	0,001	0,003	0,03	$W \cdot m^{-2}$
Near UV		E_{UVA}	10	33	100	$W \cdot m^{-2}$
Blue light	$B(\lambda)$	L_B	100	10000	4000000	$W \cdot m^{-2} \cdot sr^{-1}$
Blue light, small source	$B(\lambda)$	E_B	1,0*	1,0	400	$W \cdot m^{-2}$
Retinal thermal	$R(\lambda)$	L_R	28000/ α	28000/ α	71000/ α	$W \cdot m^{-2} \cdot sr^{-1}$
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	6000/ α	6000/ α	6000/ α	$W \cdot m^{-2} \cdot sr^{-1}$
IR radiation, eye		E_{IR}	100	570	3200	$W \cdot m^{-2}$

* 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 No.2

<p>TEST REPORT</p> <p>EN 62031</p> <p>Lamp controlgear</p> <p>Part 1: General and safety requirements</p> <p>Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules</p>	
<p>Report reference No.</p> <p>Tested by(name + signature).....</p> <p>Approved by(name + signature) ...</p> <p>Date of issue</p> <p>Contents.....</p>	<p>See report EN 60598-2-2</p> <p>See report EN 60598-2-2</p> <p>See report EN 60598-2-2</p> <p>See report EN 60598-2-2</p> <p>See report EN 60598-2-2</p>
<p>Testing laboratory</p> <p>Name</p> <p>Address.....</p> <p>Testing location</p>	
<p>Client</p> <p>Name</p> <p>Address.....</p>	
<p>Manufacturer</p> <p>Name</p> <p>Address.....</p>	
<p>Test specification</p> <p>Standard</p> <p>Test procedure</p> <p>Non-standard test method</p>	
<p>Test item Description</p> <p>Trademark</p> <p>Model and/or type reference.....</p> <p>Rating(s)</p>	

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
4	GENERAL REQUIREMENTS		---
4.1	Modules shall be so designed and constructed that in normal use (see manufacturer's instruction) they operate without danger to the user or surroundings:		P
4.2	For LED modules, all electrical measurements, unless otherwise specified, shall be carried out at voltage limits (min/max), current limits (min/max) or power limits (min/max) and minimum frequency, in a draught-free room at the temperature limits of the allowed range specified by the manufacturer. Unless the manufacturer indicates the most critical combination, all combinations (min/max) of voltage/current/power and temperature shall be tested.		P
4.3	For self-ballasted LED modules, the electrical measurements shall be carried out at the tolerance limit values of the marked supply voltage.		P
4.4	Integral modules not having their own enclosure shall be treated as integral components of luminaires as defined in IEC 60598-1, Clause 0.5. They shall be tested assembled in the luminaire, and as far as applicable with the present standard.		N
4.5	Independent modules shall comply, in addition to this standard, with the requirements of relevant clauses of IEC 60598-1, where these requirements are not already covered in this standard.		P
4.6	If the module is a factory sealed unit, it shall not be opened for any tests. In the case of doubt based on the inspection of the module and the examination of the circuit diagram, and in agreement with the manufacturer or responsible vendor, such specially prepared modules shall be submitted for testing so that a fault condition can be simulated.	Unsealed	N
5	GENERAL TEST REQUIREMENTS		---
5.1	Tests according to this standard are type tests		P
5.2	Unless otherwise specified, the tests are carried out at an ambient temperature of 10 °C to 30°C		P

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
5.3	Unless otherwise specified, the type test is carried out on one sample consisting of one or more items submitted for the purpose of the type test.		P
5.4	If the light output has detectably changed, the module shall not be used for further tests.		P
5.5	For SELV-operated LED modules, the requirements of IEC 61347-2-13, Annex I, apply additionally.		N
6	CLASSIFICATION		---
	Independent		P
	Built-in		N
	Integral		N
7	MARKING		---
7.1	Mandatory marking for built-in or independent modules		P
	a) Mark of origin (trade mark, manufacturer's name or name of the responsible vendor/supplier).	See page 1	P
	b) Model number or type reference of the manufacturer.	See page 1	P
	c) Either the - If the LED module requires a stable voltage(s), the rated supply voltage or voltage range, both together with the supply frequency shall be marked. Marking of the rated supply current(s) is voluntary. - If the LED module requires a stable current, the rated supply current(s) or current range, both together with the supply frequency shall be marked. Marking of the rated supply voltage(s) is voluntary	DC27-42V, 1100mA	P
	d) Nominal power.	Max. 35W	P
	e) Indication of position and purpose of the connections where it is necessary for safety. In case of connecting wires, a clear indication shall be given in a wiring diagram.		N
	f) Value of t_c . If this relates to a certain place on the LED module, this place shall be indicated or specified in the manufacturer's literature.		N
	g) For eye protection, see requirements of IEC 62471.		P

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
	h) Built-in modules shall be marked in order to separate them from independent modules. The mark shall be located on the packaging or on the module itself.		N
	i) The heat transfer temperature t_d (if the LED module is provided with a cap enabling the insertion and the withdrawal without the use of tools and reliant on heat-conduction to the luminaire).		N
	k) Working voltage at which the insulation is designed.		N
7.2	Location of marking		---
	Items a), b), c) and f) of 7.1 shall be marked on the module.		P
	Items d), e), g), h), i) and j) shall be marked legible on the LED module or on the LED module data sheet. Item k) should be in the manufacturer's literature.		P
	For integral modules, no marking is required, but the information given in 7.1 a) to g) shall be provided in the technical literature of the manufacturer.		N
7.3	Durability and legibility of marking		P
	Rubbing 15 s water, 15 s petroleum; marking legible		P
8 (14)	SCREW TERMINALS		N
	Separately approved: component list		N
	Part of the luminaire		N
8 (15)	SCREWLESS TERMINALS and electrical connections		N
	Separately approved: component list		N
	Part of the luminaire		N

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
9	PROVISION FOR EARTHING		N
	External metal parts connected to the earth terminal:		N
	- compliance with 7.2.1 in EN 60598-1		N
	Test with a current of 10 A between earthing terminal and each of the accessible metal parts; measured resistance (Ω): $< 0,5 \Omega$		N
	Protective earth, symbol		N
	Terminal complying with clause 8 in Part 1		N
	Locked against loosening and not possible to loosen by hand		N
	Not possible to loosen clamping means unintentionally on screwless terminals		N
	Earthing via means of fixing		N
	Earthing terminal only used for the earthing of the control gear		N
	All parts of material minimizing the danger of electrolytic corrosion		N
	Made of brass or equivalent material		N
	Contact surface bare metal		N
	Conductors by tracks on printed circuit boards:		N
	- a.c. current of 25 A for 1 min between earthing terminal and accessible metal parts		N
	- compliance with clause 7.2.1 in EN 60598-1		N
10	PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS		P
10.1	Ballast protected against accidental contact with live parts		N
A1	Current measured according to EN 60990, figure 4 and clause 7.1: max. 0,7 mA (peak) or 2,0 mA d.c., for $f \geq 1000$ Hz max. 70 mA		N
A2	Voltage at 50 k Ω (V): max. 34 V (peak)		N
	Lacquer or enamel not considered to be adequate protection		N
	Adequate mechanical strength on parts providing protection		N
10.2	Capacitors $> 0,5 \mu\text{F}$: voltage after 1 min (V): < 50 V		N
11	MOISTURE RESISTANCE AND INSULATION		P

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
	After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance with d.c. 500 V (MΩ): ≥ 2 MΩ	Refer to table 11	P
	The leakage current shall not exceed the values shown in figure 2 when measured in accordance with annex I	Refer to table 11	P

12	ELECTRIC STRENGTH		P
	Immediately after clause 11 electric strength test for 1 min	Refer to table 12	P
	Working voltage ≤ 50 V, test voltage 500 V	DC27-42V	P
	Working voltage > 50 V, test voltage (V): 2U + 1000 V		N
	Reinforced insulation, test voltage (V):		N
	No flashover or breakdown		P

13	FAULT CONDITIONS		---
	Windings of ballasts shall have adequate thermal endurance	No such parts	N
13.1	General		N
	When operated under fault conditions the ballast: - does not emit flames or molten material	No such parts	N
	- does not produce flammable gases		N
	- protection against accidental contact not impaired		N
	Thermally protected ballasts does not exceed the marked temperature value	Not thermally protected ballasts	N
	Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected		N
	Short-circuit of creepage distances and clearances if less than specified in clause 18 (except between live parts and accessible metal parts)	Refer to table 13	N
	Short-circuit or interruption of semiconductor devices	Refer to table 13	N
	Short-circuit across insulation consisting of lacquer, enamel or textile	Refer to table 13	N
	Short-circuit across electrolytic capacitors	Refer to table 13	N
	During the tests, a five-layer tissue paper, where the test specimen is wrapped, does not ignite	No ignition	N
13.2	Overpower condition		N

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
	The test shall be started at an ambient temperature as specified in Annex A.		N
	The module shall be switched on and the power monitored (at the input side) The voltage or the current shall be increased until 150 % of the rated power is reached . The test shall be continued until the module is thermally stabilised. A stable condition is reached, if the temperature does not change by more than 5 K in 1 h. The temperature shall be measured in the tc point. The module shall withstand the overpower condition for at least 15 min, the time period of which can lie within the stabilisation period if the temperature change is ≤ 5 K.		N
	If the module contains an automatic protective device or circuit which limits the power, it is subjected to a 15 min operation at this limit. If the device or circuit effectively limits the power over this period, the module has passed the test, provided the compliance (4.1 and last paragraph of 13.2) is fulfilled.		N
	After finalising the overpower mode, the module is operated under normal conditions until thermally being stable.		N
	A module fails safe if no fire, smoke or flammable gas is produced and if the 15 min overpower condition has been withstood. To check whether molten material might present a safety hazard, a tissue paper, as specified in 4.187 of ISO 4046-4, spread below the module shall not ignite.		N

15	Construction		P
	Wood, cotton, silk, paper and similar fibrous material shall not be used as insulation.		P

16	Creepage distances and clearances		P
	Working voltage (V)	DC27-42V	P
	Voltage form	Sinusoidal [] Non-sinusoidal [<input checked="" type="checkbox"/>]	P
	PTI	< 600 [<input checked="" type="checkbox"/>] > 600 []	P
	Impulse withstand category (normal category II) (category III annex U)	Normal category II	P
	Rated pulse voltage (kV)		N

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
	(1) Current-carrying parts of different polarity: cr (mm); cl (mm)	cl>2.2mm, limit: 0.2mm cr>2.6mm, limit: 1.2mm	P
	(2) Current-carrying parts and accessible parts: cr (mm); cl (mm)	cl>2.2mm, limit: 0.2mm cr>2.6mm, limit: 1.2mm	P
	(3) Parts becoming live due to breakdown of basic insulation and metal parts: cr (mm); cl (mm)		N
	(4) Outer surface of cable where it is clamp and metal parts: cr (mm); cl (mm)		N
	(5)not used		N
	(6) Current-carrying parts and supporting surface: cr (mm); cl (mm)	cl>2.2mm, limit: 0.2mm cr>2.6mm, limit: 1.2mm	P

17	SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS		P
17 (4.11)	Electrical connections		P
17(4.11.1)	Contact pressure	No pressure transmitted to the insulating material	P
17 (4.11.2)	Screws:		N
	- Self-tapping screws		N
	- thread-cutting screws		N
17 (4.11.3)	Screw locking:		N
	- spring washer		N
	- rivets	No rivet provided	N
17 (4.11.4)	Material of current-carrying parts	> 50% copper	P
17 (4.11.5)	No contact to wood or mounting surface	No wood	P
17 (4.11.6)	Electro-mechanical contact systems	No such construction	N
17 (4.12)	Mechanical connections and glands		P
17 (4.12.1)	Screw not made of soft metal	No screw	N
	Screws of insulating material		N
	Torque test: torque (Nm); part		N
	Torque test: torque (Nm); part		N
17 (4.12.2)	Screw with diameter < 3 mm screw into metal		P
17 (4.12.4)	Locked connections:		N
	- fixed arms; torque (Nm)		N
	- lampholder; torque (Nm)		N
	- push-button switches; torque (Nm)	No such switches	N
1.6 (4.12.5)	Screwed glands; force (N)		N

18	RESISTANCE TO HEAT, FIRE AND TRACKING		---
18.1	Parts of insulating material retaining live parts in position, ball-pressure test:		N
	- part; test temperature (°C)		N
18.2	Printed boards in accordance with IEC 60249-1, 4.3		N

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
18.3	External parts of insulating material preventing electric shock glow-wire test 650 °C		N
18.4	Parts of insulating material retaining live parts in position, needle-flame test 10 s:		N
	- flame extinguished within 30 s		N
	- no flaming drops igniting tissue paper		N
18.5	Tracking test	Ordinary	N
19	RESISTANCE TO CORROSION		---
	Rust protection:		P
	-10% solution of ammonium chloride in water		N
	- adequate varnish on the outer surface		P
20	Information for luminaire design		---
	Information is given in Annex D.		N
21	Heat management		---
21.1	General		N
	Clause 21 is applicable for exchangeable modules. It is not applicable for non-exchangeable modules. Exchangeability is safeguarded by means of a cap or base and a lampholder. Precondition is that a heat conducting thermal interface to the luminaire is needed for keeping the temperature below the rated maximum temperature t_c .		N
21.2	Heat-conducting foil and paste		N
	For the purpose of heat-transfer from the LED module to the luminaire, the use of a heatconducting foil can be necessary. Any heat-conducting foil shall be delivered within the LED module packaging.		N
21.3	Heat protection (under consideration)		N
	LED modules shall be equipped with a device that cuts the power off or reduces it when t_c is exceeded.		N
21.4	Construction		N
	The heat-conduction from the LED module to the luminaire, the electrical connection and the mechanical holding in the cap/holder system should be separate unless the contrary is proven safe (under consideration).		N

EN 62031			
Clause	Requirement – Test	Result – Remark	Verdict
Annex D	Information for luminaire design		--
D.1	General		N
	For safe operation of these LED modules, it is essential to observe the recommendations of this annex.		N
D.2	Design freedom		N
	A diagrammatic cross section of an LED module fixed by means of a lampholder to a luminaire with the locations for temperature measurements (t_a , t_c , t_d , t_j and t_l) and thermal resistances ($R_{th, module}$, $R_{th, luminaire}$ and $R_{th, ambient}$) is given with Figure D.1.		N
D.3	Testing in the luminaire		N
	The knowledge of t_d and P_d as provided by the LED module manufacturer, of the geometry and the surface properties of the cap and of the t_a of the luminaire to be designed, will allow for designing a luminaire that will most probably keep the t_c of the LED module. However, testing in the luminaire if the luminaires does so will still be necessary.		N

Tables

Table 11(a)		Humidity test			P
Test condition:		Temperature	Relative Humidity	Duration	Breakdown (Y/N)
		25°C	93%	48 hours	N
Test points		Measured insulation		Limited insulation	
Between	To				
+ & -	Output	>100MΩ		1MΩ	

Table 11(b)		Touch current measurement (mA)			P
Condition		Normal		Reverse	
Model No.		ON	OFF	ON	OFF
DOWN-35-ND-WW-00		0.05mA	<0.005	0.05mA	<0.005

Table 12		Electric strength		P
Test points		Test voltage		Results
Between	To			
+ & -	Enclosure	500Vac		No breakdown

13	TABLE: tests of fault conditions		N
Part	Simulated fault	Test result	Hazard
Output	s-c	Fuse opened. No hazard.	No

16	TABLE: creepage distances and clearances						P
	Minimum distances for a.c. (50-60 Hz) sinusoidal voltages						P
RMS working voltage (V) not exceeding	50	150	250	500	750	1000	
1 minimum distances between live parts of different polarity. Specify the value measured.	>2.6						
2 minimum distances between live parts and accessible parts which are permanently fixed to the ballast, including screws or devices for fixing covers or fixing the ballast to its support. Specify the value measured.	>2.2						
- required creepage distances (mm), insulation PTI ≥ 600	0,6	1,4	1,7	3	4	5,5	
- required creepage distances (mm), insulation PTI < 600	1,2	1,6	2,5	5	8	10	
- required clearances (mm)	0,2	1,4	1,7	3	4	5,5	
3 minimum distances between live parts and a flat supporting surface or a loose metal cover, if any, if the construction does not ensure that the values under 2 above are maintained under the most unfavourable circumstances							
- required clearances (mm)	2	3,2	3,6	4,8	6	8	
	Minimum distances for non-sinusoidal pulse voltages						N

Tables

rated pulse voltage (peak kV)	2,0	2,5	3,0	4,0	5,0	6,0	8,0
required minimum distances, clearances (mm)	1,0	1,5	2	3	4	5,5	8
Specify the value measured							
rated pulse voltage (peak kV)	10	12	15	20	25	30	40
required minimum distances, clearances (mm)	11	14	18	25	33	40	60
Specify the value measured							
rated pulse voltage (peak kV)	50	60	80	100	-	-	-
required minimum distances, clearances (mm)	75	90	130	170	-	-	-
Specify the value measured							

ATTACHMENT 3

Photo Documentation

View:
Model:
DOWN-035-
ND-WW-00

- General
- Front
- Rear
- Internal
- Top
- Bottom
- PWB



Figure 1

View:

- General
- Front
- Rear
- Internal
- Top
- Bottom
- PWB

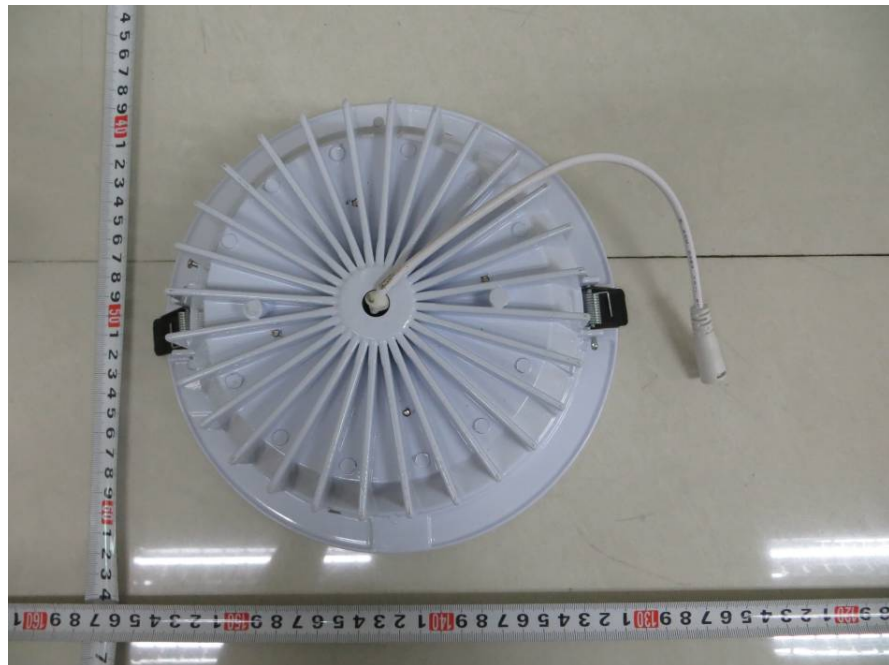


Figure 2