

**BLUEVIEW ELEC-OPTIC TECH CO.,LTD****CE LVD REPORT**

Prepared For:	BLUEVIEW ELEC-OPTIC TECH CO.,LTD No.1000, Section 2, 2nd Konggang Road, Southwest Aviation Industrial Development Zone, Chengdu,Sichuan,China
Product Name:	LED LIGHTING
Model No. :	QNDF5-16, (Q/Z)NSXX-XX-X, (Q/Z)NDXX-XX-X, N2-4 The first XX: LED type, The second XX: Neon buttom width, X:Color or voltage
Prepared By :	BST Testing (Shenzhen) Co.,Ltd. No.7, New Era Industrial Zone, Guantian, Bao'an District, Shenzhen, Guangdong, China
Test Date:	Dec. 23, 2019-Jan. 03, 2020
Date of Report :	Jan. 03, 2020
Report No.:	BSTXD200113663901SR

**TEST REPORT****EN 60598-1&EN 60598-2-21****Luminaires****Part 1: General requirements and tests****Part 2: Particular requirements****Twenty-one – Rope lights****&EN 62031****LED modules for general lighting – Safety specifications****&EN 62471****Assessment of lighting equipment related to human exposure to electromagnetic fields****&EN 62493****Assessment of lighting equipment related to human exposure to electromagnetic fields**

Testing Laboratory Name	BST Testing (Shenzhen) Co.,Ltd .
Address	No.7, New Era Industrial Zone, Guantian, Bao'an District, Shenzhen, Guangdong, China
Testing location	BST Testing (Shenzhen) Co.,Ltd .
Applicant's Name	BLUEVIEW ELEC-OPTIC TECH CO.,LTD
Address	No.1000, Section 2, 2nd Konggang Road, Southwest Aviation Industrial Development Zone, Chengdu,Sichuan,China
Manufacturer	BLUEVIEW ELEC-OPTIC TECH CO.,LTD
Address	No.1000, Section 2, 2nd Konggang Road, Southwest Aviation Industrial Development Zone, Chengdu,Sichuan,China
Test specification	N/A
Standard	EN 60598-1:2015 EN 60598-2-21:2015 EN 62031:2008+A1:2013+A2:2015+ EN 62471:2008 EN 62493:2015
Procedure deviation	N/A
Non-standard test method	N/A
Test item description	LED LIGHTING
Trade mark	
Model and/or type reference	See Page 1
Rating(s)	DC24V 9.6W
Test case verdicts	
Test case does not apply to the test object	N/A
Test item does meet the requirement	P(ass)
Test item does not meet the requirement	F(ail)

**General remarks**

This report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the item(s) tested.

"(see remark #)" refers to a remark appended to the report.

"(see Annex #)" refers to an annex appended to the report.

Clause numbers between brackets refer to clauses in IEC 60 598-1 (EN 60598-1)

Throughout this report a comma is used as the decimal separator.

Attached with:

A. photo documentation

B. General product information:

The series products have the same circuit diagram, PCB layout and functionality. The differences are the appearance, so, we select QNDF5-16 to test.

Part No.: QNDF5-16**Color: RGBW****Bin: /****Voltage: 24V****Power: 17.28W/M****Qty: 5M****Date: 2020-01-15****WARNING!**

DO NOT POWER WHEN ROLLED, MAY OVERHEAT
DO NOT CUT THE SOLDER POINTS



Name and address of the testing laboratory : BST Testing (Shenzhen) Co.,Ltd.

No.7, New Era Industrial Zone, Guantian, Bao'an
District, Shenzhen, Guangdong, China

Test by : Apple Li Jan. 03, 2020
Signature Date

Technician
Title

Review by : Wes Jan. 03, 2020
Signature Date

Project Engineer
Title

Approved by : Andy Yan Jan. 03, 2020
Signature Date

Andy Yan / Manager
Name and Title



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
1.1 (0)	SCOPE		P
1.1 (0.1)	More sections applicable	Yes [☒] No [☐]	—
21.4 (2)	CLASSIFICATION		P
21.4(2.2)	Type of protection	Class III	—
21.4 (2.3)	Degree of protection	IP20	—
1.4 (2.4)	Portable or handheld luminaire	Yes	—
	Fixed luminaire suitable for normally flammable surfaces	No	—
	Fixed luminaire suitable for non-combustible materials only	No	—
21.4 (2.5)	Luminaire for normal use	Yes	—
	Luminaire for rough service	No	—
21.4.2	Protection against electric shock		P
	Rope lights shall be classified as Class II or Class III.	Class III	P
21.4.3	Protection against dust, solid objects and moisture		P
	Rope lights for outdoor use shall be classified at least IP 44.		P
21.5 (3)	MARKING		P
21.5 (3.2)	Mandatory markings	Near connector	P
	Position of the marking	On the label	P
	Format of symbols/text	Symbol: minimum 5mm Text: minimum 2mm	P
21.5 (3.3)	Additional information		P
	Language of instructions	English	P
21.5 (3.3.1)	Combination luminaires		N
21.5 (3.3.2)	Nominal frequency in Hz		N
21.5 (3.3.3)	Operating temperature		N
21.5 (3.3.4)	Symbol or warning notice		P
21.5 (3.3.5)	Wiring diagram		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.5 (3.3.6)	Special conditions		N
21.5 (3.3.7)	Metal halid lamp luminaire – warning		N
21.5 (3.3.8)	Limitation for semi-luminaires		N
21.5 (3.3.9)	Power factor and supply current		P
21.5 (3.3.10)	Indoor and outdoor use		N
21.5 (3.3.11)	Luminaires with remote control		P
21.5 (3.3.12)	Clip-mounted luminaire – warning		N
21.5 (3.3.13)	Specifications of protective shields		N
21.5 (3.3.14)	Symbol for nature of supply	DC	P
21.5 (3.3.15)	Rated current of socket outlet		N
21.5 (3.3.16)	Rough service luminaire	Ordinary luminaire	N
21.5 (3.3.17)	Mounting instruction for type Y, type Z and some type X attachments	type Y	P
21.5 (3.3.18)	Non-ordinary luminaires with PVC cable		N
21.5 (3.3.19)	The protective conductor current shall be clearly stated in the manufacturers' instructions	The protective conductor current is not greater than 10mA.	N
21.5 (3.3.21)	Provided with information if not intended to be mounted within arms reach		N
21.5 (3.3.21)	Non-replaceable and non-user replaceable light sources information provided		P
	Cautionary symbol		P
21.5 (3.3.22)	Controllable luminaires, classification of insulation provided		N
21.5 (3.4)	Test with water	15s with water	P
	Test with hexane	15s with hexane	P
	Legible after test	The marking is legible	P
	Label attached	The marking not be easily removable and shows no curling	P
21.5.2	Rope light marking		P



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	The following information shall be marked on the rope light:		-
	– rated voltage of the complete rope light,	DC24V	P
	– rated wattage of the complete rope light,	9.6W	P
	Where the information is on the cable, it shall be marked on a durable non-removable sleeve or label.		P
21.5.3	Rope light and packing marking		P
	The following marking shall be placed on the rope light and on the accompanying packing of rope lights for indoor use only.		P
	– “FOR INDOOR USE ONLY”		P
	– As an alternative to the text, the rope light can be marked with the symbol  [SOURCE: IEC 60417-5957 (2004-12)]. The symbol shall be explained in the instructions.		P
21.5.4	Packing or instruction marking		N
	The following or similar marking shall be placed on the accompanying packing or instructions.		N
	a) For all rope lights where the packing has not been adapted for display purposes:		N
	– “Do not connect the rope light to the supply while it is in the packing or wound onto a reel”;		N
	– “Do not use the rope light when covered or recessed into a surface”;		N
	– minimum allowed bending radius, if applicable;		N
	– “Do not open or cut the rope light”.		N
	b) For rope lights which rely on gaskets to provide the specified degree of protection against dust, solid objects and moisture:		N
	– “WARNING – THIS ROPE LIGHT MUST NOT BE USED WITHOUT ALL GASKETS BEING IN PLACE”.		N
	c) For rope lights intended for interconnection:		N
	– “Do not connect this rope light to another manufacturer’s product”;		N
	– “Interconnection shall be made only by the use of the supplied connectors. Any open ends must be sealed-off before use”;		N
	– maximum system length that may be interconnected;		N
	– maximum wattage that may be interconnected.		N
	d) For rope lights incorporating lamp bridging device(s):		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	– information stating that the rope light is fitted with a bridging device(s).		N
	e) For class III rope lights delivered without a supply source:		N
	– relevant information concerning the required supply source.		N

21.6 (4)	CONSTRUCTION		P
21.6 (4.2)	Components replaceable without difficulty		P
21.6 (4.3)	Wireways smooth and free from sharp edges		P
21.6 (4.4)	Lampholders		N
21.6 (4.4.1)	Integral lampholder		N
	G5 lampholders are assessed for access to live parts during lamp replacements and with the lamp removed.		N
21.6 (4.4.2)	Wiring connection		N
21.6 (4.4.3)	Lampholder for end-to-end mounting		N
21.6 (4.4.4)	Positioning		N
21.6 (4.4.5)	Peak pulse voltage		N
21.6 (4.4.6)	Centre contact		N
21.6 (4.4.7)	Rough service luminaires	Ordinary luminaires	N
21.6 (4.4.8)	Lamp connectors	No lamp connector provided	N
21.6 (4.5)	Starter holders		N
	Starter holder in luminaires other than class II		N
	Starter holder class II construction		N
21.6 (4.6)	Terminal blocks		N
	Tails	Not apply	N
	Unsecured blocks		N
21.6 (4.7)	Terminals and supply connections		N
21.6 (4.7.1)	Contact to metal parts		N
21.6 (4.7.2)	Test 8 mm live conductor		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	Test 8 mm earth conductor		N
21.6 (4.7.3)	Terminals for supply conductors		N
21.6 (4.7.4)	Terminals other than supply connection		N
21.6 (4.7.5)	Heat-resistant wiring/sleeves		N
21.6 (4.7.6)	Multi-pole plug		N
21.6 (4.8)	Switches:		N
	- adequate rating		N
	- adequate fixing		N
	- polarized supply		N
21.6 (4.9)	Insulating lining and sleeves		N
21.6 (4.9.1)	Retainment		N
	Method of fixing		N
21.6 (4.9.2)	Insulated linings and sleeves		N
	a) & c) Insulation resistance and electric strength		N
	b) Ageing test. Temperature (°C)		N
21.6 (4.10)	Insulation of Class II luminaires		N
21.6 (4.10.1)	No contact, mounting surface - accessible metal parts - wiring of basic insulation		N
	Safe installation fixed luminaires		N
	Capacitors		N
	Interference suppression capacitors according to IEC 60384-14		N
21.6 (4.10.2)	Assembly gaps:		N
	- not coincidental	No such gaps	N
	- no straight access with test probe		N
21.6 (4.10.3)	Retainment of insulation:		N
	- fixed	Cannot remove easily	N
	- unable to be replaced; luminaire inoperative		N
	- sleeves retained in position		N
	- lining in lampholder		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.6 (4.11)	Electrical connections and current-carrying parts		P
21.6 (4.11.1)	Contact pressure	Not transmitted through insulating material	P
21.6 (4.11.2)	Screws:		N
	- self-tapping screws		N
	- thread-cutting screws		N
	- at least two self-tapping screws		N
21.6 (4.11.3)	Screw locking:		N
	- spring washer	No spring washer used	N
	- rivets	No rivet used	N
21.6 (4.11.4)	Material of current-carrying parts	Copper	N
21.6 (4.11.5)	No contact to wood	No wood use	P
21.6 (4.11.6)	Electro-mechanical contact systems	No such systems	N
21.6 (4.12)	Mechanical connections and glands		N
21.6 (4.12.1)	Screws not made of soft metal		N
	Screws of insulating material		N
	Torque test: torque (Nm); part.....:		N
	Torque test: torque (Nm); part.....:		N
	Torque test: torque (Nm); part.....:		N
21.6 (4.12.2)	Screws with diameter < 3 mm screwed into metal		N
21.6 (4.12.4)	Locked connections:		N
	- fixed arms; torque (Nm).....:		N
	- lampholder; torque (Nm)		N
	- push-button switches; torque 0,8 Nm		N
21.6 (4.12.5)	Screwed glands; force (N)	No such part	N
21.6 (4.13)	Mechanical strength		P
21.6 (4.13.1)	Impact tests:		P
	- fragile parts; energy (Nm)		N
	- other parts; energy (Nm)	Enclosure ,3 times	P



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	1) live parts	No live parts accessibly	P
	2) linings	Provide continued protection	N
	3) protection		P
	4) covers	No covers	N
21.6 (4.13.3)	Straight test finger	Can't touch with live part with 30N	P
21.6 (4.13.4)	Rough service luminaires		N
	a) fixed		N
	b) hand-held		N
	c) delivered with a stand		N
	d) for temporary installations and suitable for mounting on a stand		N
21.6 (4.13.6)	Tumbling barrel		N
21.6 (4.14)	Suspensions and adjusting devices		N
21.6 (4.14.1)	Mechanical load:		N
	A) four times the weight		N
	B) torque 2,5 Nm		N
	C) bracket arm; bending moment (Nm)		N
	D) load track-mounted luminaires		N
	E) clip-mounted luminaires, glass-shelve. Thickness (mm)		N
	metal rod. Diameter (mm)		N
21.6 (4.14.2)	Load to flexible cables		N
	Mass (kg)		N
	Stress in conductors (N/mm ²)		N
	Semi-luminaires – mass (kg)		N
	Semi-luminaires – bending moment (Nm)		N
21.6 (4.14.3)	Adjusting devices:		N
	- flexing test; number of cycles		N
	- strands broken		N
	- electric strength test afterwards		N
21.6 (4.14.4)	Telescopic tubes: cords not fixed to tube; no strain on conductors	No telescopic tubes	N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.6 (4.14.5)	Guide pulleys	No guide pulleys	N
21.6 (4.14.6)	Strain on socket-outlets		N
21.6 (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		P
	- thermal protection		N
	- electronic circuits exempted		N
21.6 (4.15.2)	Luminaires made of thermoplastic material with lamp control gear		N
	a) construction		N
	b) temperature sensing control		N
	c) surface temperature		N
21.6 (4.16)	Luminaires marked with flammable symbol		P
	No lamp control gear		N
21.6 (4.16.1)	Lamp control gear spacing:		N
	- spacing 35 mm		N
	- spacing 10 mm		N
21.6 (4.16.2)	Thermal protection:		N
	- in lamp control gear		N
	- external		N
	- fixed position		N
	- temperature marked lamp control gear		N
21.6 (4.16.3)	"F" curve measured	--	N
21.6 (4.17)	Drain holes		N
	Clearance at least 5 mm		N
21.6 (4.18)	Resistance to corrosion:		N
21.6 (4.18.1)	- rust-resistance	Not have metal part	N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.6 (4.18.2)	- season cracking in copper		N
21.6 (4.18.3)	- corrosion of aluminium		N
21.6 (4.19)	Ignitors compatible with ballast		N
21.6 (4.21)	Rough service vibration	Ordinary luminaire	N
21.6 (4.21)	Protective shield:		P
21.6 (4.21.1)	Shield fitted		P
21.6 (4.21.2)	Particles from a shattering lamp not impair safety		N
21.6 (4.21.3)	No direct path		N
21.6 (4.21.4)	Impact test on shield		N
	Glow-wire test on lamp compartment		N
21.6 (4.22)	Attachments to lamps	No attachments	N
21.6 (4.23)	Semi-luminaires comply class II		N
21.6 (4.24)	Photobiological hazards		N
21.6 (4.24.1)	UV radiation for tungsten halogen lamps and metal halide lamps (Annex P)		N
21.6 (4.24.2)	Retinal blue light hazard		P
	Luminaires with Ethr :		P
	a) Fixed luminaires		P
	- distance x m, borderline between RG1 and RG2..		N
	- marking and instruction according 3.2.23		N
	b) Portable and handheld luminaires		N
	Portable luminaires for children IEC 60598-2-10 and Mains socket outlet nightlights IEC 60598-2-12 not exceed RG1 at 210 mm according to IEC/62778		N
21.6 (4.25)	No sharp point or edges	No sharp points or edges	P
21.6 (4.26)	Short-circuit protection:		N
21.6 (4.26.1)	Uninsulated accessible SELV parts		P
21.6 (4.26.2)	Short-circuit test		N
21.6 (4.26.3)	Test chain according to IEC 61032		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.6 (4.27)	Terminal blocks with integrated screwless earthing contacts		N
	Test according Annex V		N
	Pull test of terminal fixing (21 N)		N
	After test, resistance < 0,05 Ω		N
	Pull test of mechanical connection (50 N)		N
	After test, resistance < 0,05 Ω		N
	Voltage drop test, resistance < 0,05 Ω		N
	Test according Annex V		N
	Not plug-in or easily replaceable type		N
	Reliably kept in position		N
	No adhesive fixing if UV radiations from a lamp can degrade the fixing		N
	Not outside the luminaire enclosure		N
	Test of adhesive fixing:		N
	Max. temperature on adhesive material ($^{\circ}\text{C}$)		N
	100 cycles between t min and t max		N
	Temperature sensing control still in position		N
21.6 (4.29)	Luminaires with non-replaceable light source		P
	Not possible to replace light source		P
	Live part not accessible after parts have been opened by hand or tools		P
21.6 (4.30)	Luminaires with non-user replaceable light source		N
	If protective cover provide protection against electric shock and marked with "caution, electric shock risk" symbol:		N
	Minimum two fixing means		N
21.6 (4.31)	Insulation between circuits		N
	Circuits insulated from LV supply fulfil requirements according 4.31.1 – 4.31.3		N
	Controllable luminaires requiring same level of insulation for all components, the insulation between control terminals and LV supply fulfil requirements according 4.31.1 – 4.31.3		N
	Used SELV source		N
	Voltage $\leq$ ELV		P



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	Insulating of SELV circuits from LV supply		P
	Insulating of SELV circuits from other non SELV circuits		N
	Insulating of SELV circuits from FELV		M
	Insulating of SELV circuits from other SELV circuits		P
	SELV circuits insulated from accessible parts according Table X.1		P
	Plugs not able to enter socket-outlets of other voltage systems		N
	Socket outlets does not admit plugs of other voltage systems		N
	Plugs and socket-outlets does not have protective conductor contact		N
21.6 (4.31.2)	FELV circuits		N
	Used FELV source		N
	Voltage $\leq$ ELV		N
	Insulating of FELV circuits from LV supply		N
	FELV circuits insulated from accessible parts according Table X.1		N
	Plugs not able to enter socket-outlets of other voltage systems		N
	Socket outlets does not admit plugs of other voltage systems		N
	Socket-outlets does not have protective conductor contact		N
21.6 (4.31.3)	Other circuits		N
	Other circuits insulated from accessible parts according Table X.1		N
	Class II construction with equipotential bonding for protection against indirect contacts with live parts:		N
	- conductive parts are connected together		N
	- test according 7.2.3 of above		N
	- conductive part not cause an electric shock in case of an insulation fault		N
	- equipotential bonding in master/slave applications		N
	- master luminaire provided with terminal for accessible conductive parts of slave luminaires		N
	- slave luminaire constructed as class I		N
21.6 (4.32)	Overvoltage protective devices		N
	Comply with IEC 61643-11		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	External to control gear and connected to earth:		N
	- only in fixed luminaires		N
	- only connected to protective earth		N
21.6.2	Terminal blocks		N
	Clause 4.6 of Section 4 of IEC 60598-1 referring to terminal block does not apply.		N
21.6.3	Terminals and supply connections		N
	Clause 4.7 of Section 4 of IEC 60598-1 referring to terminals and supply connections applies together with the following requirement.		N
	Interconnecting connectors for rope lights shall, in addition, comply with the requirements and modifications.		N
21.6.4	Control units		P
	Control units and similar devices forming an integral part of the rope light shall be enclosed in non-flammable insulating material. In addition they shall be securely fixed to the rope light or the cable.		P
	Any electronic control device (e.g. flasher units) shall, in addition to the requirements of this standard, comply with the requirements of IEC 61347-2-11.		P
	LED-drivers shall comply with the requirements of IEC 61347-2-13.		P
21.6.5	Mechanical strength		P
	Rope lights shall have adequate mechanical strength.		P

21.7 (11)	CREEPAGE DISTANCES AND CLEARANCES		N
	Working voltage (V)	DC24V	—
	Voltage form	DC	—
	PTI	< 600V	—
	Rated pulse voltage (kV)	--	—
	(1) Current-carrying parts of different polarity: cr (mm); cl (mm)	Cr>2.5mm; Cl> 1.5mm	N
	(2) Current-carrying parts and accessible parts: cr (mm); cl (mm)	Cr>5.0mm; Cl> 3.0mm	N
	(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 clamped and metal parts: cr (mm); cl (mm)		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	(5) Current-carrying parts of switches and metal parts, after removal of insulation: cr (mm); cl (mm)		N
	(6) Current-carrying parts and supporting surface: cr (mm); cl (mm)		N
21.7	The provisions of section 11 of EN 60598.1 apply except that for Edison screw lampholders and small lampholders of the push-in type, clause 17 of IEC 60238 applies.		N

21.9 (15)	TERMINALS		N
	Separately approved; component list		N
	Part of the luminaire		N

21.10 (5)	EXTERNAL AND INTERNAL WIRING		P
21.10 (5.2)	Supply connection and external wiring		P
21.10 (5.2.1)	Means of connection.....		P
21.10 (5.2.2)	Type of cable		N
	Nominal cross-sectional area (mm ²)		N
21.10 (5.2.3)	Type of attachment, X, Y or Z		P
21.10 (5.2.5)	Type Z not connected to screws		N
21.10 (5.2.6)	Cable entries:		N
	- suitable for introduction		N
	- adequate degree of protection		N
21.10 (5.2.7)	Cable entries through rigid material have rounded edges		N
21.10 (5.2.8)	Insulating bushings:		N
	- suitably fixed		N
	- material in bushings		N
	- tubes or guards made of insulating material		N
21.10 (5.2.9)	Locking of screwed bushings		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.10 (5.2.10)	Cord anchorage:		N
	- 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
21.10 (5.2.10.1)	Cord anchorage for type X attachment:		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
21.10 (5.2.10.2)	Adequate cord anchorage for type Y and type Z attachment		N
21.10 (5.2.10.3)	Tests:		N
	- impossible to push cable; unsafe		N
	- pull test: 25 times; pull (N)	60N	N
	- torque test: torque (Nm)	0.25Nm	N
	- displacement ≤ 2 mm	<1mm	N
	- no movement of conductors		N
	- no damage of cable or cord		N
21.10 (5.2.11)	External wiring passing into luminaire		N
21.10 (5.2.12)	Looping-in terminals		N
21.10 (5.2.13)	Wire ends not tinned		N
	Wire ends tinned: no cold flow		N
21.10 (5.2.14)	Mains plug same protection		N
	Class III luminaire plug		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.10 (5.2.16)	Appliance inlets (IEC 60321)		N
	Appliance couplers of class II type		N
21.10 (5.3)	Internal wiring		N
21.10 (5.3.1)	Internal wiring of suitable size and type		N
	Through wiring		N
	- not delivered/ mounting instruction		N
	- factory assembled		N
	- socket outlet loaded (A)		N
	- temperatures		N
	Green-yellow for earth only		N
21.10 (5.3.1.1)	Internal wiring connected directly to fixed wiring		P
	Cross-sectional area (mm ²)		P
	Insulation thickness		P
	Extra insulation added where necessary		N
21.10 (5.3.1.2)	Internal wiring connected to fixed wiring via internal current-limiting device		N
	Adequate cross-sectional area and insulation thickness		N
21.10 (5.3.1.3)	Double or reinforced insulation for class II		N
21.10 (5.3.1.4)	Conductors without insulation		N
21.10 (5.3.1.5)	SELV current-carrying parts		P
21.10 (5.3.1.6)	Insulation thickness other than PVC or rubber		P
21.10 (5.3.2)	Sharp edges etc.		P
	No moving parts of switches etc.		P
	Joints, raising/lowering devices		N
	Telescopic tubes etc.		N
	No twisting over 360°		P
21.10 (5.3.3)	Openings		N
	Bushings not removable		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	Bushings in sharp openings		N
	Cables with protective sheath		N
21.10 (5.3.4)	Joints and junctions effectively insulated		N
21.10 (5.3.5)	Strain on internal wiring		N
21.10 (5.3.6)	Wire carriers		N
21.10 (5.3.7)	Wire ends not tinned		N
	Wire ends tinned: no cold flow		N
21.10. 2	Cables for rope lights		P
	The nominal cross-sectional area of the conductors shall provide adequate current-carrying capacity and mechanical properties but shall not be less than the following values:		-
	a) 0,5 mm ² for class II rope lights		N
	b) 0,15 mm ² for class III rope lights and parts of rope lights supplied by SELV		P
	c) 1 mm ² for supply cables and extension cables on all extendable class II rope lights		N
	d) 0,75 mm ² for supply cable on non-extendable class II rope lights of class IP20		N
	e) 1 mm ² for supply cable on non-extendable class II rope lights over class IP20.		N
21.10. 3	Cord anchorage test		N
	For rope lights incorporating a single-core cable, the test described in 5.2.10.1 of Section 5 of IEC 60598-1 is made in the following way:		N
	The cable is subjected 25 times to a pull of 30 N. The torque test is not made.		N
	For rope lights fitted with screwless type terminals, the electrical connections are disconnected without adversely affecting the efficiency of the cord anchorage function.		N
21.10. 4	Plugs and cable length		P
	Rope lights for outdoor use shall either be provided with a splash-proof plug or be suitable for permanent connection to fixed wiring by means of a junction box.		N
	The length of the cable between the plug and the connection to the rope light shall be not less than 1,5 m.		P



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.10.5	Maximum length of extendable class II rope lights		N
	Extendable class II rope lights shall be limited to a maximum length of:		N
	– 100 m for systems using 0,5 mm ² cable;		N
	– 150 m for systems using 0,75 mm ² cable.		N

21.11 (8)	PROTECTION AGAINST ELECTRIC SHOCK		P
21.11 (8.2.1)	Live parts not accessible		P
	Protection in any position		P
	Double-ended tungsten filament lamp		N
	Insulation lacquer not reliable	No insulation lacquer	P
	Double-ended high pressure discharge lamp		N
21.11 (8.2.2)	Portable luminaire adjusted in most unfavourable position		N
21.11 (8.2.3)	Class II luminaire:		N
	- basic insulated metal parts not accessible during starter or lamp replacement		N
	- basic insulation not accessible other than during starter or lamp replacement		N
	- glass protective shields not used as supplementary insulation	No glass	N
	Class I luminaire with BC lampholder		N
21.11 (8.2.4)	Portable luminaire:		N
	- protection independent of supporting surface		N
	- terminal block completely covered		N
21.11 (8.2.6)	Covers reliably secured		N
21.11 (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
21.11.1	other than E10 or larger lampholders shall be at least equivalent to that required for lighting chains provided with E10 lampholders.		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
21.11.2	Lighting chains shall not electrify tinsel or other metallic decorations with which they are used.	No metal part	N
21.11.3	Lampholder contact shall be reliably secured in the lampholder body		N

21.12 (12)	ENDURANCE TEST AND THERMAL TEST		P
21.12 (12.3)	Endurance test:		P
	- mounting-position	Normal position	—
	- test temperature (°C)	35°C	—
	- total duration (h)	240h	—
	- supply voltage: Un factor; calculated voltage (V):	1.1xDC24V=26.4V	—
	- lamp used	LED	—
	Luminaires with an IP classification greater than IP21 shall be subjected to the relevant tests of Clauses 12.4, 12.5 and 12.6 of Section Twelve of Publication 598-1 after the test(s) of Clause 9.2 but before the test(s) of Clause 9.3 of Section Nine of Publication 598-1 specified in Clause 1.13 of this Section of Publication 598-2.	IP20	—
21.12 (12.3.2)	After endurance test:		P
	- no part unserviceable		P
	- luminaire not unsafe		P
	- no damage to track system		N
	- marking legible	Marking still legible and shows no curling	P
	- no cracks, deformation etc.		P
21.12 (12.4)	Thermal test (normal operation)	(see Annex 2)	P
21.12 (12.5)	Thermal test (abnormal operation)	(see Annex 2)	N
21.12 (12.6)	Thermal test (failed lamp control gear condition):		N
21.12 (12.6.1)	- case of abnormal conditions.....		—
	- electronic lamp control gear		N
	- measured winding temperature (°C) at 1,1 Un...		—
	- measured mounting surface temperature (°C) at 1,1 Un		N



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	- calculated mounting surface temperature (°C)...		N
	- track-mounted luminaires		N
21.12 (12.6.2)	Temperature sensing control		--
	- case of abnormal conditions.....:		—
	- thermal link		N
	- manual reset cut-out		N
	- auto reset cut-out		N
	- measured mounting surface temperature (°C) :		N
	- track-mounted luminaires		N
21.12 (12.7)	Thermal test (failed lamp control gear in plastic luminaires):		N
	- case of abnormal conditions.....:		—
21.12 (12.7.1)	- 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
21.12 (12.7.2)	Temperature sensing control		--
	- thermal link		N
	- manual reset cut-out		N
	- auto reset cut-out		N
	- measured temperature of fixing point/ exposed part (°C)		N
21.12. 2	Test voltage		N
	The provisions of 12.3.1 d) of IEC 60598-1 together with the following apply:		N
	For class III rope lights supplied from an associated transformer/convertor, the test is carried out at 1,10 times the rated voltage of the transformer/convertor.		N
	The provisions of 12.4.1 d) of IEC 60598-1 together with the following apply:		N
	For class III rope lights supplied from an associated transformer/convertor, the test is carried out at 1,06 times the rated voltage of the transformer/convertor.		N
21.12. 3	Short-circuit test of rectifier		P



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	A class II or class III LED rope light incorporating a rectifier unit shall be subjected to the following test.		P
	The rope light is supplied with a voltage between 0,9 and 1,1 times the rated supply voltage. The output of the rectifier is short-circuited. During this test, there shall be no emission of flames or molten material or production of flammable gases. Live parts shall not become accessible.		P

21.13 (9)	RESISTANCE TO DUST, SOLID OBJECTS AND MOISTURE		P
21.13 (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 test afterwards		N
	a) no deposit in dust-proof luminaire		N
	b) no talcum in dust-tight luminaire		N
	c) no trace of water on current-carrying parts or where it could become a hazard		N
	d) i) For luminaires without drain holes – no water entry		N
	d) ii) For luminaires with drain holes – no hazardous water entry		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
21.13 (9.3)	Humidity test 48 h	R.H.:93% T:28°C	P
21.13	positioned at random		P

21.14 (10)	INSULATION RESISTANCE AND ELECTRIC STRENGTH		P
21.14 (10.2.1)	Insulation resistance test		P
	Insulation resistance (MΩ):		P
	SELV:		P



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	- between current-carrying parts of different polarity	> 4MΩ	P
	- between current-carrying parts and mounting surface	> 4MΩ	P
	- between current-carrying parts and metal parts of the luminaire	> 4MΩ	P
	Other than SELV:		N
	- between live parts of different polarity		N
	- between live parts and mounting surface		N
	- between live parts and enclosure		N
	- between live parts of different polarity through action of a switch		N
21.14 (10.2.2)	Electric strength test		P
	Dummy lamp		N
	Luminaires with ignitors after 24 h test		N
	Luminaires with manual ignitors		N
	Test voltage (V):		P
	SELV:		P
	- between current-carrying parts of different polarity	DC500V	P
	- between current-carrying parts and mounting surface	DC500V	P
	- between current-carrying parts and metal parts of the luminaire	DC500V	P
	Other than SELV:		N
	- between live parts of different polarity		N
	- between live parts and mounting surface		N
	- between live parts and enclosure		N
	- between live parts of different polarity through action of a switch		N
21.14 (10.3.1)	Leakage current (mA)	0.04mA	N
21.15 (13)	RESISTANCE TO HEAT, FIRE AND TRACKING		P
21.15 (13.2.1)	Ball-pressure test:		P
	- part tested; temperature (°C)	125°C	P



EN 60598-1 & EN 60598-2-21					
Cl.	Requirement – Test		Result		Verdict
	- part tested; temperature (°C).....:				N
	For luminaires with an IP classification greater than IP21 the order of the tests specified in Section Nine of Publication EN 60598-1 shall be as specified in Clause 21.12 of this Section of Publication EN 60598-2.		-		N
21.15 (13.3.2)	Glow wire test (650°C):				P
	- part tested.....:				P
	- part tested.....:				N
21.15	glow-wire				N
21.15 (13.4.1)	Tracking test: part tested				N
	ANNEX 1: components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity
LED	Shenzhen smed Semiconductor Co., Ltd	A65 /SL- C25050W-AM	Flux :W-19- 23lm ;R:700- 900mcd/G:1500- 1700mcd/B:300- 500mcd; WL-R:620- 625nm/G:520- 530nm/B:460-470nm Tc:2700-7035K;U- R:1.8-2.4/BGW:2.8- 3.4V	--	tested with appliance
FPC	Huizhou ChuanLian electronic technology Co., LTD	BV-FL- 5050RGBW(4IN1) -24-72-12mm	V-0,105°C	UL	E362158
WIRE	Shenzhen Jieshuo Wire Co. , Ltd.	UL2464 22AWG L=200/2/12mm 5 / 20mm white sheathed wire with black, red, green, blue and white core	22AWG80°C, 300V	UL	E491472
Solid Silica Gel	Chengdu zequun Insulation Material Co. , Ltd.	XS1110-ZA	See through	--	/
	ANNEX 2: temperature measurements, thermal tests of Section 12				P



EN 60598-1 & EN 60598-2-21						
Cl.	Requirement – Test			Result		Verdict
	Type reference.....:			QNDF5-16		—
	Lamp used.....:			LED		—
	Lamp control gear used.....:			No use		—
	Mounting position of luminaire.....:			Normal luminaires		—
	Supply Voltage (V).....:			24V		
	Supply wattage (W).....:			9.6W		—
	Supply current (A).....:			--		—
	Calculated power factor.....:			>0.6		—
	Table: measured temperatures corrected for ta = 25 °C:					P
	- abnormal operating mode.....:			--		—
	- test 1: rated voltage.....:					—
	- test 2: 1,06 times rated voltage or 1,05 times rated wattage.....:			25.4V		—
	- test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage.....:			--		—
	- test 4: 1,1 times rated voltage or 1,05 times rated wattage.....:			--		—
temperature (°C) of part		clause 12.4 – normal			clause 12.5 – abnormal	
		test 1	test 2	test 3	limits	test 4 limit
Power cord		--	39.4	--	90	
Ambient		--	25.0	--	--	
	ANNEX 3: screw terminals (part of the luminaire)					N
(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 (mm²).....:					N
(14.3.3)	Conductor space (mm).....:					N
(14.4)	Mechanical tests					--
(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



EN 60598-1 & EN 60598-2-21			
Cl.	Requirement – Test	Result	Verdict
	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
	Pull test; pull (N)		N
(14.4.8)	Without undue damage		N
	ANNEX 4: SCREWLESS TERMINALS (PART OF THE LUMINAIRE)		N
(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		N
	Voltage drop (mV) after 1 h (4 samples)		N
	Voltage drop of two inseparable joints		N
	Number of cycles		—
	Voltage drop (mV) after 10th alt. 25th cycle (4 samples).....:		N



EN 60598-1 & EN 60598-2-21										
Cl.	Requirement – Test					Result				Verdict
	Voltage drop (mV) after 50th alt. 100th cycle (4 samples)									N
	After ageing, voltage drop (mV) after 10 th alt. 25th cycle (4 samples)									N
	After ageing, voltage drop (mV) after 50 th alt. 100th cycle (4 samples)									N
(15.7)	Terminals external wiring									N
	Terminal size and rating									N
(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)										



EN 62031			
Cl.	Requirement – Test	Result	Verdict
3	Terms and definitions		P
3.10	rated maximum temperature	see marking label	--
4	General requirements		P
4.1	Modules shall be so designed and constructed that in normal use they operate without danger to the user or surroundings	(see manufacturer's instruction)	P
4.2	All electrical measurements shall be carried out		P
	at voltage limits (min/max)		--
	Current limits (min/max)		--
	Power limits (min/max)		--
	Minimum frequency		--
	In a draught-free room at the temperature limits		--
4.3	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.		N
4.5	Independent modules shall comply with the requirements of relevant clauses of IEC 60598-1, where these requirements are not already covered in this standard.		N
4.6	If the module is a factory sealed unit, it shall not be opened for any tests.		P
	In the case of doubt based on the inspection of the module.		N
5	General test requirements		P
5.1	Tests according to this standard shall be type tests.		P
5.2	Unless otherwise specified, the tests shall be carried out at an ambient temperature of 10 °C to 30 °C.		P
5.3	Type test shall be 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



EN 62031			
Cl.	Requirement – Test	Result	Verdict
5.5	For SELV-operated LED modules, the requirements of IEC 61347-2-13, Annex I, apply additionally.		P
	General conditions for tests are given in Annex A.		N
6	Classification		P
	According to the method of installation		P
	– built-in;		N
	– independent;		P
	– integral.		N
	For integral modules, the NOTE to 1.2.1 in IEC 60598-1 applies.		P
7	Marking		P
7.1	Mandatory marking for built-in or independent modules		N
	a) Mark of origin (trade mark, manufacturer's name or name of the responsible vendor/supplier).		P
	b) Model number or type reference of the manufacturer.		P
	c) Either the ● rated supply voltage(s), or voltage range, supply frequency or/and ● rated supply current(s) or current range, supply frequency (the supply current may be given in the manufacturer's literature) or/and ● rated input power, or power range.		P
	d) Nominal power.		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.		P
	g) For eye protection, see requirements of IEC 62471.		P
	h) Built-in modules shall be marked in order to separate them from independent modules.		N
	The mark shall be located on the packaging or on the module itself.		P
7.2	Location of marking		P



EN 62031			
Cl.	Requirement – Test	Result	Verdict
7.3	Durability and legibility of marking		P
	the marking by rubbing the area lightly by hand for 15 s with a piece of smooth cloth, dampened with water.		P
	Marking shall be durable and legible.		P
8	Terminals		N
	For screw terminals, the requirements of IEC 60598-1, Section 14, shall be used, if applicable.		N
	For screwless terminals, the requirements of IEC 60598-1, Section 15, shall be used, if applicable.		N
	For connectors, the requirements of IEC 60838-2-2 shall be used, if applicable		N
9	Provisions for protective earthing		N
	The requirements of IEC 61347-1, Clause 9, apply.		N
10	Protection against accidental contact with live parts		P
	The requirements of IEC 61347-1, Clause 10, apply.		P
11	Moisture resistance and insulation		P
	The requirements of IEC 61347-1, Clause 11, apply.		P
12	Electric strength		P
	The requirements of IEC 61347-1, Clause 12, apply		P
13	Fault conditions		P
13.1	General		--
	The module shall not impair safety when operated under fault conditions		P
	The requirements of IEC 61347-1, Clause 14, apply.		P
13.2	Overpower condition		P
	Annex A		P
	150 % of the rated voltage		P
	The test shall be continued until the module is thermally stabilised		P
	After finalising the overpower mode, the module is operated under normal conditions until thermally being stable.		P



EN 62031			
Cl.	Requirement – Test	Result	Verdict
	A module fails safe if no fire, smoke or flammable gas is produced and if the 15 min overpower condition has been withstood		P
	A tissue paper, as specified in 4.187 of ISO 4046-4, spread below the module shall not ignite.		P
14	Conformity testing during manufacture		P
15	Construction		P
	Wood, cotton, silk, paper and similar fibrous material shall not be used as insulation. Compliance is checked by inspection.		P
16	Creepage distances and clearances		P
	The requirements of IEC 60598-1, Section 11, apply		P
17	Screws, current-carrying parts and connections		N
	The requirements of IEC 61347-1, Clause 17, apply.		N
18	Resistance to heat, fire and tracking		P
	The requirements of IEC 61347-1, Clause 18, apply.		P
19	Resistance to corrosion		P
	The requirements of IEC 61347-1, Clause 19, apply.		P
Annex A	Tests		P
Annex B	Overview of systems composed of LED modules and control gear		P
Annex C	Conformity testing during manufacture		P



EN 62471			
Cl.	Requirement – Test	Result	Verdict
4	EXPOSURE LIMITS		P
4.1	General		P
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure	Conform	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
4.3	Hazard exposure limits		P
4.3.1	Actinic UV hazard exposure limit for the skin and eye		P
	The exposure limit for effective radiant exposure is 30 J.m ⁻² within any 8-hour period	Conform	P
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broadband source, the effective integrated spectral irradiance, E _s , of the light source shall not exceed the levels defined by:		P
	$E_s \cdot t = \sum_{200}^{400} E_{\lambda}(\lambda, t) \cdot S_{uv}(\lambda) \cdot \Delta \lambda \leq 30 \text{ J} \cdot \text{m}^{-2}$		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{\max} = 30/E_s \geq 30000 \text{ s}$		P
4.3.2	Near-UV hazard exposure limit for eye		P
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 J.m ⁻² for exposure times less than 1000s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, E _{UVA} , shall not exceed 10 W.m ⁻²		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		P
	$t_{\max} \leq 10000/E_{UVA} \text{ s}$		P
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



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	$L_B \cdot t = \sum_{300}^{700} L_{\lambda}(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 10^6 \text{ J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		P
	$L_B = \sum_{300}^{700} L_{\lambda} \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \text{ W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		N
4.3.4	Retinal blue light hazard exposure limit - small source		N
	Thus the spectral irradiance at the eye E_{λ} , weighted against the blue-light hazard function $B(\lambda)$ shall not exceed the levels defined by: see table 4.2	See table 4.2	N
	$E_B \cdot t = \sum_{300}^{700} E_{\lambda}(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \text{ J} \cdot \text{m}^{-2}$		N
	$E_B = \sum_{300}^{700} E_{\lambda} \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \text{ W} \cdot \text{m}^{-2}$		N
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_{λ} , weighted by the burn hazard weighting function $R(\lambda)$ (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:		P
	$L_R = \sum_{380}^{1400} L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50000}{\alpha \cdot t^{0.25}} \text{ W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		N
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, LIR, as viewed by the eye for exposure times greater than 10 s shall be limited to:		N
	$L_{IR} = \sum_{780}^{1400} L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6000}{\alpha} \text{ W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		N
4.3.7	Infrared radiation hazard exposure limits for the eye		P
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis), ocular exposure to infrared radiation, EIR, over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		P
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 18000 \cdot t^{-0.75} \text{ W} \cdot \text{m}^{-2}$		P



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	For times greater than 1000 s the limit becomes:		N
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2}$		N
4.3.8	Thermal hazard exposure limit for the skin		N
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:		N
	$E_H \cdot t = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta\lambda \leq 20000 \cdot t^{0.25} \quad J \cdot m^{-2}$		N
5	MEASUREMENT OF LAMPS AND LAMP SYSTEMS		P
5.1	Measurement conditions	Seasoned for 24h before measurement	P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.	See above	P
5.1.1	Lamp ageing (seasoning)	See above	P
	Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard.	Under manufacture's recommendation	P
5.1.2	Test environment	Under manufacture's recommendation	P
	For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.	Under manufacture's recommendation	P
5.1.3	Extraneous radiation	Considered	P
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.	Considered	P
5.1.4	Lamp operation	Under manufacture's recommendation	P
	Operation of the test lamp shall be provided in accordance with:		P
	– the appropriate EN lamp standard, or		N
	– the 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 EN standard, or		N
	– the manufacturer's recommendation		P



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Cl.	Requirement – Test	Result	Verdict
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	Maximum aperture diameter 50 mm.		P
	The measurement shall be made in that position of the beam giving the maximum reading.		P
	The measurement instrument is adequate calibrated.		P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		P
	The measurements made with an optical system.		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		P
5.2.2.2	Alternative method		N
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		N
5.2.3	Measurement of source size		P
	The determination of α , the angle subtended by a source, requires the determination of the 50% emission points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N
	The determination of 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
	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.		P



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



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	– 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 and do not pose a near-infrared retinal hazard (LIR), within 10 s are in Risk Group 2.		N
6.1.4	Risk Group 3 (High-Risk)	Exempt Group provided	N
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N
6.2	Pulsed lamps		N
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.		N
	The risk group determination of the lamp being tested shall be made as follows:		N
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		N
	– for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N
	– for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N

Table 4.1 Spectral weighting function for assessing ultraviolet hazards for skin and eye			P
Wavelength1 λ , nm	UV hazard function $S_{UV}(\lambda)$	Wavelength λ , nm	UV hazard function $S_{UV}(\lambda)$
200 0	0.030	313* 0	0.006
205 0	0.051	315 0	0.003
210 0	0.075	316 0	0.0024
215 0	0.095	317 0	0.0020
220 0	0.120	318 0	0.0016
225 0	0.150	319 0	0.0012
230 0	0.190	320 0	0.0010
235 0	0.240	322 0	0.00067
245 0	0.360	325 0	0.00050
250 0	0.430	328 0	0.00044
254* 0	0.500	330 0	0.00041
255 0	0.520	333* 0	0.00037
260 0	0.650	335 0	0.00034
265 0	0.810	340 0	0.00028



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270 1	0.000	345 0	0.00024
275 0	0.960	350 0	0.00020
280* 0	0.880	355 0	0.00016
285 0	0.770	360 0	0.00013
290 0	0.640	365* 0	0.00011
295 0	0.540	370 0	0.000093
297* 0	0.460	375 0	0.000077
300 0	0.300	380 0	0.000064
303* 0	0.120	385 0	0.000053
305 0	0.060	390 0	0.000044
308 0	0.026	395 0	0.000036
310 0	0.015	400 0	0.000030
* 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	-
Wavelength nm	Blue-light hazard function B(λ)	Burn hazard function R(λ)	
300	0,01	-	
305	0,01	-	
310	0,01	-	
315	0,01	-	
320	0,01	-	
325	0,01	-	
330	0,01	-	
335	0,01	-	
340	0,01	-	
345	0,01	-	
350	0,01	-	
355	0,01	-	
360	0,01	-	
365	0,01	-	
370	0,01	-	
375	0,01	-	
380	0,01	0,1	
385	0,013	0,13	
390	0,025	0,25	
395	0,05	0,5	
400	0,10	1,0	
405	0,20	2,0	
410	0,40	4,0	
415	0,80	8,0	
420	0,90	9,0	
425	0,95	9,5	
430	0,98	9,8	
435	1,00	10,0	
440	1,00	10,0	
445	0,97	9,7	



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450		0,94	9,4
455		0,90	9,0
460		0,80	8,0
465		0,70	7,0
470		0,62	6,2
475		0,55	5,5
480		0,45	4,5
485		0,40	4,0
490		0,22	2,2
495		0,16	1,6
500-600	$10^{[(450-\lambda)/50]}$		1,0
600-700	0,001		1,0
700-1050	0,013	$10^{[(700-\lambda)/500]}$	
1050-1150	0,025		0,2
1150-1200	0,05	$0,2 \cdot 100.02^{(1150-\lambda)}$	
1200-1400	0,10		0,02
* 1 Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths. * Emission lines of a mercury discharge spectrum.			

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 aperture rad(deg)	Limiting aperture rad(deg)	EL in terms of constant irradiance $W.m^{-2}$
Actinic UV skin & eye	$E_s = \sum E_\lambda \cdot S(\lambda)$	200 – 400	< 30000	1,4 (80)	30/t
Eye UV-A	$E_{UVA} = \sum E \cdot \Delta\lambda$	315 – 400	1000 >1000	1,4 (80)	10000/t 10
Blue-light small source	$E_B = \sum E \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	100 >100	< 0,011	100/t 1,0
Eye IR	$E_{IR} = \sum E \cdot \Delta\lambda$	780-3000	1000 >1000	1,4 (80)	$18000/t^{0.75}$ 100
Skin thermal	$E_H = \sum E \cdot \Delta\lambda$	380-3000	<10	2 sr	$20000/t^{0.75}$

Table 5.5	Summary of the ELs for the retina (radiance based values)				
Hazard Name	Relevant equation	Wavelength Range nm	Exposure duration Sec	Field of view radians	EL in terms of constant radiance $W.m^{-2}.sr^{-1}$
Blue light	$LB = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300-700	0.25-10 10-100 100-10000 10000	$0.011 \cdot (t/10)$ 0.011 $0.0011 \cdot t$ 0.1	$10^6/t$ $10^6/t$ $10^6/t$ 100



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Cl.	Requirement – Test		Result		Verdict
Retinal thermal	$LR = \sum L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda$	380-1400	<0.25 0.25-10	0.0017 0.011.(t/10)	50000/(.t ^{0.25}) 50000/(.t ^{0.25})
Retinal thermal(weak visual stimulus)	$LIR = \sum L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda$	780-1400	>10	0.011	6000/

Table 6.1 Emission limits for risk groups of continuous wave lamps									P
Risk	Action spectrum	Units	Symbol	Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	Suv(λ)	W.m ⁻²	E _S	0.001	2.71e-08	0.003	0.00e+00	0.03	0.00e+00
Near UV		W.m ⁻²	E _{UVA}	0.3	0	31.0	0	100.0	0
Blue light	B(λ)	W.m ⁻² .sr ⁻¹	L _B	100	1.96e+01	10000		40000 00	
Blue light,small sourc	B(λ)	W.m ⁻²	E _B	-		-	-	-	-
Retinal thermal	R(λ)	W.m ⁻² .sr ⁻¹	L _R	2.80e+05	3.35e+02	2.70e+05	0.00e+00	7.10e+05	0.00e+00
Retinal thermal, Weak visual stimulus**	R(λ)	W.m ⁻² .sr ⁻¹	L _{IR}	6.00e+04	0.00e+00	6.00e+05	0.00e+00	6.00e+04	0.00e+00
IR radiation Eye		W.m ⁻²	E _{IR}	100.0	0.00e+00	530.0	0.00e+00	3200.0	0.00e+00
* Small source defined as one with a < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.									
** Involves evaluation of non-GLS source									



EN 62493-2015

Test Report

1) Test Summary:

The EMF (Electromagnetic Field) measurement at the highest level component for the LED LIGHTING Model: QNDF5-16 was shown as below:

Test Result Summary:

Model	Maximal test result (mA/m ²)	Weighted result	Maximum Limit(mA/m ²)	Pass / Fail
QNDF5-16	0.288	N/A	8	Pass

2) Test condition:

Power Source of EUT: 24V~

Operation Condition: EUT continuously on

Ambient Condition: 25 °C

Background Level: 1.028%

Measuring Distance: 50cm

Coupling Factor: $0.12 < 0.85$

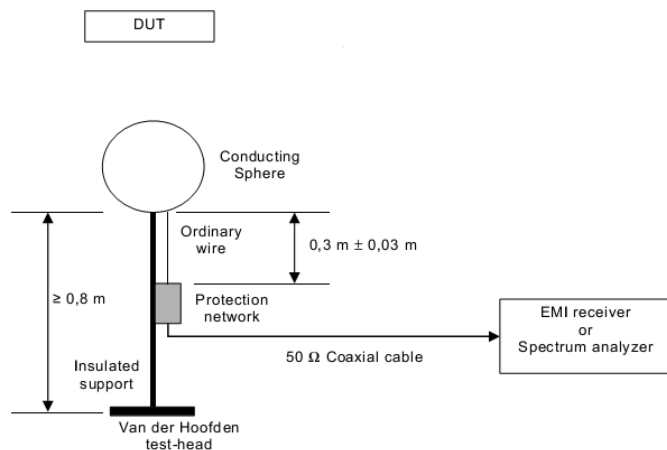
Sensor Locations: Around

3) Test data: (unit: mA/m²)

Measuring Positions	Front	Left	Right	Rear	Top	Bottom
Test result	0.221	0.218	0.219	0.218	0.232	0.187

4) Notes:

1. In accordance to EN 62493, The measurement frequency range considered is from 20 kHz to 10 MHz.
2. Measure set-up



3. Test time: 15mins.

***** End of Page*****



ANNEX A

Photo-documentation



Photo 1 General Appearance of the EUT



Photo 2 General Appearance of the EUT

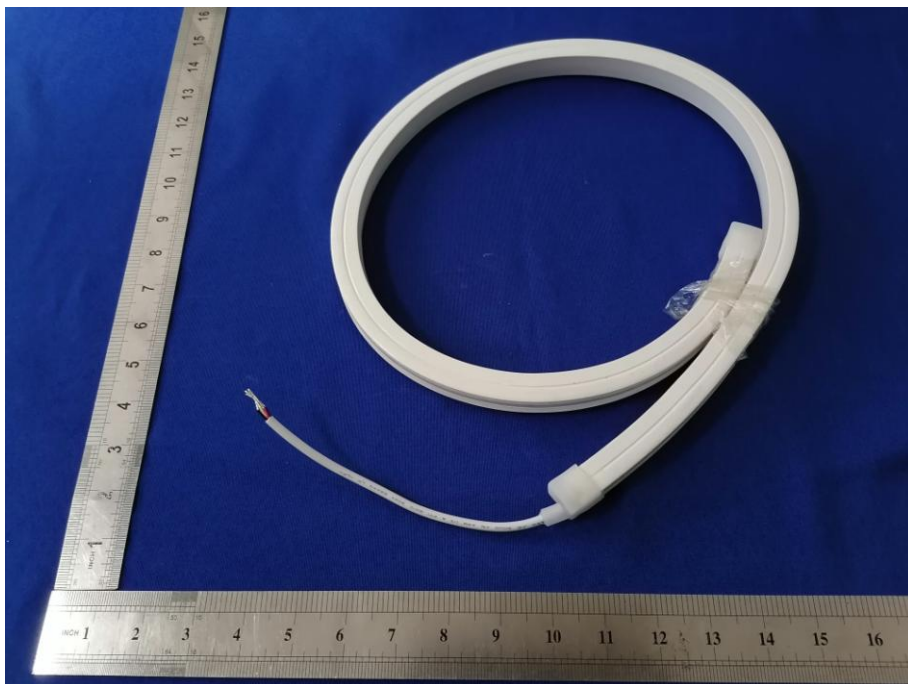




Photo 3 General Appearance of the EUT



Photo 4 General Appearance of the EUT





Photo 5 General Appearance of the EUT



Photo 6 General Appearance of the EUT





Photo 7 General Appearance of the EUT

