Test Report issued under the responsibility of:

SGS

TEST REPORT
IEC 62471 and/or EN 62471
Photobiological safety of lamps and lamp systems

Report Reference No. ..... :	GZES150400337331
Tested by (name + signature)..... :	Change Ye .....
Approved by (name + signature) ..... :	Bica Chen .....
Date of issue ..... :	2015-04-10
Total number of pages ..... :	13
Testing Laboratory ..... :	SGS-CSTC Standards Technical Services Co., Ltd. - E&E Lab Guangzhou
Address ..... :	198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, 510663 Guangdong, China
Applicant's name ..... :	Guangzhou Hongli Opto-electronic Co., Ltd.
Address ..... :	No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, Guangdong, China
Test specification:	
Standard ..... :	☒ IEC 62471: 2006 (First Edition) ☐ EN 62471: 2008
Test procedure ..... :	Test report
Non-standard test method……..:	N/A
Test Report Form No. ..... :	IECEN62471A (Modified by SGS-CSTC, dated 2012-5, added content of EN 62471: 2008)
TRF Originator ..... :	VDE Testing and Certification Institute
Master TRF ..... :	Dated 2009-05

Test item description ..... :	LED
Trade Mark ..... :	—
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	P2016W3H4-D01-8D1A01
Ratings ..... :	2,8 – 3,2 Vd.c., 60 mA

Summary of testing: The tests were conducted under 60 mA which powered by DC power supply. The submitted samples were found to be in compliance with IEC 62471: 2006.	
Tests performed (name of test and test clause): 4.3.1 Actinic UV hazard exposure limit for the skin and eye 4.3.2 Near-UV hazard exposure limit for eye 4.3.4 Retinal blue light hazard exposure limit - small source 4.3.5 Retinal thermal hazard exposure limit 4.3.7 Infrared radiation hazard exposure limits for the eye 4.3.8 Thermal hazard exposure limit for the skin	**Testing location:** Refer to page 1.
Summary of compliance with National Differences: N/A	
Copy of marking plate: N/A	

Test item particulars ..... :	
Tested lamp ..... :	☒ continuous wave lamps ☐ pulsed lamps
Tested lamp system ..... :	—
Lamp classification group ..... :	☒ exempt ☐ risk 1 ☐ risk 2 ☐ risk 3
Lamp cap ..... :	—
Bulb ..... :	—
Rated of the lamp ..... :	—
Furthermore marking on the lamp ..... :	—
Seasoning of lamps according IEC standard ..... :	—
Used measurement instrument ..... :	Ref. to List of test equipment used
Temperature by measurement ..... :	25 ± 5 °C
Information for safety use ..... :	—

Possible test case verdicts:

– test case does not apply to the test object ..... : N/A

– test object does meet the requirement ..... : P (Pass)

– test object does not meet the requirement ..... : F (Fail)

Testing:

Date of receipt of test item ..... : 2015-04-02

Date (s) of performance of tests ..... : 2015-04-02 to 2015-04-09

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.
Throughout this report a comma is used as the decimal separator.
List of test equipment must be kept on file and available for review.
When determining for test conclusion, measurement uncertainty of tests has been considered.

General product information:

The product can emit neutral white light when powered.

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

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	$L_B \cdot t = \sum_{300}^{700} \sum_{t} L_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 10^6$ $J \cdot m^{-2} \cdot sr^{-1}$		N/A
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 100$ $W \cdot m^{-2} \cdot sr^{-1}$		N/A
4.3.4	Retinal blue light hazard exposure limit - small source		P
	Thus the spectral irradiance at the eye E_λ, weighted against the blue-light hazard function B(λ) shall not exceed the levels defined by:		P
	$E_B \cdot t = \sum_{300}^{700} \sum_{t} E_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 100$ $J \cdot m^{-2}$	for t ≤ 100 s	P
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 1$ $W \cdot m^{-2}$		N/A
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_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
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{50\,000}{\alpha \cdot t^{0,25}}$ $W \cdot m^{-2} \cdot sr^{-1}$	(10 µs ≤ t ≤ 10 s)	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		N/A
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, L_{IR}, as viewed by the eye for exposure times greater than 10 s shall be limited to:		N/A
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{6\,000}{\alpha}$ $W \cdot m^{-2} \cdot sr^{-1}$		N/A
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, E_{IR}, over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		P
	$E_{IR} = \sum_{780}^{3\,000} E_\lambda \cdot \Delta\lambda \le 18\,000 \cdot t^{-0,75}$ $W \cdot m^{-2}$	t ≤ 1000 s	P
	For times greater than 1000 s the limit becomes:		N/A

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	$E_{IR} = \sum_{780}^{3\,000} E_\lambda \cdot \Delta\lambda \le 100 \qquad W \cdot m^{-2}$		N/A
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
	$E_H \cdot t = \sum_{380}^{3\,000} \sum_{t} E_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 20\,000 \cdot t^{0,25} \qquad J \cdot m^{-2}$		P
5	**MEASUREMENT OF LAMPS AND LAMP SYSTEMS**		—
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		N/A
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N/A
5.1.2	Test environment		P
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		P
5.1.3	Extraneous radiation		P
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		P
	Operation of the test lamp shall be provided in accordance with:		P
	– the appropriate IEC lamp standard, or		N/A
	– 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 IEC standard, or		N/A
	– the manufacturer' s recommendation		P
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P

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	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		N/A
	The measurements made with an optical system.		N/A
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		N/A
5.2.2.2	Alternative method		P
	Alternatively to an imaging radiance set-up, an ir-radiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		P
5.2.3	Measurement of source size		P
	The determination of α, the angle subtended by a source, requires the determination of the 50% emis-sion points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N/A
	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/A
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	To standardize interpolated values, use linear in-terpolation on the log of given values to obtain in-termediate points at the wavelength intervals de-sired.		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 in the norm	P
6	**LAMP CLASSIFICATION**		—
	For the purposes of this standard it was decided that the values shall be reported as follows:		P

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Clause	Requirement + Test	Result – Remark	Verdict
	– for lamps intended for general lighting service, the hazard values shall be reported as either ir-radiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		N/A
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm	r = 200 mm	P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group		P
	In the exempt group are lamps, which do not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		P
	– an actinic ultraviolet hazard (E_S) within 8-hours exposure (30000 s), nor		P
	– a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min), nor		P
	– a retinal blue-light hazard (L_B) within 10000 s (about 2,8 h), nor		P
	– a retinal thermal hazard (L_R) within 10 s, nor		P
	– an infrared radiation hazard for the eye (E_{IR}) within 1000 s		P
6.1.2	Risk Group 1 (Low-Risk)		N/A
	In this group are lamps, which exceeds the limits for the exempt group but that does not pose:		N/A
	– an actinic ultraviolet hazard (E_S) within 10000 s, nor		N/A
	– a near ultraviolet hazard (E_{UVA}) within 300 s, nor		N/A
	– a retinal blue-light hazard (L_B) within 100 s, nor		N/A
	– a retinal thermal hazard (L_R) within 10 s, nor		N/A
	– an infrared radiation hazard for the eye (E_{IR}) within 100 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (L_{IR}), within 100 s are in Risk Group 1.		N/A
6.1.3	Risk Group 2 (Moderate-Risk)		N/A
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N/A
	– an actinic ultraviolet hazard (E_S) within 1000 s exposure, nor		N/A
	– a near ultraviolet hazard (E_{UVA}) within 100 s, nor		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
	– a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor		N/A
	– a retinal thermal hazard (L_R) within 0,25 s (aversion response), nor		N/A
	– an infrared radiation hazard for the eye (E_{IR}) within 10 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (L_{IR}), within 10 s are in Risk Group 2.		N/A
6.1.4	Risk Group 3 (High-Risk)		N/A
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N/A
6.2	Pulsed lamps		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	CENELEC COMMON MODIFICATIONS (EN)		—
4	**EXPOSURE LIMITS**		—
	Contents of the whole Clause 4 of IEC 62471:2006 moved into a new informative Annex ZB		—
	Clause 4 replaced by the following:		N/A
	Limits of the Artificial Optical Radiation Directive (2006/25/EC) have been applied instead of those fixed in IEC 62471:2006		N/A
4.1	General		N/A
	First paragraph deleted		—

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Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	Emission limits for risk groups of continuous wave lamps									P
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	SUV(λ)	E_s	$W•m^{-2}$	0,001	0	0,003	—	0,03	—	
Near UV	—	E_{UVA}	$W•m^{-2}$	10	0	33	—	100	—	
Blue light	B(λ)	L_B	$W•m^{-2}•sr^{-1}$	100	—	10000	—	4000000	—	
Blue light, small source	B(λ)	E_B	$W•m^{-2}$	1,0*	0,11	1,0	—	400	—	
Retinal thermal	R(λ)	L_R	$W•m^{-2}•sr^{-1}$	28000/α	12065	28000/α	—	71000/α	—	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W•m^{-2}•sr^{-1}$	6000/α	—	6000/α	—	6000/α	—	
IR radiation, eye	—	E_{IR}	$W•m^{-2}$	100	0	570	—	3200	—	

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

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Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									N/A
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	SUV(λ)	Es	W•m-2	0,001	—	—	—	—	—	
Near UV	—	EUVA	W•m-2	0,33	—	—	—	—	—	
Blue light	B(λ)	LB	W•m-2•sr-1	100	—	10000	—	4000000	—	
Blue light, small source	B(λ)	EB	W•m-2	0,01*	—	1,0	—	400	—	
Retinal thermal	R(λ)	LR	W•m-2•sr-1	28000/α	—	28000/α	—	71000/α	—	
Retinal thermal, weak visual stimulus**	R(λ)	LIR	W•m-2•sr-1	545000 0,0017≤ α ≤ 0,011	—					
				6000/α 0,011≤ α ≤ 0,1	—					
IR radiation, eye	—	EIR	W•m-2	100	—	570	—	3200	—	

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

Photo documentation

Details of: View for the product

View:

[x] general

[ ] front

[ ] rear

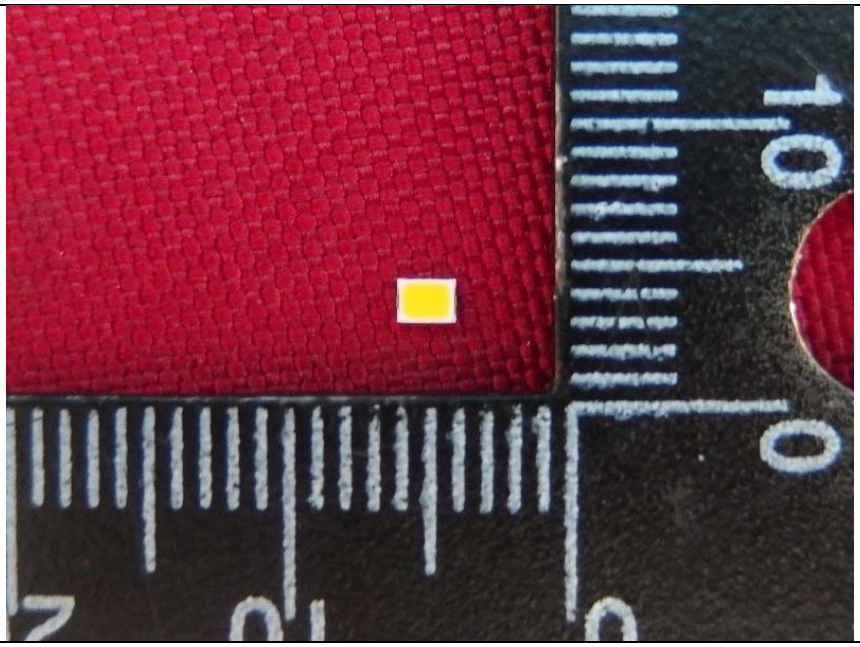
[ ] right

[ ] left

[ ] top

[ ] bottom

[ ] Internal



— End of report —