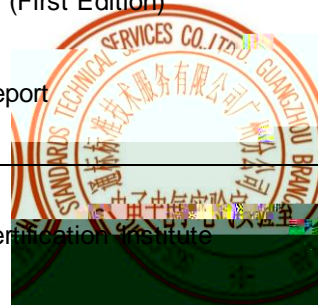




TEST REPORT IEC 62471 Photobiological safety of lamps and lamp systems	
Report Reference No.....	GZES180900006131
Date of issue	2018-09-25
Total number of pages	23
Testing Laboratory.....	SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch
Address.....	198 Kezhu Road, Science City, Economic & Technology Development Area, Guangzhou, Guangdong, China
.....	Guangzhou Tianxin Photoelectric Co., Ltd.
Address.....	#15-1, Jingu South Avenue, Xiutang Village, Huadong Town, Huadu District, Guangzhou, Guangdong, China
Test specification:	
Standard	<input type="checkbox"/> IEC 62471: 2006 (First Edition) <input checked="" type="checkbox"/> EN 62471: 2008
Test procedure	SGS-CSTC / Test report
Non- = = A A	N/A
Test Report Form No.....	IEC62471A
TRF Originator.....	VDE Testing and Certification Institute
Master TRF	Dated 2009-05
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Test item description	LED
Trade Mark.....	
Manufacturer	Same as applicant
Model/Type reference	TX-R3A140, TX-G3A14, TX-B3A140, TX-Y3A140, TX-W3A140
Ratings.....	DC 600 mA



Testing procedure and testing location:	
<input checked="" type="checkbox"/> Testing Laboratory: Testing location/ address : <input type="checkbox"/> Associated CB Laboratory: Testing location/ address : Tested by (name + signature)..... : Approved by (+ signature) :	SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch 198 Kezhu Road, Science City, Economic & Technology Development Area, Guangzhou, Guangdong, China N/A Simon Chen Alex Tan
<input type="checkbox"/> Testing procedure: TMP Tested by (name + signature)..... : Approved by (+ signature) : Testing location/ address :	N/A
<input type="checkbox"/> Testing procedure: WMT Tested by (name + signature)..... : Witnessed by (+ signature)..... : Approved by (+ signature) : Testing location/ address :	N/A
<input type="checkbox"/> Testing procedure: SMT Tested by (name + signature)..... : Approved by (+ signature) : Supervised by (+ signature)..... : Testing location/ address :	N/A
<input type="checkbox"/> Testing procedure: RMT Tested by (name + signature)..... : Approved by (+ signature) : Supervised by (+ signature)..... : Testing location/ address :	N/A



Summary of testing:

The tests were conducted under 600 mA powered by DC current source.

Models TX-R3A140, TX-G3A14, TX-Y3A140 were tested and found to meet the requirement of Exempt Group according to EN 62471: 2008

Models TX-B3A140, TX-W3A140 were tested and found to meet the requirement of Risk Group 1 according to EN 62471: 2008

The test data is based on report GZES141201504431.

Tests performed (name of test and test clause):

All applicable test items.

Testing location:

198 Kezhu Road, Science City, Economic & Technology Development Area, Guangzhou, Guangdong, China

Summary of compliance with National Differences:

European Group Differences and National Differences for EN 62471: 2008 were taken into account.

Copy of marking plate:

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict
4	EXPOSURE LIMITS			N/A
4.1	General			N/A
	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			N/A
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds $10^4 \text{ cd}\cdot\text{m}^{-2}$	see clause 4.3		N/A
4.3	Hazard exposure limits			N/A
4.3.1	Actinic UV hazard exposure limit for the skin and eye			N/A
	The exposure limit for effective radiant exposure is $30 \text{ J}\cdot\text{m}^{-2}$ within any 8-hour period			N/A
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broad-band source, the effective integrated spectral irradiance, E_s , of the light source shall not exceed the levels defined by:			N/A
	$E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J}\cdot\text{m}^{-2}$			N/A
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:			N/A
	$t_{\max} = \frac{30}{E_s} \quad \text{s}$			N/A

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict
	$L_B \cdot t = \sum_{300}^{700} \sum_t L_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 10^6 \quad \text{J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	B	$4 \text{ s} \quad t_{\max} = \frac{10^6}{L_B}$	N/A
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		for $t > 10^4 \text{ s}$	N/A
4.3.4	Retinal blue light hazard exposure limit - small source			N/A
	Thus the spectral irradiance at the eye E_λ , weighted against the blue- $C_\lambda = B_\lambda$ exceed the levels defined by:		see table 4.2	N/A
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{J} \cdot \text{m}^{-2}$	B		N/A
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \quad \text{W} \cdot \text{m}^{-2}$		for $t > 100 \text{ s}$	N/A
4.3.5	Retinal thermal hazard exposure limit			N/A
	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:			N/A
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50\,000}{\alpha \cdot t^{0,25}} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$			N/A
4.3.6	Retinal thermal hazard exposure limit weak visual stimulus			N/A
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, L_{IR} , as viewed by the eye for exposure times greater than 10 s shall be limited to:			N/A
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6\,000}{t} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		$t > 10 \text{ s}$	N/A
4.3.7	Infrared radiation hazard exposure limits for the eye			N/A
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis), ocular exposure to infrared radiation, E_{IR} , over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:			N/A
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \leq 18\,000 \cdot t^{-0,75} \quad \text{W} \cdot \text{m}^{-2}$			N/A
	For times greater than 1000 s the limit becomes:			N/A

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict
	$E_{IR} = \sum_{380}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 10000 \text{ W} \cdot \text{m}^{-2}$	t > 1000 s		N/A
4.3.8	Thermal hazard exposure limit for the skin			N/A
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:			N/A
	$E_{H,t} = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \leq 20000 \cdot t^{0,25} \text{ J} \cdot \text{m}^{-2}$			N/A
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)			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 = A = = = = = B A 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
	A = B A A A =			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
	A = B A A A = n			P
5.2	Measurement procedure			P
5.2.1	Irradiance measurements			P
	Minimum aperture diameter 7mm.			P

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict
	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 irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.			P
5.2.3	Measurement of source size			P
	0 A AA = B A= CA > A A > = source, requires the determination of the 50% emission points of the source.			P
5.2.4	Pulse width measurement for pulsed sources			N/A
	0 A AA = B A = A = of a source, requires the determination of the time during which the emission is > 50% of its peak value.			N/A
5.3	Analysis methods			P
5.3.1	Weighting curve interpolations			P
	To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.	see table 4.1		P
5.3.2	Calculations			P
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.			P
5.3.3	Measurement uncertainty			P
	The quality of all measurement results must be quantified by an analysis of the uncertainty.	see Annex C in the norm		P
6	LAMP CLASSIFICATION			P

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict
	For the purposes of this standard it was decided that the values shall be reported as follows:	see table 6.1		P
	<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> <p>for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm</p>			N/A

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

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict

Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye	P
Wavelength ¹	UV hazard function S_{uv}	Wavelength

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources			P
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Wavelength nm	Blue-light hazard function	Burn hazard function
300	0,01	
305	0,01	
310	0,01	
315	0,01	
320	0,01	
325	0,01	
330	0,01	
335	0,01	
340	0,01	
345	0,01	
350	0,01	
355	0,01	
360	0,01	
365	0,01	
370	0,01	
375	0,01	
380	0,01	0,1
385	0,013	0,13
390	0,025	0,25
395	0,05	0,5
400	0,10	1,0
405	0,20	2,0
410	0,40	4,0
415	0,80	8,0
420	0,90	9,0
425	0,95	9,5
430	0,98	9,8
435	1,00	10,0
440	1,00	10,0
445	0,97	9,7
450	0,94	9,4
455	0,90	9,0
460	0,80	8,0
465	0,70	7,0
470	0,62	6,2
475	0,55	5,5
480	0,45	4,5
485	0,40	4,0
490	0,22	2,2
495	0,16	1,6
500-600	$10^{(450-\lambda)}$	1,0
600-700	0,001	1,0
700-1050		$10^{(700-\lambda)}$
1050-1150		0,2
1150-1200		$0,2 \cdot 10^{0,02(1150-\lambda)}$
1200-1400		0,02

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict

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

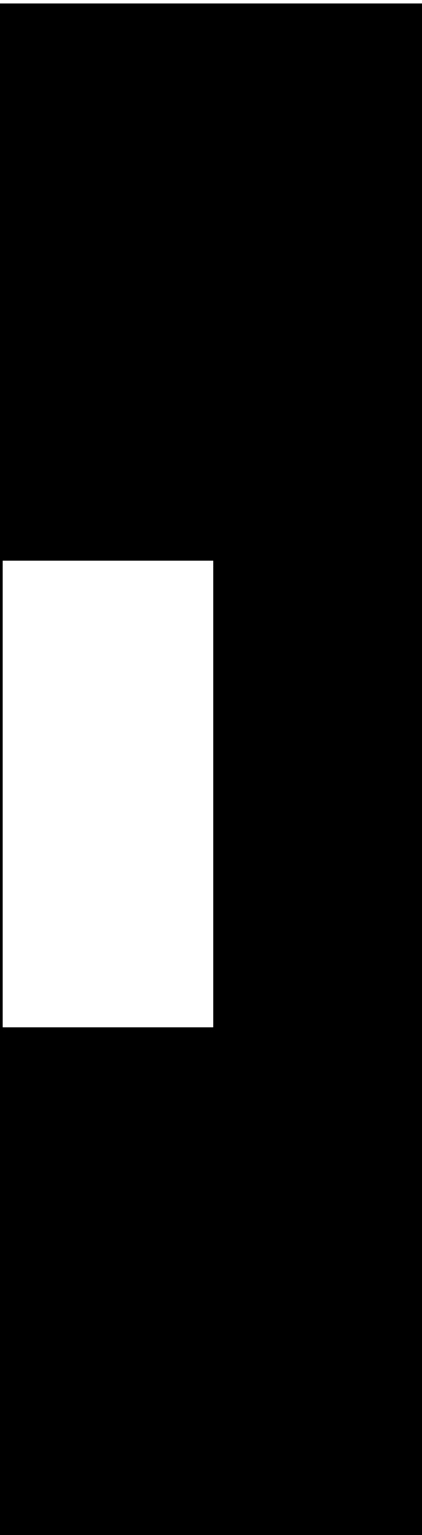
Table 5.5 Summary of the ELs for the retina (radiance based values)						P
Hazard Name	Relevant equation	Wavelength range nm	Exposure duration sec	Field of view radians	EL in terms of constant radiance $W m^{-2} sr^{-1}$	
Blue light	L_B (300 700	0,25 10	0,011	$10^6/t$	
			10-100		$10^6/t$	
			100-10000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

IEC 62471				
Clause	Requirement + Test	Result	Remark	Verdict

Table 6.1		Emission limits for risk groups of continuous wave lamps							N/A	
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	S _{UV}	E _s	3 ⁻²	0,001		0,003		0,03		
Near UV		E _{UVA}	3 ⁻²	10		33		100		
Blue light		L								

Attachment: European Group Differences And National Differences of IEC 62471

Clause	Requirement + Test	Result - Remark	Verdict
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Attachment: European Group Differences And National Differences of IEC 62471

Clause	Requirement + Test	Result	Remark	Verdict
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Table 6.1		Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) For model TX-R3A140							P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	S _{UV}	E _s	3 ⁻²	0,001	0				
Near UV		E _{UVA}	3 ⁻²	0,33	0				
Blue light		L _B	3 ^{-2 -1}	100	0,3	10000		4000000	
Blue light, small source		E _B	3 ⁻²	0,01*		1,0		400	
Retinal thermal	.	L _R	3 ^{-2 -1}		16032				
Retinal thermal, weak visual stimulus**	.	L _{IR}	3 ^{-2 -1}	545000					
IR radiation, eye		E _{IR}	3 ⁻²	100	0	570		3200	
Skin thermal		E _H	3 ⁻²	20000/t ^{0.75}				0	

* / = A AB A = A = = A=C C BA B A = = =

** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
 The applicable aperture diameters: see 4.2.1
 The limitations for the angular subtenses: see 4.2.2
 The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Attachment: European Group Differences And National Differences of IEC 62471

Clause	Requirement + Test	Result	Remark	Verdict
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Table 6.1		Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) For model TX-G3A14							P	
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	S _{UV}	E _s	3 ⁻²	0,001	0					
Near UV		E _{UVA}	3 ⁻²	0,33	0					
Blue light		L _B	3 ^{-2 -1}	100						

Attachment: European Group Differences And National Differences of IEC 62471

Clause	Requirement + Test	Result	Remark	Verdict
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Table 6.1		Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) For model TX-B3A140							P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	S _{UV}	E _s	3 ⁻²	0,001	0				
Near UV		E _{UVA}	3 ⁻²	0,33	0,01				
Blue light		L _B	3 ^{-2 -1}	100	241	10000	6239	4000000	
Blue light, small source		E _B	3 ⁻²	0,01*		1,0		400	
Retinal thermal	.	L _R	3 ^{-2 -1}		62393				
Retinal thermal, weak visual stimulus**	.	L _{IR}	3 ^{-2 -1}	545000					
IR radiation, eye		E _{IR}	3 ⁻²	100	0	570		3200	
Skin thermal		E _H	3 ⁻²	20000/t ^{0.75}				0	

* / = A AB A = A = = A=C C BA B A = 0 s is 0,1 radian.

** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
 The applicable aperture diameters: see 4.2.1
 The limitations for the angular subtenses: see 4.2.2
 The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Attachment: European Group Differences And National Differences of IEC 62471

Clause	Requirement + Test	Result	Remark	Verdict
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Table 6.1		Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) For model TX-Y3A140							P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	S _{UV}	E _s	3 ⁻²	0,001	0				
Near UV		E _{UVA}	3 ⁻²	0,33	0				
Blue light		L _B	3 ^{-2 -1}	100	0,2	10000		4000000	
Blue light, small source		E _B	3 ⁻²	0,01*		1,0		400	
Retinal thermal	.	L _R	3 ^{-2 -1}		686,7				
Retinal thermal, weak visual stimulus**	.	L _{IR}	3 ^{-2 -1}	545000					

IR radiation,
eye

Attachment: European Group Differences And National Differences of IEC 62471

Clause	Requirement + Test	Result	Remark	Verdict
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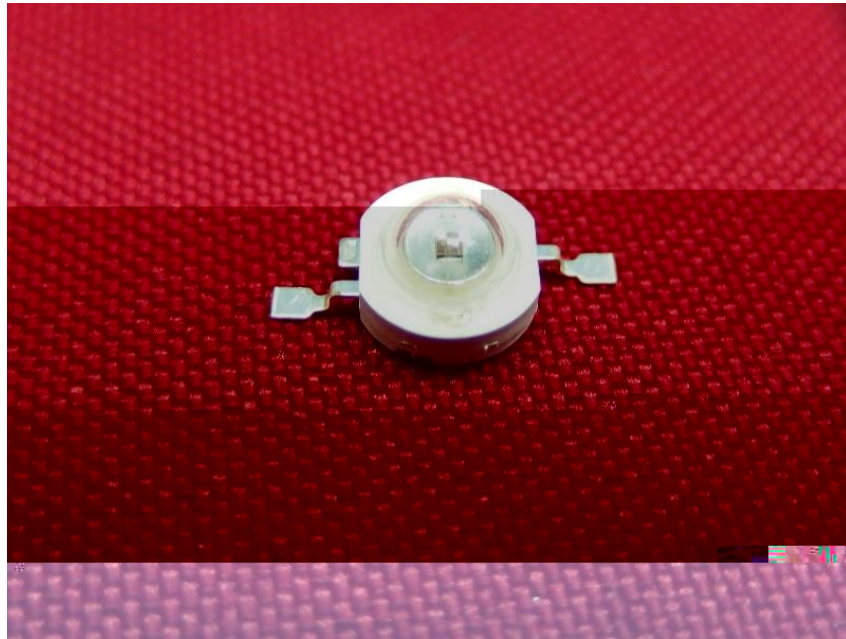
Table 6.1		Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) For model TX-W3A140							P	
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	S _{UV}	E _s	3 ⁻²	0,001	0					
Near UV		E _{UVA}	3 ⁻²	0,33	0					
Blue light		L _B	3 ^{-2 -1}	100	133	10000	3768,4	4000000		
Blue light, small source		E _B	3 ⁻²	0,01*		1,0		400		
Retinal thermal	.	L _R	3 ^{-2 -1}	2	42642					
Retinal thermal, weak visual stimulus**	.	L _{IR}	3 ^{-2 -1}	545000						
IR radiation, eye		E _{IR}	3 ⁻²	100	0	570		3200		
Skin thermal		E _H	3 ⁻²	20000/t ^{0.75}			0			

* / = A AB A = A = =

Details of: View for model TX-R3A140

View:

- general
- front
- rear
- right
- left
- top
- bottom



Details of: View for model TX-G3A14

View:

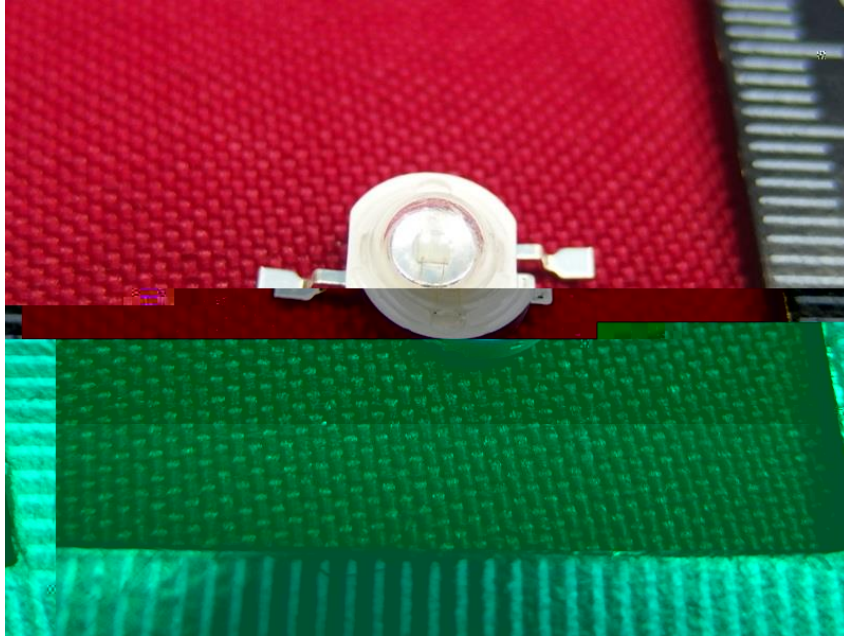
- general
- front
- rear
- right
- left
- top
- bottom



Details of: View for model TX-B3A140

View:

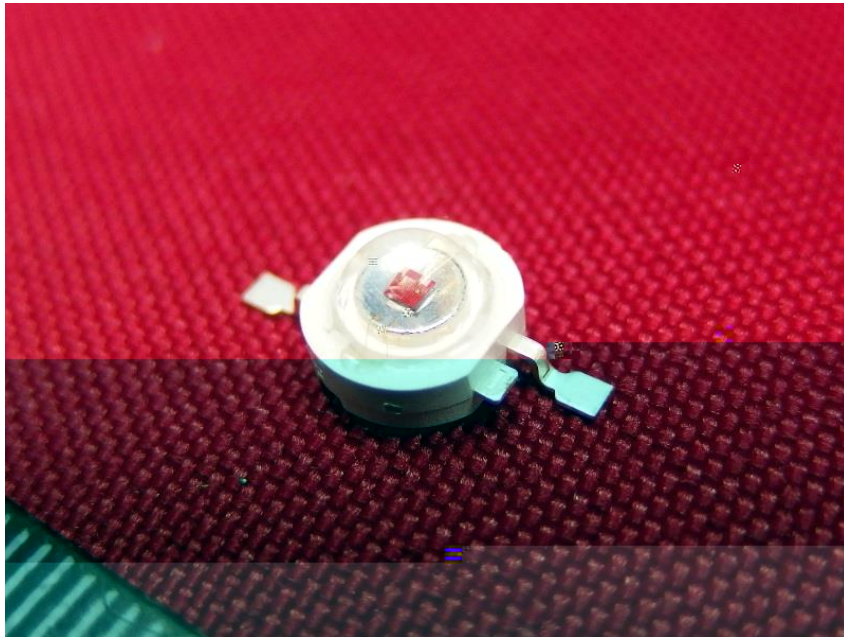
- general
- front
- rear
- right
- left
- top
- bottom



Details of: View for model TX-Y3A140

View:

- general
- front
- rear
- right
- left
- top
- bottom



Details of: View for model TX-W3A140

View:

- general
- front
- rear
- right
- left
- top
- bottom



End of report