TEST REPORT

Photobiological Safety of Lamps and Lamp Systems

Applicant Name:

Würth Elektronik eiSos GmbH & Co.KG

Actual Revision: 2.0

Product:	LED components
Match Code:	**WL-SBRW**
Part No.:	**156125RB73000**

Reference Standard: EN 62471:2008

IEC 62471:2006

EN 62778:2014

Test Results: **Exempt Group**

Find test summary on page 13

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Document Control

No	Page	Change Description	Issued by	Checked by	Date
1.0		First layout	Oezguer, Harun		2014-07
2.0		New layout	Shuguo Wang	Linh Do	2019-09

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Identification of Test Laboratory

Third Testing Party:	TÜV Rheinland (Shenzhen) Co., Ltd
Laboratory Address:	East of F/1, F/2~F/4, Building 1, Cybio Technology Building No.6, Langshan No.2 Road, North Hi-tech Industry Park 518057 Shenzhen Nanshan District CHINA
Testing Engineer:	Simon Zou
Contact Information:	Tel: +86 755 82681265 Email: simon.zou@tuv.com Homepage: www.tuv.com

1. Description of the Device under Test (DUT)

Date of Receipt of Test Sample: 2016-08-15

Testing Start Date 2016-08-15

Testing End Date: 2016-10-18

Tested Lamp: ☒ Continuous Wave Lamps ☐ Pulse Lamps

General Product Information:

Model	Match-code	Emitting	Peak Forward Current (mA)	Continuous Forward Current (mA)	Forward Voltage min(V)	Forward Voltage type(V)	Forward Voltage max(V)
156125RB73000	WL-SBRW	Red	60	30	1.6	2	2.4
		Blue	80	30	2.7	3.3	3.9

The product is a LED component. Testing was conducted on a sample of model 156125RB73000, mounted on a PCB with the Peak Forward Current 30mA.
The evaluation covered in this report was performed based on the Würth Electronic eiPal test condition (see the table "General Product Information" above). This report is valid to all part numbers of the match-code. When the product is incorporated in products, additional conditions may be necessary depending on the power supply condition of the product.

Product Status: ☐ Development Sample

☐ Preproduction Sample

☒ Production Sample

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2. Test Data

IEC 62471										
Clause	Requirement + Test			Result – Remark				Verdict		
Table 6.1	Emission limits for risk groups of continuous wave lamps For model 156125RB73000, blue light, α=0,0118 rad.							P		
Risk	Action spectrum	Symbol	Units	Emission						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0,001	0,00E+00	0,003	--	0,03	-	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	0,00E+00	33	--	100	-	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	5,44E+00	10000	--	4000000	-	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01	--	1,0	--	400	-	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	2,43E+03	28000/α	--	71000/α	-	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	0,00E+00	6000/α	--	6000/α	- -	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	0,00E+00	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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IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
Table 6.1	Emission limits for risk groups of continuous wave lamps For model 156125RB73000, red light, α=0,0080 rad.		P

Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0,001	0,00E+00	0,003	--	0,03	--
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	0,00E+00	33	--	100	--
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	--	10000	--	4000000	--
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01	1,42E-07	1,0	--	400	--
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	7,14E+01	28000/α	--	71000/α	--
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	0,00E+00	6000/α	--	6000/α	- -
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	0,00E+00	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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IEC62471A - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT IEC 62471 **EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES** Photobiological safety of lamps and lamps systems	
Differences according to.....:	EN 62471:2008; IEC/TR62778:2014
Attachment Form No.....:	EU_GD_IEC62471A
Attachment Originator ...:	IMQ S.p.A.
Master Attachment.....:	2009-07

	CENELEC COMMON MODIFICATIONS (EN)		P
4	**EXPOSURE LIMITS**		P
	Contents of the whole Clause 4 of IEC/EN 62471:2008 moved into a new informative Annex		-
	Clause 4 replaced by the following:		P
	Limits of the Artificial Optical Radiation Directive (2006/25/EC) have been applied instead of those fixed in IEC/EN 62471:2006	See appended Table 6.1	P
4.1	General		P
	First paragraph deleted		-

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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 156125RB73000, blue light, α=0,0118 rad.	P

Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0,001	0,00E+00	--	--	--	--
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	0,00E+00	--	--	--	--
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	5,44E+00	10000	--	4000000	--
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01*	--	1,0	--	400	--
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	2,43E+03	28000/α	--	71000/α	--
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--				
				6000/α 0,011≤ α ≤ 0,1	0,00E+00				
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	0,00E+00	570	--	3200	--

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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 156125RB73000, red light, α=0,0080 rad.	P

Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0,001	0,00E+00	--	--	--	--
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	0,00E+00	--	--	--	--
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	--	10000	--	4000000	--
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01*	1,42E-07	1,0	--	400	--
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	7,14E+01	28000/α	--	71000/α	--
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	0,00E+00				
				6000/α 0,011≤ α ≤ 0,1	--				
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	0,00E+00	570	--	3200	--

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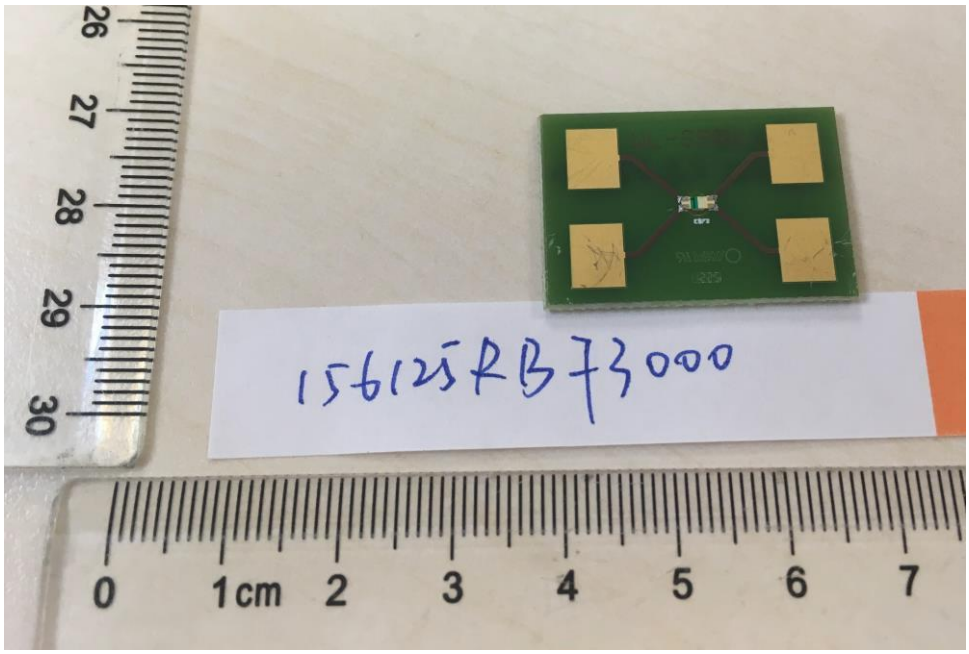
3. Picture of Test Sample



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4. Testing Conditions and Performance Criteria

4.1 Testing Conditions

1) Ambient temperature: 25,0°C; Humidity: 65%
2) Input: see model list
3) Aperture stop: 7mm
4) Angular subtense and Measurement distance, see table as below:

Model	Match-code	Emitting color	Angular subtense
156125RB73000	WL-SBRW	Red	0,0080 rad
		Blue	0,0118 rad

4.2 Performance Criteria

Photobiological safety of lamps and lamp systems
(EN 62471:2008; EN62778-2015) (Exempt)

1. LAMP CLASSIFICATION

This standard was developed by CIE TC 6-47 with representation of IEC SC34A. This joint effort was deemed important so that issues concerning risk group classification and distance at which the photobiological hazard values due to lamp radiation are reported could be agreed upon. Since lamps may be hazardous from several aspects, a classification scheme is helpful. For the purposes of this standard, it was decided that the values should be reported as follows:

- for lamps intended for general lighting service (GLS), see definition 3.11, 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;
- for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm.

This clause is concerned with lamp classification. However, a similar classification system could be applicable to luminaires or other systems containing operating lamps. For lamps intended for general lighting, the distance at which the irradiance measurements are made is left to the discretion of the measurement facility.

The classification scheme indicates only the potential risk. Depending upon use factors, time of exposure, and luminaire effects, these potential hazards may or may not actually become real hazards. Table 6.1 summarizes the various irradiance and radiance emission limits for each of the hazards discussed in clause 4.3 for each risk group classification.

Note: In some cases, the same lamp may be used in both GLS and special applications and in such

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cases should be evaluated and rated for the intended applications.

2. Continuous wave lamps

Exempt group

The philosophical basis for the exempt group classification is that the lamp does not pose any photobiological hazard for the end points in this standard. This requirement is met by any lamp that does not pose

- an actinic ultraviolet hazard (E_S) within 8-hours exposure (30000 s), nor
- a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min) nor
- a retinal blue-light hazard (L_B) within 10000 s (about 2, 8 h), nor
- a retinal thermal hazard (L_R) within 10 s, nor
- an infrared radiation hazard for the eye (E_{IR}) within 1000 s.

These lamps are in the Exempt Group.

Also, lamps that emit infrared radiation without a strong visual stimulus (i.e., less than 10 cd·m-2) and do not pose a near-infrared retinal hazard (L_{IR}) within 1000 s are in the Exempt Group.

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5. Summary of Testing

Testing Conditions

1. Tests were performed on all models.
2. Ambient temperature: 25, 0°C; Humidity: 65%
3. Aperture stop: 7mm

Test Location: TÜV Rheinland (Shenzhen) Co., Ltd.

Test Engineer: Simon Zou

Test Standard: Photobiological safety of lamps and lamp systems (IEC/EN 62471:2008)

Tests Performed (name of test and test clause):
All applicable tests as described in Test Case and Measurement Sections of the test specification (IEC/EN 62471:2008) were performed.

Copy of marking plate and Warning Labels:
Note: No warning label is needed for this product.

Summary of testing:
This test report was issued for considering the potential radiation hazards resulting from the LED under the normal operating conditions only. The rating of LED has been considered for the testing as shown in the test result section. No further single fault and abnormal tests performed.

Test Results:
This test report is for photobiological safety evaluation of optical output per request from the client. According to IEC/EN 62471:2008, LEDs mentioned above have satisfied the requirements for Exempt Group, see table below:

Model	Match-code	Emitting color	Classification
156125RB73000	WL-SBRW	Red	Exempt Group
		Blue	Exempt Group

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6. TUV Original Testing Report Excerpt

Produkte
Products

TÜVRheinland®

Prüfbericht-Nr.: *Test Report No.:*	**50051673 001**	**Auftrags-Nr.:** *Order No.:*	**164070385**	**Seite 1 von 104** *Page 1 of 104*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	2016-08-15	
Auftraggeber: *Client:*	Wuerth Elektronik eiSos GmbH&Co.KG Max-Eyth Strasse1, Waldenburg,74638 Germany			
Prüfgegenstand: *Test item:*	LED components			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	See page 5 to 6			
Auftrags-Inhalt: *Order content:*	Type test			
Prüfgrundlage: *Test specification:*	EN 62471:2008 IEC 62471:2006			

Wareneingangsdatum: *Date of receipt:*	2016-08-15	Photos see test report.
Prüfmuster-Nr.: *Test sample No.:*	A000401754 001-040	
Prüfzeitraum: *Testing period:*	2016-08-15 to 2016-10-18	
Ort der Prüfung: *Place of testing:*	See page 3	
Prüflaboratorium: *Testing laboratory:*	**TÜV Rheinland (Shenzhen) Co., Ltd.**	
Prüfergebnis*: *Test result*:*	Pass	

geprüft von / *tested by:*

Datum / Date	Name / Stellung / Name / Position	Unterschrift / Signature
2016-10-24	Simon Zou / Engineer	

kontrolliert von / *reviewed by:*

Datum / Date	Name / Stellung / Name / Position	Unterschrift / Signature
2016-10-25	Allan Huang / Supervisor	

Sonstiges / *Other:*
-Optical output testing based on Photobiological safety: Exempt Group, Low Risk or Mod Risk for model mentioned above, see page 3 to 4 in report.
-Other than optical hazards have not been considered during investigation.
-Attachment 1: Measuring Instruments and Test Equipments.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
Legend:	*1 = very good* *P(ass) = passed a.m. test specification(s)*	*2 = good*	*3 = sstisfactory* *F(ail) = failed a.m. test specification(s)*	*4 = sufficient* *N/A = not applicable*	*5 = poor* *N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

V04

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TEST REPORT
IEC 62471
Photobiological safety of lamps and lamp systems

Report Reference No.	:	See cover page
Date of issue	:	See cover page
Total number of pages	:	See cover page
Testing Laboratory	:	**TÜV Rheinland (Shenzhen) Co., Ltd.**
Address	:	East of F/1, F/2~F/4, Building 1, Cybio Technology Building No. 6 Langshan No.2 Road, North Hi-tech Industry Park 518057 Shenzhen Nanshan District CHINA
Applicant's name	:	See cover page
Address	:	See cover page
Test specification:		
Standard	:	EN 62471:2008 IEC 62471:2006
Test procedure	:	Test report only
Non-standard test method	:	N/A
Test Report Form No.	:	IEC62471A
TRF Originator	:	VDE Testing and Certification Institute
Master TRF	:	Dated 2009-05

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

Test item description	:	LED components
Trade Mark	:	N/A
Factory	:	Same as the applicant
Model/Type reference	:	See general product information
Ratings	:	See general product information