TÜRK STANDARDLARI ENSTİTÜSÜ
DENEY ve KALİBRASYON MERKEZİ BAŞKANLIĞI
Elektroteknik Laboratuvarı Gebze Müdürlüğü

TURKISH STANDARDS INSTITUTION
HEADSHIP OF TEST and CALIBRATION CENTER
Electrotechnical Laboratory (Gebze)
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Test
TS EN ISO/IEC 17025
AB-0001-T

AB-0001-T
600439
04-21

MUAYENE VE DENEY RAPORU
TEST REPORT

Deneyi Talep Eden/Firma (Adı,Adresi,Şehir vb.) *Requesting/Customer (Name,Adress,City etc.)*	:	HERA EĞLENCE VE MİMARİ AYDINLATMA SİSTEMLERİ A.Ş. (GULLUBAĞLAR MAH.KAHRAMANLAR CAD.NO:3-1 Pendik-İSTANBUL)
Deney Talep Tarihi/No *Order Date / No*	:	26.03.2021 / 549901
Numunenin Tanımı (No,Cins, Marka, Tip, Tür, Model vb.) *Sample Description(No,Type,Model etc.)*	:	731141,AYDINLATMA ARMATÜRÜ, HERA , Chronopix DW , - , - , 1.00 adet *731141,LUMINAIRE,HERA,Chronopix DW,,,1,00 item*
Numune Kabul Tarihi *Test Item Receipt Date*	:	26.03.2021
Deneylerin Yapıldığı Tarih *Date of Test*	:	26.03.2021 - 31.03.2021
Uygulanan Standard / Metod *Applied Standard/Method*	:	TS EN 62471: 2012-01 Lambaların ve lamba sistemlerinin fotobiyolojik güvenliği *TS EN 62471: 2012-01 Photobiological safety of lamps and lamp systems*
Raporun Sayfa Sayısı *Number of pages of the report*	:	23
Açıklamalar *Remarks*	:	Yapılan muayene ve deneylerden OLUMLU sonuç alınmıştır. *The sample described above Passed the applied tests.*

Deney laboratuvarları olarak faaliyet gösteren TSE Deney ve Kalibrasyon Merkezi Başkanlığı Deney Laboratuvarları TÜRKAK'tan AB-0001-T ile TS EN ISO/IEC 17025:2012 standardına göre akredite edilmiştir.
TSE Headship of Test and Calibration Center Testing Laboratories accredited by TÜRKAK under registration number AB-0001-T for TS EN ISO/IEC 17025:2012 as test laboratory.
TÜRKAK deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararası Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanıma anlaşması imzalamıştır.
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Rules described in "LAB-D-PR-18 Decision Rule Procedure", which is published on TSE Web site have been applied to the test results for which Conformity Declaration is given in this test report
Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metodları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.
Numune müşteri tarafından alınmıştır, bu rapordaki sonuçlar numunenin teslim alındığı hali için geçerlidir. Bu rapor özel deney talebine istinaden düzenlenmiş olup, Standartlara Uygunluk Belgesi niteliğinde değildir. Partiyi temsil etmez, Piyasa Gözetim ve Denetim Faaliyetlerine esas oluşturmaz, ilan, reklam ve ilanlarda 6102 Sayılı Türk Ticaret Kanunu'nun 54. ve 55. Maddelerinde yer alan haksız rekabet hükümlerine aykırılık teşkil edecek şekilde kullanılamaz. Söz konusu hususlara aykırı hareket edilmesi halinde hukuki ve cezai açıdan TSE sorumlu tutulamaz.

Mühür / Tarih *Seal / Date*	Deney Sorumlusu *Person in charge of tests*	Kontrol Eden *Reviewer*	Onaylayan *Approved by*
02-04-2021	Emin ÇİFTÇİ	Gülşah GÖKER TATLI	Dr. Güvenir Kaan ESEN
...../...../.....	Deney Personeli	Bölüm Sorumlusu	Laboratuvar Müdürü
	Testing Expert	Division Head	Laboratory Manager

TEST REPORT
TS EN 62471
Photobiological safety of lamps and lamp systems

Report Reference No. .....:	600439
Date of issue.....:	02-04-2021
Total number of pages .....:	23
Name of Testing Laboratory preparing the Report.....:	TSE Electrotechnical Laboratory Gebze Directorate
Applicant's name .....:	HERA EĞLENCE VE MİMARİ AYDINLATMA SİSTEMLERİ A.Ş.
Address.....:	Güllübağlar mah.Kahramanlar cad.no:3-1 Tuzla / İSTANBUL
Test specification:	
Standard.....:	TS EN 62471:2012
IEC standard.....:	IEC 62471:2006
Test procedure .....:	TSE
Non-standard test method .....:	N/A
Test Report Form No .....:	TSE62471B
TRF Originator .....:	TSE
Master TRF .....:	2020-06

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description .....:	Photobiological safety of lamps and lamp systems
Trade Mark .....:	HERA
Manufacturer .....:	HERA EĞLENCE VE MİMARİ AYDINLATMA SİSTEMLERİ A.Ş.
Model/Type reference .....:	Chronopix DW
Ratings.....:	48V DC 2,4 W 0,05A 6,1x11,2x4,7

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**CB Testing Laboratory:**	TSE Electrotechnical Laboratory Gebze Directorate	
Testing location/ address.....:		Cumhuriyet Mah. 2258 Sok. No:10 Gebze / KOCAELİ	
Tested by (name, function, signature).....:		See Cover Page	
Approved by (name, function, signature)...:		See Cover Page	
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address .....:			
Tested by (name, function, signature).....:			
Approved by (name, function, signature) ..:			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address .....:			
Tested by (name + signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature) ..:			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address .....:			
Tested by (name, function, signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature) ..:			
Supervised by (name, function, signature) :			

List of Attachments (including a total number of pages in each attachment):

- European Group Differences and National Differences (3 pages)

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
- TS EN 62471 with all relevant examinations and tests of TSE IEC TR 62778 standard have been applied. Only Blue Light Hazard measurement has been done.	TSE Electrotechnical Laboratory Gebze Directorate Cumhuriyet Mah. 2258 Sok. No:10 Gebze / KOCAELİ

Summary of compliance with National Differences (List of countries addressed):-

Copy of marking plate:

Test item particulars	:	☒ continuous wave lamps ☐ pulsed lamps
Tested lamp	:	
Tested lamp system	:	NA
Lamp classification group	:	☐ exempt ☒ risk 1 ☐ risk 2 ☐ risk 3
Lamp cap	:	N/A
Bulb	:	NA
Rated of the lamp	:	NA
Furthermore marking on the lamp	:	NA
Seasoning of lamps according IEC standard	:	NA
Used measurement instrument	:	BENTHAM
Temperature by measurement	:	23°C
Information for safety use	:	NA

Possible test case verdicts:	
- This test is not applicable for this sample .....:	NA
- This result complies with the stated condition(s).....:	C
- This result does not comply with the stated condition(s).....:	NC
- This test is not evaluated since declariton/conditions are not stated .....:	ND
- This test is not requested .....:	NR
- This test could not be done with the capability of the laboratory .....:	X
- This test is not done due to the breakdown of the equipment .....:	EB

Testing:	
Date of receipt of test item..... :	26.03.2021
Date (s) of performance of tests..... :	26.03.2021 - 31.03.2021

General remarks:

"(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 / ☐ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) .....:

General product information and other remarks:

Measurements were made with the transparent cover on the led module.

TS EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict
4	**EXPOSURE LIMITS**		**C**
4.1	General		C
	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		C
	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	C
4.3	Hazard exposure limits		NA
4.3.1	Actinic UV hazard exposure limit for the skin and eye		NA
	The exposure limit for effective radiant exposure is 30 J·m^{-2} within any 8-hour period		NA
	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:		NA
	$E_s \cdot t = \sum_{200}^{400} \sum_{t} E_\lambda(\lambda,t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 30$ J·m^{-2}		NA
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		NA
	$t_{max} = \frac{30}{E_S}$ s		NA
4.3.2	Near-UV hazard exposure limit for eye		NA
	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}.		NA
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		NA
	$t_{max} \le \frac{10\,000}{E_{UVA}}$ s		NA
4.3.3	Retinal blue light hazard exposure limit		C
	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:		C

TS EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	$L_B \cdot t = \sum_{300}^{700} \sum_{t} L_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 10^6$ J · m^{-2} · sr^{-1}	for t ≤ 10^4 s $t_{max} = \frac{10^6}{L_B}$	C
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 100$ W · m^{-2} · sr^{-1}	for t > 10^4 s	C
4.3.4	Retinal blue light hazard exposure limit - small source		NA
	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:	see table 4.2	NA
	$E_B \cdot t = \sum_{300}^{700} \sum_{t} E_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 100$ J · m^{-2}	for t ≤ 100 s	NA
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 1$ W · m^{-2}	for t > 100 s	NA
4.3.5	Retinal thermal hazard exposure limit		NA
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_λ, weighted by the burn hazard weighting function R(λ) (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:		NA
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{50\,000}{\alpha \cdot t^{0,25}}$ W · m^{-2} · sr^{-1}	(10 µs ≤ t ≤ 10 s)	NA
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		NA
	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:		NA
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{6\,000}{\alpha}$ W · m^{-2} · sr^{-1}	t > 10 s	NA
4.3.7	Infrared radiation hazard exposure limits for the eye		NA
	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:		NA
	$E_{IR} = \sum_{780}^{3\,000} E_\lambda \cdot \Delta\lambda \le 18\,000 \cdot t^{-0,75}$ W · m^{-2}	t ≤ 1000 s	NA
	For times greater than 1000 s the limit becomes:		NA
	$E_{IR} = \sum_{780}^{3\,000} E_\lambda \cdot \Delta\lambda \le 100$ W · m^{-2}	t > 1000 s	NA

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Clause	Requirement + Test	Result – Remark	Verdict
4.3.8	Thermal hazard exposure limit for the skin		NA
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:		NA
	$E_H \cdot t = \sum_{380}^{3000} \sum_{t} E_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 20000 \cdot t^{0,25}$ J · m^{-2}		NA
5	**MEASUREMENT OF LAMPS AND LAMP SYSTEMS**		**C**
5.1	Measurement conditions		C
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		C
5.1.1	Lamp ageing (seasoning)		NA
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		NA
5.1.2	Test environment		C
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		NA
5.1.3	Extraneous radiation		NA
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.		NA
5.1.4	Lamp operation		C
	Operation of the test lamp shall be provided in accordance with:		C
	– the appropriate IEC lamp standard, or		C
	– the manufacturer' s recommendation		NA
5.1.5	Lamp system operation		C
	The power source for operation of the test lamp shall be provided in accordance with:		C
	– the appropriate IEC standard, or		NA
	– the manufacturer' s recommendation		C
5.2	Measurement procedure		NA
5.2.1	Irradiance measurements		NA
	Minimum aperture diameter 7mm.		NA
	Maximum aperture diameter 50 mm.		NA
	The measurement shall be made in that position of the beam giving the maximum reading.		NA

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Clause	Requirement + Test	Result – Remark	Verdict
	The measurement instrument is adequate calibrated.		NA
5.2.2	Radiance measurements		C
5.2.2.1	Standard method		C
	The measurements made with an optical system.		C
	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.		C
5.2.2.2	Alternative method		NA
	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.		NA
5.2.3	Measurement of source size		C
	The determination of α, the angle subtended by a source, requires the determination of the 50% emission points of the source.		C
5.2.4	Pulse width measurement for pulsed sources		NA
	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.		NA
5.3	Analysis methods		C
5.3.1	Weighting curve interpolations		C
	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	C
5.3.2	Calculations		C
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		C
5.3.3	Measurement uncertainty		C
	The quality of all measurement results must be quantified by an analysis of the uncertainty.	see Annex C in the norm	C
6	**LAMP CLASSIFICATION**		**C**
	For the purposes of this standard it was decided that the values shall be reported as follows:	see table 6.1	C
	– for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance		C

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Clause	Requirement + Test	Result – Remark	Verdict
	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		NA
6.1	Continuous wave lamps		NA
6.1.1	Except Group		NA
	In the except group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		NA
	– an actinic ultraviolet hazard (E_S) within 8-hours exposure (30000 s), nor		NA
	– a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min), nor		NA
	– a retinal blue-light hazard (L_B) within 10000 s (about 2,8 h), nor		NA
	– a retinal thermal hazard (L_R) within 10 s, nor		NA
	– an infrared radiation hazard for the eye (E_{IR}) within 1000 s		NA
6.1.2	Risk Group 1 (Low-Risk)		C
	In this group are lamps, which exceeds the limits for the except group but that does not pose:		C
	– an actinic ultraviolet hazard (E_S) within 10000 s, nor		NA
	– a near ultraviolet hazard (E_{UVA}) within 300 s, nor		NA
	– a retinal blue-light hazard (L_B) within 100 s, nor		C
	– a retinal thermal hazard (L_R) within 10 s, nor		NA
	– an infrared radiation hazard for the eye (E_{IR}) within 100 s		NA
	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.		NA
6.1.3	Risk Group 2 (Moderate-Risk)		NA
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		NA
	– an actinic ultraviolet hazard (E_S) within 1000 s exposure, nor		NA
	– a near ultraviolet hazard (E_{UVA}) within 100 s, nor		NA
	– a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor		NA

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Clause	Requirement + Test	Result – Remark	Verdict
	– a retinal thermal hazard (L_R) within 0,25 s (aversion response), nor		NA
	– an infrared radiation hazard for the eye (E_{IR}) within 10 s		NA
	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.		NA
6.1.4	Risk Group 3 (High-Risk)		NA
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		NA
6.2	Pulsed lamps		NA
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		NA
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.		NA
	The risk group determination of the lamp being tested shall be made as follows:		NA
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		NA
	– 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		NA
	– 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		NA

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Clause	Requirement + Test	Result – Remark	Verdict

Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye	C

Wavelength[1] λ, nm	**UV hazard function $S_{uv}(\lambda)$**	**Wavelength λ, nm**	**UV hazard function $S_{uv}(\lambda)$**
200	0,030	313*	0,006
205	0,051	315	0,003
210	0,075	316	0,0024
215	0,095	317	0,0020
220	0,120	318	0,0016
225	0,150	319	0,0012
230	0,190	320	0,0010
235	0,240	322	0,00067
240	0,300	323	0,00054
245	0,360	325	0,00050
250	0,430	328	0,00044
254*	0,500	330	0,00041
255	0,520	333*	0,00037
260	0,650	335	0,00034
265	0,810	340	0,00028
270	1,000	345	0,00024
275	0,960	350	0,00020
280*	0,880	355	0,00016
285	0,770	360	0,00013
290	0,640	365*	0,00011
295	0,540	370	0,000093
297*	0,460	375	0,000077
300	0,300	380	0,000064
303*	0,120	385	0,000053
305	0,060	390	0,000044
308	0,026	395	0,000036
310	0,015	400	0,000030

[1] Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
* Emission lines of a mercury discharge spectrum.

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Clause	Requirement + Test	Result – Remark	Verdict

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

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
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		$10^{[(700-\lambda)/500]}$
1050-1150		0,2
1150-1200		$0{,}2\ 10^{0{,}02(1150-\lambda)}$
1200-1400		0,02

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Clause	Requirement + Test	Result – Remark	Verdict

Table 5.4	Summary of the ELs for the surface of the skin or cornea (irradiance based values)	NA

Hazard Name	**Relevant equation**	**Wavelength range nm**	**Exposure duration sec**	**Limiting aperture rad (deg)**	**EL in terms of constant irradiance $W \cdot m^{-2}$**
Actinic UV skin & eye	$E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$	200 – 400	< 30000	1,4 (80)	30/t
Eye UV-A	$E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$	315 – 400	≤1000 >1000	1,4 (80)	10000/t 10
Blue-light small source	$E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	≤100 >100	< 0,011	100/t 1,0
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 –3000	≤1000 >1000	1,4 (80)	$18000/t^{0,75}$ 100
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2π sr	$20000/t^{0,75}$

Table 5.5	Summary of the ELs for the retina (radiance based values)	C

Hazard Name	**Relevant equation**	**Wavelength range nm**	**Exposure duration sec**	**Field of view radians**	**EL in terms of constant radiance $W \cdot m^{-2} \cdot sr^{-1}$)**
Blue light	$L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	0,25 – 10 10-100 100-10000 ≥ 10000	$0,011 \cdot \sqrt{(t/10)}$ 0,011 $0,0011 \cdot \sqrt{t}$ 0,1	$10^6/t$ $10^6/t$ $10^6/t$ 100
Retinal thermal	$L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0,25 0,25 – 10	0,0017 $0,011 \cdot \sqrt{(t/10)}$	$50000/(\alpha \cdot t^{0,25})$ $50000/(\alpha \cdot t^{0,25})$
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	780 – 1400	> 10	0,011	$6000/\alpha$

TS EN 62471			
Clause	Requirement + Test	Result – Remark	Verdict

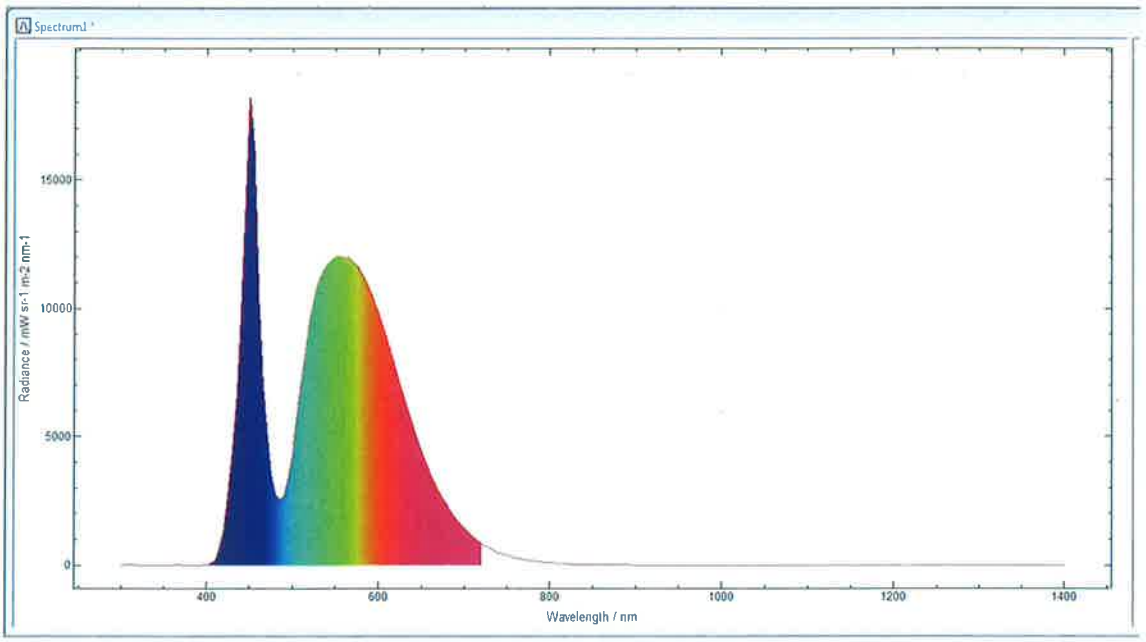
Table 6.1	Emission limits for risk groups of continuous wave lamps									**C**
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	$S_{UV}(\lambda)$	E_S	$W \cdot m^{-2}$	0,001	NA	0,003	NA	0,03	NA	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	NA	33	NA	100	NA	
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	NA	10000	482.869	4000000	NA	
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	NA	1,0	NA	400	NA	
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	NA	28000/α	NA	71000/α	NA	
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	NA	6000/α	NA	6000/α	NA	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	NA	570	NA	3200	NA	
* 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										

Measurement Results of Photobiolojical Safety Test

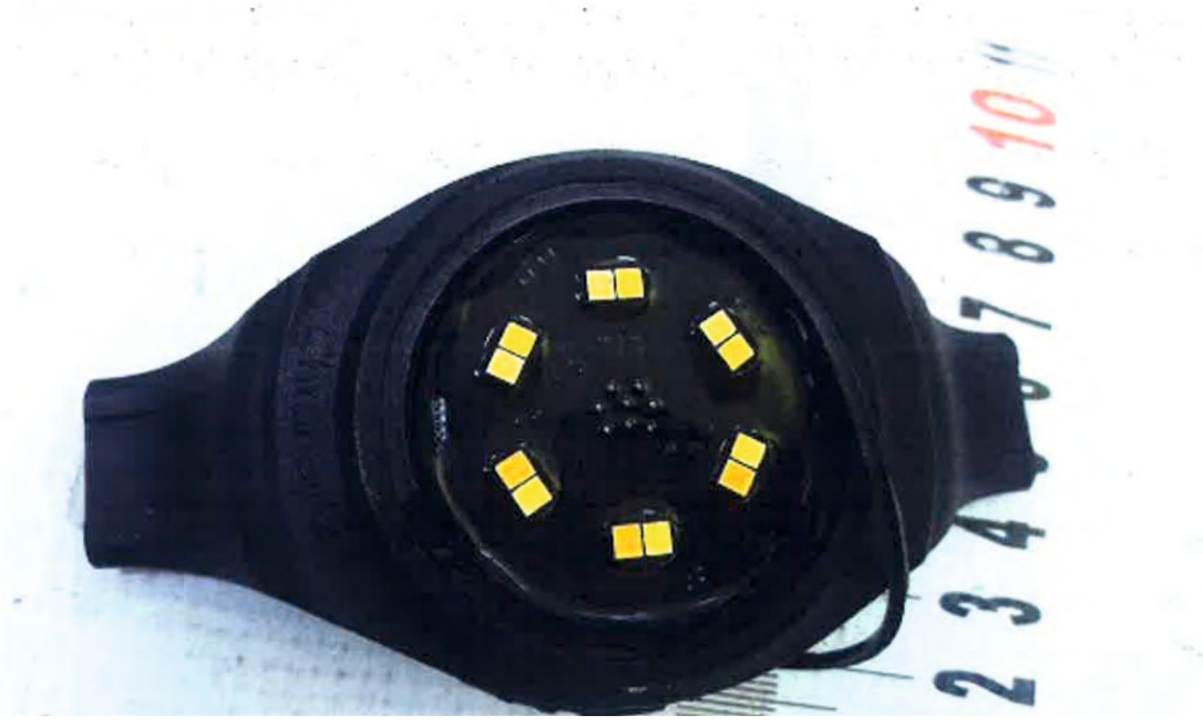
5. Blue Light Hazard

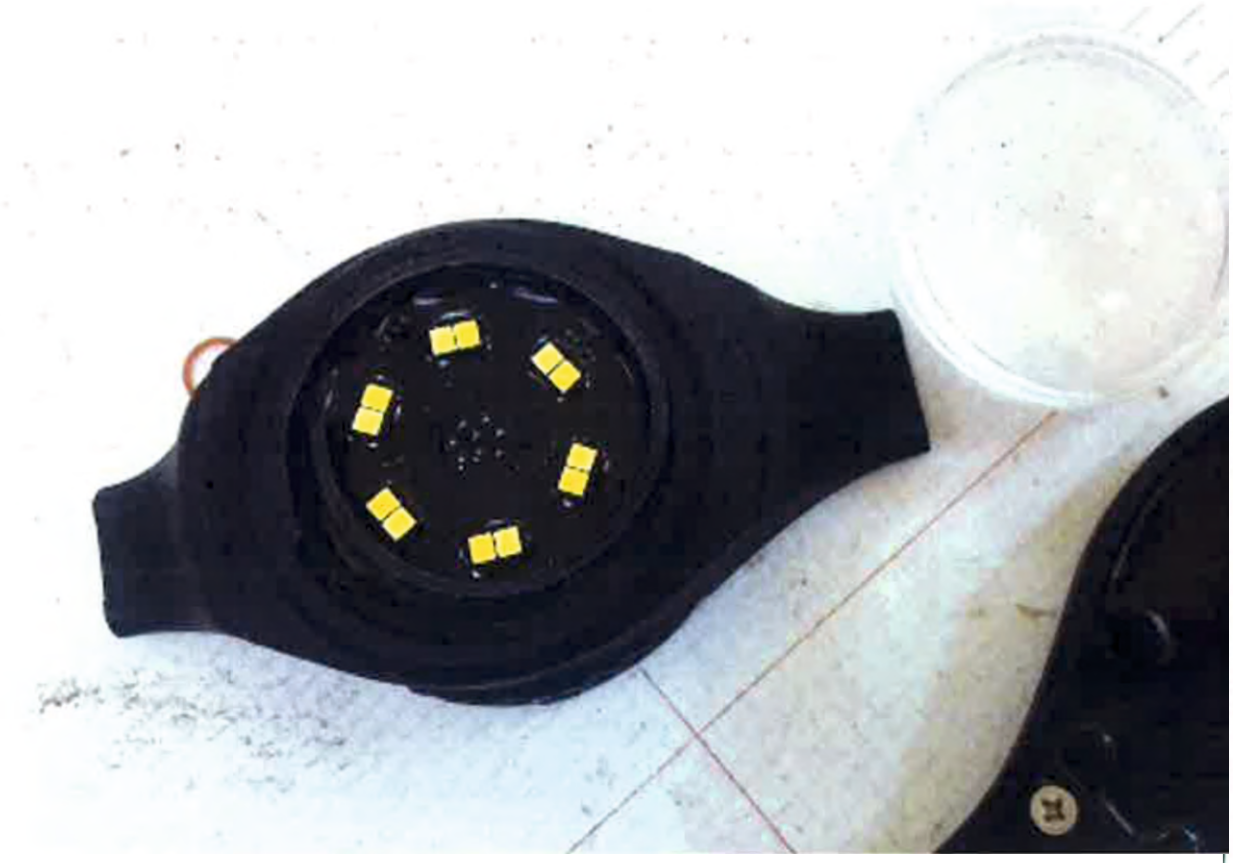
Spectral Range	300 – 780 nm
Luminance	1.05E+06 cd m-2

Hazard	Measured value	RG1 Limit	Classification	E_{thr} (lx)
Blue Light Radiance 11mrad FOV (W m-2 sr-1)	482.869	*1E+04*	*RG1*	NA



Numunenin Fotoğrafları






hera
IP67

Auxiliary test equipment used with the sample

Note: Images represent the sample and sample sizes.

TSE62471B - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT TS EN 62471
EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES
Photobiological safety of lamps and lamps systems

Standard .....:	TS EN 62471:2012
Differences according to .....:	EN 62471:2008
Annex Form No. .....:	EU_GD_TSE62471B
Annex Form Originator .....:	TSE
Master Annex Form .....:	2019-12

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

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									**C**
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	NA	-	-	-	-	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	NA	-	-	-	-	
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	NA	10000	*482.869*	4000000	NA	
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	0,01*	NA	1,0	NA	400	NA	
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	NA	28000/α	NA	71000/α	NA	
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	NA					
				6000/α 0,011≤ α ≤ 0,1	NA					
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	NA	570	NA	3200	NA	

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)	**C**

* 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
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.