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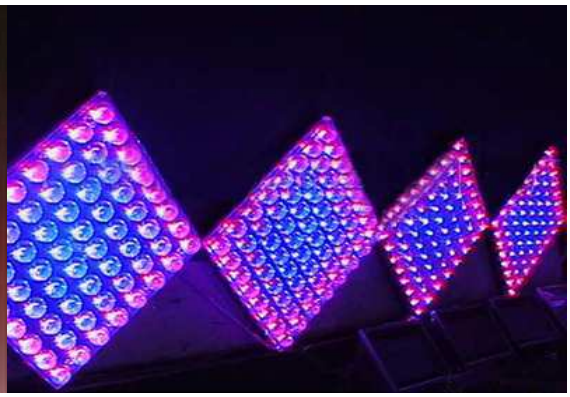
IEC/EN 62471 for LED Lighting Products



Standard: IEC/EN 62471

As White light LEDs become widely used in many LED products, assessment of the unique “Blue Light” hazard is critical. As of September 1, 2009, IEC/EN 62471, Photobiological Safety of Lamps and Lamp Systems was fully applied to all LED lighting products.

STANDARD SCOPE

IEC/EN 62471 gives guidance for evaluating the photobiological safety of lamps and lamp systems including luminaires. Specifically it defines exposure limits, references measurement techniques and the classification scheme for the evaluation and control of photobiological hazards from all electrically powered incoherent broadband sources of optical radiation, including LEDs (but excluding lasers), in the wavelength range from 200 nm through 3000 nm. This standard was prepared as Standard CIE S 009:2002 by the International Commission on Illumination.

Difference between IEC/EN 62471 and IEC/EN 60825

European Standards		
Standard	**IEC/EN 62471**	**IEC/EN 60825**
Title	Photobiological safety of lamps and lamp systems	Safety of laser products
Scope	Measure the radiation within the wavelength range from 200 nm through 3000 nm	Measure peak radiation power in the wavelength range 180 nm to 1mm
Mandatory	Yes	Yes
Related products	All lamps and luminaires including LEDs but excluding laser	All laser products
Type of application	Lamp applications	Data reading and storage; transmission and display of information etc.

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Hazardous Considerations

There are various biological hazards that are considered within different wavelength ranges in accordance with the standard IEC/EN 62471. The biological effects on both the eyes and skin are considered.

	Bioeffect			
Hazard	**Wavelength Range (nm)**	**Quantity**	**Eye**	**Skin**
Actinic UV skin and eye	200-400 (weighted)	Irradiance	*Cornea* -photokeratitis *Conjunctiva* - conjunctivitis *Lens* -cataractogenesis	Erythema Elastosis
UVA eye	315-400	Irradiance	*Lens* -cataractogenesis	--
Retinal Blue-light	300-700 (weighted)	Radiance	*Retina* -photoretinitis	--
Retinal Blue-light-small source	300-700 (weighted)	Irradiance		--
Retinal thermal	380-1400 (weighted)	Radiance	*Retina* - retinal burn	--
Retinal thermal-weak visual stimulus	780-1400 (weighted)	Radiance	*Retina* - retinal burn	--
Infrared radiation eye	780-3000	Irradiance	*Cornea* - comeal burn *Lens* -cataractogenesis	--
Thermal skin	380-3000	Irradiance	--	Skin burn

Classification

According to EN 62471:2008 sources of optical radiation are classified into risk groups subject to their potential photobiological hazard. This classification takes place through a risk assessment, which is conducted on the either individual components or the final product based on information obtained from the manufacturer. If a source is assigned to a “safe” group (Exempt Group), or to a low risk group (Risk Group 1), it would not be needed for a detailed workplace evaluation, since there is no photobiological safety hazard issue.

Sources are classified into the following four groups according to hazard, based on the emission limit as well as permissible exposure time before hazard exceeded.

Risk Group	Philosophical Basis
Exempt	No Photobiological hazard
Group 1 (Low-Risk)	No photobiological hazard under normal behavioural limitations
Group 2 (Moderate-Risk)	Does not pose a hazard due to aversion response to bright light or thermal discomfort
Group 3 (High-Risk)	Hazardous even for momentary exposure

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Permissible Exposure Time (Cl. 6)

In order to determine the risk group of a source, its spectral irradiance or radiance has to be measured at a specified distance, weighted with action spectra and maximum allowed exposure time, which is compared to different exposure limits. For continuous sources, the exposure time limits are as follows:

	Exposure time before hazard exceeded (in seconds)			
Hazard	**Exempt**	**Group 1**	**Group 2**	**Group 3**
Actinic UV	30000	10000	1000	--
UVA hazard	1000	300	100	--
Blue Light Radiance	10000	100	0.25	--
Blue Light Small Source	10000	100	0.25	--
Retinal Thermal	10	10	0.25	--
Retinal Thermal weak visual	1000	100	10	--
IR Eye	1000	100	10	--

Labeling Requirements – IEC62471-2

IEC 62471-2 “Photobiological safety of lamps and lamp systems – Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety” provides further guidance on the measurement and labeling of sources and is a useful supplement to IEC/EN 62471.

Labeling – IEC62471-2 (Cl. 5.4)				
Hazard	**Exempt**	**Group 1**	**Group 2**	**Group 3**
Actinic UV	--	NOTICE UV emitted from this product. Minimize exposure to eyes or skin. Use appropriate shielding.	CAUTION. UV emitted from this product. Eye or skin irritation may result from exposure. Use appropriate shielding.	WARNING. UV emitted from this product, Avoid eye and skin exposure to unshielded product.
UVA	--	NOTICE UV emitted from this product. Minimize exposure to eyes or skin. Use appropriate shielding.	CAUTION. UV emitted from this product. Eye or skin irritation may result from exposure. Use appropriate shielding.	WARNING. UV emitted from this product, Avoid eye and skin exposure to unshielded product.
Blue Light Radiance	--	--	CAUTION. Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eye	WARNING. Possibly hazardous optical radiation emitted from this product. Do not look at operating lamp. Eye injury may result.
Retinal Thermal Hazard	--	--	CAUTION. Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eye	WARNING. Possibly hazardous optical radiation emitted from this product. Do not look at operating lamp. Eye injury may result.
IR Radiation Eyes		NOTICE IR emitted from this product. Use appropriate shielding or eye protection.	CAUTION. IR emitted from this product. Do not stare at operating lamp.	WARNING IR emitted from this product. Avoid eye exposure. Use appropriate shielding or eye protection.
Retinal Thermal Hazard Weak Visual		WARNING IR emitted from this product. Do not stare at operating lamp	WARNING IR emitted from this product. Do not stare at operating lamp	WARNING IR emitted from this product. Do not look at operating lamp

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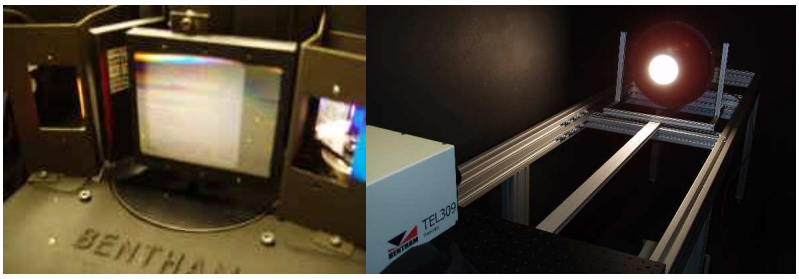
Spectroradiometer System

The Spectroradiometer System is the testing equipment used to measure a light source with spectral range **200- 3,500 nm.**



Intertek is equipped to perform the LED photo-biological safety testing (i.e. **IEC/EN 62471**) and Ultra-Violet radiation measurements according to different requirements.

In addition to our optical testing capabilities, Intertek offers a full range of testing and certification services for LED Lighting Products including:

- Electrical Safety
- Photo-biological Safety
- Photometry Testing per IESNA LM-79
- Performance Testing
- Lumen Maintenance and Life Testing
- EMC and FCC Compliance

For further details about our testing and certification services, please contact us at:

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