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Technical requirements for application of LED sports lighting

LED 体育照明应用技术要求

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1 Scope

This Standard specifies terms and definitions, general requirements, specification classification requirements and performance requirements for luminaires, driving power supplies and lighting control systems of LED for stadium sports lighting.

This Standard is applicable to LED luminaires, driver and lighting control system as well as their applications for stadium and auditorium lighting.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB 7000.1, *Luminaires - Part 1: General requirements and tests*

GB 7000.7, *Safety requirements for floodlights*

GB 7000.218, *Luminaires - Part 2-18: Particular requirements - Luminaries for swimming pools and similar application*

GB/T 7921-2008, *Uniform color space and color difference formula*

GB/T 9254, *Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement*

GB 17625.1-2012, *Electromagnetic compatibility - Limits - Limits for harmonic current emissions (equipment input current ≤16 A per phase)*

GB/T 17626.5-2019, *Electromagnetic compatibility - Testing and measurement techniques - Surge immunity test*

GB/T 17743, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment*

GB/T 18595, *Equipment for general lighting purposes - EMC immunity*

a visual phenomenon that causes uncomfortable feeling or reduces the ability to observe details or objects due to the inappropriate brightness distribution or brightness range in the field of view, or the existence of extreme contrast\

[JGJ/T 119-2008, definition 2.2.17]

3.6 colour rendering index

measurement of light source color rendering, expressed by the degree of agreement between the color of the object under the measured light source and the color of the object under the reference light source

[JGJ/T 119-2008, definition 2.3.28]

3.6.1 general colour rendering index; R_a

the average value of the color rendering index of the light source to the 1^{st} ~ 8^{th} standard color samples specified by the International Commission on Illumination (CIE)

3.6.2 special colour rendering index; R_i

the color rendering index of the light source for the 9^{th} ~ 15^{th} standard color samples selected by the International Commission of Illumination (CIE)

NOTE: In this Standard, R_9 refers to the color rendering index of the light source for the 9^{th} standard color sample selected by the International Commission on Illumination (CIE).

3.7 colour temperature

when the chromaticity of the light source is the same as the chromaticity of a black body at a certain temperature, the absolute temperature of the black body is the color temperature of the light source; color temperature is used to express how warm (red) or cold (blue) a kind of lighting feels or the apparent feeling

[JGJ/T 119-2008, definition 2.3.21]

3.8 correlated colour temperature

when the chromaticity point of the light source is not on the black body locus, and the chromaticity of the light source is close to the chromaticity of the blackbody at a certain temperature, the absolute temperature of the blackbody is the correlated color temperature of the light source

[JGJ/T 119-2008, definition 2.3.22]

3.9 chromaticity tolerances

characterize the deviation of each light source in a batch of light sources from

lower than 70% of the initial luminous flux or cannot be used normally TO the installed quantity of this model of luminaires after installation and use

3.17 harmonic wave

the component whose number of times is greater than the fundamental frequency in the Fourier series decomposition of a periodic non-sinusoidal electricity in the power supply system

3.18 total harmonic distortion of voltage

the ratio of the effective value of all harmonic components of the voltage TO the effective value of the fundamental component

3.19 total harmonic distortion of current

the ratio of the effective value of all harmonic components of the current TO the effective value of the fundamental component

3.20 overshoot amplitude

the maximum instantaneous amplitude of the output voltage or current exceeding the nominal value

NOTE: Overshoot refers to the phenomenon that the output DC voltage or current exceeds the nominal value caused by the instantaneous change of a certain influence.

3.21 differential mode voltage

the voltage between any two of a set of specified live conductors

3.22 common mode voltage

the average value of the phase voltage between each conductor and a specified reference point (usually ground or chassis)

3.23 failure rate of driver

proportion of failure of driver after 1000h

3.24 smart lighting control system

a control system that uses computer, network communication, automatic control and other technologies, by analyzing and processing environmental information and user needs, to implement specific control strategies, so as to perform overall control and management of the lighting system to achieve the desired lighting effect

NOTE: It is usually composed of control and management equipment, input equipment,

b) The driver for indoor lighting (including adapted lightning protection device), under the experimental conditions of differential mode voltage of 1kV and common mode voltage of 2kV, shall be able to meet the requirements of category b) products specified in GB/T 17626.5-2019.

7.4 Durability

7.4.1 When the maximum temperature of the housing does not exceed 75°C, the life of the driver for LED lighting shall not be less than 50000h.

7.4.2 Under the working conditions specified in 7.1.2, the failure rate of driver for LED lighting shall not exceed 0.5%.

7.4.3 The product shall be able to work normally after 500h durability test at high temperature (85°C).

8 Lighting control system performance requirements

8.1 Basic requirements

8.1.1 It shall be able to perform single luminaire, group or zone control of lighting fixtures according to functional requirements.

8.1.2 There shall be an open communication interface and protocol.

8.1.3 It shall be able to achieve control functions through data collection and analysis, automatic function presets, in accordance with the following regulations:

a) It shall be able to realize switch control according to the requirements;

b) In places where dimming is required, the illuminance (brightness) shall be adjusted according to the set value;

c) In places where scene switching is required, the set scene mode shall be able to be switched according to the stated requirements, and on-site adjustments shall be possible.

8.1.4 When the control system fails, it shall be able to automatically send out audible and visual alarm signals, and meet the following requirements:

a) It shall support the offline alarm of the control module and the gateway module AND the feedback of the inconsistent control and status;

b) When a communication failure occurs, the system input and output equipment shall be able to operate according to the preset program;

systems.

8.2.3 LED luminaires for natural lighting shall be equipped with a smart sensor or an external sensor control interface that automatically adjusts the illuminance according to natural light changes.

8.2.4 The LED venue lighting control system shall determine the network structure of the control system according to the scale and needs of the competition venue. And through the network integrated equipment management system, it can collect and control the lighting operating status.

8.2.5 The architecture of the LED intelligent lighting control system shall refer to Annex G to determine. The communication protocol and system configuration shall refer to Annex H to determine.

8.3 Dimming requirements

8.3.1 When the control system is used for TV relay lighting, it is not advisable to use dimming method for lighting scene changes. When using the dimming method, the following requirements shall be met:

a) The upper limit of the luminous flux of the light source shall not be higher than the rated luminous flux;

b) When adjusting the brightness or illuminance, the color temperature deviation shall not exceed 200K;

c) The dimming shall meet the requirements for the stroboscopic limit;

d) The dimming shall be realized by adjusting the output current value.

8.3.2 It shall meet linear dimming requirements. The deviation of the actual luminous flux output from the set value shall not exceed 10%.

8.3.3 The harmonic interference of dimming equipment to the power distribution system shall be restricted and comply with relevant standards.

B.2 Camera glare and flicker requirements

B.2.1 Avoid direct glare from luminaires and reflected glare from glossy surfaces into the camera lens.

B.2.2 The maximum glare index (GR) of all cameras shall not be greater than 40.

B.2.3 For super slow-motion playback, it shall be ensured that there is no flicker phenomenon at least at 600fps.

B.3 Requirements for uniformity gradient of fixed camera and super slow-motion playback vertical illumination

B.3.1 When the illuminance calculation and measurement grid is less than 5m, it shall not be greater than 10% per 2m.

B.3.2 When the illuminance calculation and measurement grid is not less than 5m, it shall not be greater than 20% per 4m.

B.3.3 The coefficient of deviation (CV) shall not be greater than 0.13.

NOTE: CV is the ratio of the standard deviation of the illuminance value at all test points to its average value.

B.4 Other requirements

B.4.1 The lighting level of the standby lighting shall not be lower than 50% of the normal lighting. It shall be evenly distributed throughout the field.

B.4.2 For flying competitions, lighting of flight path and target shall be provided.

B.4.3 Field lighting shall avoid direct glare and the effects of reflected glare on athletes from ice, water, snow and polished ground.

B.4.4 When indoor venues use large-area decorative lighting or decorative lighting as the dominant light source, the competition light source shall not adopt the basic colors of red, green and blue (RGB).

B.4.5 Outdoor venues shall be supplemented with lighting for shadow boundaries and shadow areas near the finish line. Its correlated color temperature shall match daylight.

B.4.6 Display lighting shall not interfere with TV relay lighting. If it is affected, it shall be off during the broadcast of the game.

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