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**Requirements and test methods for sport field equipment -
Part 1: LED Screen**

体育场馆设备使用要求及检验方法 第1部分：LED显示屏

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Requirements and test methods for sport field equipment -

Part 1: LED Screen

1 Scope

This part of TY/T1001 specifies the definition, classification, use requirements, inspection methods, qualification judgment rules for LED display screens for sports fields.

This Part is applicable to LED display screens in track and field stadiums, comprehensive gymnasiums, swimming pools, diving halls. Other sports fields can refer to it for implementation.

This Part does not include display screens in timing and scoring systems and display screens for guiding directions in sports fields.

2 Normative references

The clauses in the following documents become clauses of this Part through reference to this Part of TY/T 1001. For any dated referenced document, all subsequent amendments (excluding corrections) or revisions are not applicable to this Part. However, parties that reach an agreement based on this Part are encouraged to study whether the latest versions of these documents can be used. For any undated referenced document, its latest version applies to this Part.

GB 4208-1993 Degrees of protection provided by enclosure (IP code) (eqv IEC 600529:1989)

GB 6593 Quality inspection provisions for electronic measuring instruments

GB 50168 Code for construction and acceptance of cable levels electric equipment installation engineering

GB 50171 Code for construction and acceptance of switchboard outfit complete cubicle and secondary circuit electric equipment installation engineering

GB 50303 Code for acceptance of construction quality of electrical installation in building

SJ/T 11141-2003 General specifications for LED panels

SJ/T 11281-2003 Test methods of LED panels

When the display screen displays text content, it continuously updates the entire screen or part of the content, until all the content is displayed.

3.1.19

Manual switch

Change of content displayed on the display screen by manual operation.

3.1.20

Automatic switch

Change of content displayed on the display screen by program control.

3.2 Abbreviations

The following abbreviations apply to this Part of TY/T 1001.

3.2.1

LED: Light emitting diode

4 Classification

4.1 According to the use environment, it is divided into:

The display screen is divided into indoor screen (for gymnasium) and outdoor screen (for stadium), according to the different places of use.

4.2 According to the composition of pixels, it is divided into:

Monochrome: Pixels are composed of LEDs of one color.

Dual color: Pixels are composed of LEDs of two different colors.

Tricolor (full color): Pixels are composed of LEDs of red, green, blue, which can achieve standard white field.

4.3 According to function, it is divided into:

Sports stadium display screens can be divided into graphic information display screens and video display screens, according to different use functions.

4.4 According to installation structure, it is divided into:

Sports stadium display screens can be divided into flat display screens, bucket-shaped display screens, ring-shaped display screens, according to different installation

structures.

5 Requirements

5.1 Installation location and number of display screens

5.1.1 Except for special circumstances, it is advisable that more than 95% of the audience with formal fixed seats in the venue meet the maximum viewing distance requirements.

5.1.2 Athletes, coaches, referees at the competition site (except for on-site scoring referees in diving competitions) can all easily and clearly see the contents displayed on the screen.

5.2 Character display on a flat screen

5.2.1 Comprehensive gymnasium

5.2.1.1 The display screen used in a comprehensive gymnasium for scoring events (gymnastics, martial arts routines, figure skating, etc.) can display at least 12 lines of 16-dot Chinese characters, with a line spacing of not less than 1/10 of the characters, and at least 27 Chinese characters per line.

5.2.1.2 The display screen used in a comprehensive gymnasium for ball games can display at least 8 lines of 16-dot Chinese characters, with a line spacing of not less than 1/10 of the characters, and at least 16 Chinese characters per line.

5.2.2 Track and field stadium

5.2.2.1 The display screen can display at least 13 lines of 16-dot Chinese characters, with a line spacing of no less than 1/10 of the character, and at least 26 Chinese characters displayed in each line.

5.2.2.2 Each character has a flashing function.

5.2.3 Swimming pool

5.2.3.1 The display screen can display at least 13 lines of 16-dot Chinese characters, with a line spacing of no less than 1/10 of the character, and at least 25 Chinese characters displayed in each line.

5.2.3.2 Each character has a flashing function.

5.2.4 Diving hall

The display screen can display at least 12 lines of 16-dot Chinese characters, with the line spacing not less than 1/10 of the character, and each line can display at least 13

When the background illumination is less than 20 lx, the contrast of the display screen shall be able to reach 100:1.

5.4.4 White field chromaticity coordinates

The white field chromaticity coordinates can be adjusted within the color temperature of 5000 K ~ 9500 K according to the use environment. According to the CIE 1931 colorimetric system, the tolerance is $|\Delta x| \leq 0.030$, $|\Delta y| \leq 0.030$.

5.4.5 Brightness uniformity

The non-uniformity of the display screen in the stadium shall be less than 10%.

5.5 Display control

5.5.1 The running time of the game can be displayed in real time.

5.5.2 The rolling display of game results can be displayed.

5.5.3 The game results can be displayed by turning pages.

5.5.4 The text content displayed can be switched automatically or manually.

5.5.5 For display screens with graphic and video display functions, text and images, animations, live broadcast images shall be able to switch automatically or manually.

5.6 Interface

5.6.1 Network interface

It shall have an IEEE 802.3 Ethernet network interface.

5.6.2 Data interface

It shall have the ability to equip multiple data interfaces including a standard RS-232 serial interface; be able to connect to the timing and scoring system at the game site to receive data.

5.6.3 Video interface

For display screens with graphic and video display functions, they shall have video interfaces that can receive video signals of various formats.

5.7 Electrical performance

5.7.1 Refresh frame frequency

The refresh frame frequency of LED video display screens shall be no less than 60 frames/s.

5.7.2 Refresh ratio

The refresh ratio of graphic display screens for stadiums shall be no less than 60 Hz; the refresh ratio of full-color video display screens shall be no less than 240 Hz.

5.7.3 Ratio of out-of-control pixel

The loss of control rate of stadium display screens shall be no more than 3/10000; the loss of control rate of stadium display screens shall be no more than 2/1000, which shall be discretely distributed.

5.7.4 Grayscale level

For display screens used to display video images, each primary color shall have a grayscale processing capability of 256 levels (8-bit).

5.7.5 Video display resolution

To ensure the video display effect of the display screen, the minimum resolution of the display screen for video images is 320 (W) × 240 (H)

5.8 Appearance and structure

5.8.1 The appearance of the stadium display screen shall comply with the requirements of 5.3.2 in SJ/T 11141-2003.

5.8.2 The degree of protection of the outer shell of the stadium display screen shall comply with the requirements of 5.3.3 in SJ/T 11141-2003.

5.8.3 The relative deviation of the pixel center distance of the stadium display screen shall comply with the requirements of 5.3.4 in SJ/T 11141-2003.

5.8.4 The level up degree of the stadium display screen shall comply with the requirements of 5.3.5 in SJ/T 11141-2003.

5.9 Reliability

The reliability of the stadium display screen shall meet the requirements of 5.10 in SJ/T 11141-2003.

5.10 Safety

5.10.1 The safety requirements of the stadium display screen shall meet the requirements of 5.4 in SJ/T 11141-2003.

5.10.2 The display screen in the stadium shall be powered separately and shall meet the requirements of 5.8 in SJ/T 11141-2003. The construction acceptance of the cable line of the stadium display screen must meet the requirements of GB 50168 and GB 50171.

- b) Display Chinese characters on the whole screen;
- c) Display characters in the first column; display Chinese characters in other columns.

Inspect by visual inspection. The result shall meet the corresponding requirements in 5.2.1.

6.2.2 Track and field stadium, swimming pool, diving hall

- a) Display characters on the whole screen;
- b) Display Chinese characters on the whole screen;
- c) Display characters in the first column; display Chinese characters in other columns.
- d) The display screen displays the entire screen of characters; each character flashes one by one.

The results of visual inspection shall meet the corresponding requirements in 5.2.2 ~ 5.2.4.

6.3 Maximum viewing distance and character height

6.3.1 The character height is calculated based on the pixel center distance of the display screen of the tested venue; the maximum viewing distance is calculated using formula (1) and meets the requirements of 5.3.1.

6.3.2 The character height of the display screen of the swimming pool, diving hall or swimming and diving hall is calculated based on the pixel center distance of the display screen. The result shall meet the requirements of 5.3.2.

6.4 Optical performance

6.4.1 Viewing angle

Choose any point on the display screen as the test point. Make the optical axis of the brightness meter coincide with the normal line of the display screen, that is, the angle between the two is zero. Measure the brightness at this time as the maximum brightness. Then gradually change the angle between the optical axis of the brightness meter and the normal line of the screen. When the brightness is reduced to half of the maximum brightness, the angle at this time is regarded as the viewing angle. In actual testing, a module of the same quality as the screen can also be used to test in the laboratory according to the above method.

The viewing angle shall meet the requirements of 5.4.1.

The result shall meet the requirements of 5.5.2.

6.5.3 The display screen turns pages to display text. The result shall meet the requirements of 5.5.3 when tested by visual inspection.

6.5.4 The text content displayed can be switched automatically or manually. The result shall meet the requirements of 5.5.4 when tested by visual inspection.

6.5.5 For display screens with graphic and video display functions, text, images, animations, live broadcast images shall be able to switch automatically or manually. The result shall meet the requirements of 5.5.5 when tested by visual inspection.

6.6 Interface

6.6.1 Network interface

Use a computer to connect to the display screen through Ethernet for data exchange. The result shall meet the requirements of 5.6.1.

6.6.2 Data interface

Use a computer to connect to the display screen through the data interface for data exchange. The result shall meet the requirements of 5.6.2.

6.6.3 Video interface

Use a standard video signal generator to output signals to the display screen. The results shall meet the requirements of 5.6.3.

6.7 Electrical performance test

6.7.1 Refresh frame frequency

Use a general oscilloscope or frequency meter to measure. The results shall meet the requirements of 5.7.1.

6.7.2 Refresh ratio

Use a module of the same quality as the screen, to perform the test according to the method specified in 5.3.2 of SJ/T 11281-2003. The results shall meet the requirements of 5.7.2.

6.7.3 Ratio of out-of-control pixel

When displaying the white field and each primary color, observe the pixels that do not match the controlled luminous conditions. The ratio of the pixels to the total luminous pixels is the ratio out-of-control pixel. The ratio out-of-control pixel shall meet the requirements of 5.7.3.

6.7.4 Grayscale

The grayscale test is carried out according to the method specified in 5.3.5 of SJ/T 11281-2003. The result shall meet the requirements of 5.7.4.

6.7.5 Video display resolution

In the video control computer, a screen with a resolution of 320 (W) × 240 (H) is produced; the screen can be fully displayed on the display screen.

6.8 Appearance and structure

6.8.1 The appearance of the stadium display screen is inspected according to the method specified in 6.3.2 of SJ/T 11141-2003; the result shall meet the requirements of 5.8.1.

6.8.2 The degree of protection of the outer shell of the stadium display screen is inspected according to the method specified in GB 4208-1993; the result shall meet the requirements of 5.8.2.

6.8.3 The relative deviation of the center distance of the pixel of the stadium display screen shall be tested according to the method specified in 6.3.4 of SJ/T 11141-2003; the result shall meet the requirements of 5.8.3.

6.8.4 The level up degree of the stadium display screen shall be tested according to the method specified in 6.3.5 of SJ/T 11141-2003; the result shall meet the requirements of 5.8.4.

6.9 Reliability

The reliability of the stadium display screen shall be tested according to the method specified in 6.10 of SJ/T 11141-2003; the result shall meet the requirements of 5.9.

6.10 Safety requirements

6.10.1 The safety requirements of the display screens in sports fields shall be tested according to the method specified in 6.4 of SJ/T 11141-2003; the results shall meet the requirements of 5.10.1.

6.10.2 The power supply requirements of the display screens in sports fields shall be tested according to the method specified in 6.8 of SJ/T 11141-2003; the electrical safety shall meet the requirements of 5.10.2.

6.10.3 For devices containing polymer materials in the display screens, the manufacturer shall provide relevant certification materials to prove that they are flame-retardant materials.

6.10.4 Use on-site experiments to visually inspect the automatic alarm and automatic screen shutdown functions of the display screens in sports fields.

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