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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 21520-2023

Replacing GB 21520-2015

**Minimum allowable values of energy efficiency and energy
efficiency grades for displays**

显示器能效限定值及能效等级

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1 Scope

China's mandatory energy efficiency standard for displays - the computer monitors sold with and beside every PC, a product bought in enormous numbers, left switched on for most of the working day, and whose consumption nobody thinks about individually. It specifies the energy efficiency grades, the minimum allowable values of energy efficiency, the energy conservation evaluation values, the test methods and the inspection rules for displays. What a display standard has to get right is the measurement condition, because a monitor's power draw depends almost entirely on how bright it is set and what is on the screen. A figure taken at whatever brightness the factory shipped, on a white screen, is meaningless and easily gamed. The standard therefore fixes the luminance at which the measurement is made, the test pattern displayed, the stabilisation before reading, and the ambient conditions - and it sets the efficiency in terms that account for the screen area and resolution, so that a large high resolution panel is not penalised against a small one for doing more work. Alongside the on-mode consumption it sets the sleep and off-mode power, which on a device that spends more hours idle than in use is a large part of the annual total, and the automatic power-down behaviour. The minimum allowable value is the threshold below which a display may not be sold, the energy conservation evaluation value the higher threshold for certification, and the grades what appears on the label. Issued on 23 May 2023 and in force since 1 June 2024, it replaces GB 21520-2015.

This document specifies the minimum allowable values of energy efficiency and energy efficiency grades for displays, and energy efficiency calculation and test methods. This document is applicable to flat and curved general-purpose and commercial displays with a screen diagonal size of not less than 40 cm, powered by AC or DC, and using liquid crystal (LCD) and organic light-emitting diode (OLED) as display methods. This document is applicable to LED panel-controller integrated display terminals powered by AC or DC, with light-emitting diodes (LED) as the display mode, pixel pitch greater than

0.30 mm and not greater than

2.60 mm, and maximum luminance not greater than 3000 cd/m². This document does not apply to:

- a) Professional-purpose monitors for image evaluation during the shooting, production, and broadcasting of TV programs;
- b) Dual screen displays;
- c) Displays used for industrial equipment, medical equipment, movie projection, virtual reality (VR), augmented reality (AR), merged reality (MR), extended reality (XR), LCD console (KVM/KMM), and other professional uses, and display products used only as accessories;
- d) Displays that are only powered by battery.

2 Normative references

The following documents contain the provisions which, through normative reference in this document, constitute the essential provisions of this document. For the dated referenced documents, only the versions with the indicated dates are applicable to this document; for the undated referenced documents, only the latest version (including all the amendments) is applicable to this document.

GB/T 8170 Rules of rounding off for numerical values & expression and judgment of limiting values

GB 20943 Minimum allowable values of energy efficiency and evaluating values of energy conservation for single voltage external AC-DC and AC-AC power supplies SJ/T 11141 Generic specification for LED displays SJ/T 11281 Measure methods of light emitting diode (LED) displays

IEC 62087-2:2015 Audio, video, and related equipment - Determination of power consumption - Part 2: Signals and media ITU-R BT.2100 Image parameter values for high dynamic range television for use in production and international program exchange

3 Terms and definitions

The terms and definitions defined in SJ/T 11141 and the following apply to this document.

3.1 LED panel-controller integrated display terminal A standardized LED display device that has a variety of standard input and output interfaces, displays information such as text, images, and videos with LED pixels, has a built-in display control system and image processing unit, and can provide services including but not limited to playback, information release, power management, human-computer interaction, wireless projection, and other functions.

3.2 on mode The state in which the display is connected to the power supply and displays information such as video, images, and text.

3.3 off mode The state in which the display is connected to the power supply, does not display video, image, and text information, and cannot enter other states through the remote-control unit, internal signals, or external signals.

3.4 sleep mode A low-power state in which the display can provide one or more functions without being turned off. NOTE 1: There may be multiple sleep modes. NOTE 2: The functions that the display can provide in sleep mode include but are not limited to:

Appendix A

(Normative) Test methods for the energy efficiency of displays, and the power of sleep mode and the power of off mode of LCD and OLED displays A.1 Test conditions A.1.1 Environmental conditions The test shall be carried out under conditions of temperature, humidity, and air pressure within the following ranges:

a) Temperature: $23\text{ }^{\circ}\text{C}\pm 5\text{ }^{\circ}\text{C}$;

b) Relative humidity: 45%~75%;

c) Atmospheric pressure: 86 kPa~106 kPa. A.1.2 Power supply A.1.2.1 The power supply mode and electrical parameters of the display shall be specified by the manufacturer.

A.1.2.2 In the case of AC power supply, the power supply voltage, power frequency, and total harmonic distortion shall meet the following requirements:

a) Power supply voltage: AC $220\text{x}(1\pm 1\%)\text{V}$ or $380\text{x}(1\pm 1\%)\text{V}$;

b) Power frequency: $50\text{x}(1\pm 1\%)\text{Hz}$;

c) Total harmonic distortion: $\leq 2\%$. A.1.2.3 In the case of DC power supply, the fluctuation of the power supply voltage shall not exceed $\pm 5\%$ of the value specified by the manufacturer. A.2 Test instruments A.2.1 Luminance colorimeter When used for testing LCD displays and OLED displays, the measuring range of the luminance colorimeter shall be at least

0.02 cd/m²~2000 cd/m², and the luminance resolution shall be at least

0.01 cd/m². When used for testing the LED panel-controller integrated display terminal, the measuring range of the luminance colorimeter shall at least be

0.02 cd/m²~10000 cd/m², and the luminance resolution shall be at least

0.01 cd/m². A.2.2 Power meter The power meter is an active power meter with a crest factor greater than or equal to 3 and a minimum current range of less than or equal to 10 mA. When measured power is less than or equal to 1 W, the reading shall be accurate to

0.001 W. A.2.3 Test signal generating equipment The test signal generating equipment shall

have the following characteristics:

- a) At least it shall have test output interfaces such as HDMI, DP, USB, DVI, and VGA;
- b) It can generate image test signals consistent with the inherent resolution of the display under test;

Appendix B

(Normative) Test method for display performance of high-performance LCD and high-performance OLED displays

B.1 Test conditions The conditions are the same as A.1.

B.2 Test setup Set the LCD display and OLED display according to the method specified in A.3.5.

B.3 Test interface The test interface for the display performance of LCD displays and OLED displays shall be consistent with the test interface for energy efficiency.

B.4 Test equipment

B.4.1 Luminance colorimeter The measurement range of the luminance colorimeter shall be at least

0.02 cd/m²~2000 cd/m², and the luminance resolution shall be at least

0.01 cd/m². The luminance colorimeter shall be able to measure the chromaticity coordinates (x,

y) on the screen.

B.4.2 Test signal generating equipment The test signal generating equipment shall have the following characteristics:

- a) At least it shall have test output interfaces such as HDMI, DP, USB, DVI, and VGA;
 - b) It can generate image test signals consistent with the inherent resolution of the LCD and OLED displays under test;
 - c) The refresh rate can be adjusted, supporting at least 120 Hz or more;
 - d) It can generate HDR test signals, and the signal encoding supports 10 bit. NOTE 1: The format of the test signal is related to the interface version. It is recommended to use test signal generating equipment with a certificate of reference material.
- luminance colorimeter AND the LCD display and OLED display shall be adjusted to the condition in which the left and right extreme positions of the LCD display and OLED display screens can be clearly focused as the horizontal left viewing angle and horizontal right viewing angle; record and calculate according to the formula (B.2).
- B.7 Test method for inherent resolution** The test steps of inherent resolution are as follows:

- a) The LCD display and OLED display are connected to the power supply and test signal generating equipment;
- b) Test and record the physical horizontal pixel number and vertical pixel number of the LCD display and OLED display;
- c) The test result is represented as the product of the number of horizontal pixels and the