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

GB/T 23828-2023

Replacing GB/T 23828-2009

Light-emitting diode changeable message signs for motorways

高速公路LED可变信息标志

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1 Scope

China's national standard for LED changeable message signs on motorways. It specifies the classification, the requirements, the test methods, the inspection rules and the marking, packaging, transport and storage of variable message signs using light-emitting diodes. A variable message sign is a road sign that has to be read at speed, at distance, in conditions the designer does not control - and unlike a fixed sign it is an electronic device with a power supply, a controller and a communication link, mounted over a live carriageway where it cannot be reached for maintenance without closing lanes. The optical requirements are the difficult part and they pull in opposite directions. The sign must be legible in direct sunlight falling on its face, which demands very high luminance; the same luminance at night would dazzle a driver and make the message unreadable, so the sign has to measure the ambient light and adjust continuously over a range of several hundred to one. It must be legible from the design distance, which fixes the character height and the pixel pitch; and it must be legible off-axis to a driver in the near lane, which fixes the beam angle - and a wider beam

spreads the same light over more directions, so it trades against the luminance. Add the phantom effect, where low sun on an unlit sign face makes dark pixels appear lit, and the specification becomes a set of measured photometric requirements rather than a description. Around them sit the structural and environmental requirements for a device that lives over a motorway - wind loading, ingress protection, temperature range, lightning and surge protection - the electrical safety, the control interface and the failure behaviour, which matters because a sign displaying a wrong or stale message is worse than a blank one. Issued on 17 March 2023 and in force since 1 October 2023, it replaces GB/T 23828-2009.

This document specifies the classification, composition and model, technical requirements, test methods, inspection rules, as well as signs, packaging, transportation and storage for light-emitting diode (LED) changeable message signs of motorway. This document applies to the production, use and inspection for light-emitting diode changeable message signs of motorway.

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/T 191, Packaging and storage marks

GB/T 2312, Code of Chinese graphic character set for information interchange - Primary set

GB/T 2423.1, Environmental testing for electric and electronic products - Part 2: Test methods - Tests A: Cold

GB/T 2423.2, Environmental testing for electric and electronic products - Part 2: Test methods - Tests B: Dry heat

GB/T 2423.3, Environmental testing - Part 2: Testing method - Test Cab: Damp heat, steady state

GB/T 2423.10, Environmental testing - Part 2: Test methods - Test Fc: Vibration (sinusoidal)

GB/T 2423.17, Environmental testing for electric and electronic products - Part 2: Test method - Test Ka: Salt mist

GB/T 2423.22, Environmental testing - Part 2: Test methods - Test N: Change of temperature

GB/T 3681.1, Plastics - Methods of exposure to solar radiation - Part 1: General guidance well as the followings apply.

3.1 LED changeable message signs The equipment that the full screen uses LED as the

light-emitting unit, which can change different traffic information on the display screen through automatic or manual control.

3.2 pixel The smallest imaging unit of LED variable information signs.

3.3 LED panel It is composed of one or several display modules, which can be controlled by the display control system to complete the screen display. [Source: SJ/T 11141-2017, 3.2]

3.4 dotpitch The center-to-center distance between adjacent pixels.

5.9.2 Electric strength Apply a sinusoidal AC voltage with a frequency of

50 Hz and an effective value of 1500 V between the power terminal of the highway LED variable information sign and the casing for 1 min. There shall be no flashover or breakdown.

5.9.3 Safety grounding LED changeable message signs of motorway shall be equipped with safety protection grounding terminals. The grounding terminal is reliably connected to the casing (including the metal casing of the live parts). The connection resistance between the ground terminal and the casing shall be less than 0.1 Ω .

5.9.4 Power adaptability LED changeable message signs of motorway shall adapt to the requirements of power grid fluctuations, and shall work normally under the following conditions: - Voltage: AC 220 V $\pm$ 33 V; - Frequency:

5.9.5 Contact current When the LED changeable message sign of motorway is working, the contact current between the power terminal and the ground terminal shall be less than

5.9.6 Lightning protection and overvoltage protection Necessary lightning protection and overvoltage protection measures shall be taken for LED changeable message signs of motorway. The interfaces, components and protective measures adopted shall meet the requirements of GB/T 18802.11.

5.10 Degree of protection for casing Rainproof and dustproof measures shall be taken for LED changeable message signs of motorway. The protection level of the casing shall not be lower than IP56 according to the provisions of

GB/T 4208-2017. The protection level of the casing of the LED changeable message sign of motorway applied in the tunnel environment shall be IP66.

5.11 Electromagnetic compatibility

5.11.1 Surge immunity It shall meet the requirements of GB/T 9254.2.

5.11.2 Electrostatic discharge immunity Conduct electrostatic discharge immunity tests on the points and surfaces that operators may touch when using the LED changeable message signs of motorway, as well as user maintenance points. The product shall work normally.

5.11.3 Immunity to radio frequency electromagnetic field radiation Carry out the radio frequency electromagnetic field radiation immunity test on the four sides of the LED changeable message sign of motorway in normal operation at the vertical polarization and horizontal polarization positions of the transmitting antenna, respectively. The product shall work normally.

5.11.4 Electrical fast transient burst immunity Conduct electrical fast transient burst immunity test on the power port, signal and control port of the LED changeable message sign of motorway and the grounding wire of the chassis. The product shall work normally.

5.12 Mechanical properties The structure of LED changeable message signs of motorway shall be stable. After bearing the wind pressure generated by the wind speed of 40 m/s, the deformation shall not be greater than 2 mm, and the performance of the sign board shall not be affected.

5.13 Communication interface and procedures

5.13.1 The interface shall use an Ethernet interface with a rate not lower than 100 Mbit/s. It shall comply with the regulations of 100BASE-TX in IEEE 802.3-2018.

5.13.2 When providing other interfaces and procedures, detailed interface parameters and communication procedures shall be provided for connection with the system.

5.13.3 The connection between the interface and the outside shall be convenient for installation and maintenance. Take waterproof, dustproof and other measures.

5.13.4 The data interaction format adopted by LED changeable message signs of motorway shall comply with the provisions of Annex A.

5.14 Environmental adaptability

5.14.1 Low temperature resistance performance. According to the test method given in 6.14.1, the LED changeable message sign of motorway is tested under the electrified state. The product shall work normally.

5.14.2 Storage performance at low temperature. According to the test method given in 6.14.2, the LED changeable message sign of motorway is tested under the power-off state. After recovery, the product shall start normally, and the logic is correct.

5.16.2 Automatic functions After being connected to the system through the communication interface, it shall be able to accept the control of the system or the main control unit. Correctly display the corresponding content according to the command of the system or the main control unit and upload the working status to the system or the main control unit.

5.16.3 Manual functions When deviating from the automatic control of the system, it shall be possible to manually control the displayed content locally or remotely.