



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

GB/T 44038-2024

**Requirements and test methods for the reversing warning
sound of vehicles**

车辆倒车提示音要求及试验方法

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1 Scope

GB/T 44038-2024 sets the requirements and test methods for the reversing warning sound of vehicles. It is a small standard addressing a real and growing hazard: an electric vehicle reversing is almost silent, and the people most at risk from that are pedestrians who are blind, elderly or simply not looking. The standard has to hold two things in balance, since a warning loud enough to be heard is also loud enough to be a nuisance in a residential street at night. It specifies the requirements on the sound itself, the sound pressure level and its permitted range, the frequency content and the requirement that the sound be recognisable as a vehicle, the modulation and the intermittency, the conditions under which it must sound and those in which it may be paused, and the requirements on the emitter and its position on the vehicle. It then gives the test methods: the test site and the background noise limits, the microphone positions, the operating conditions of the vehicle and the measurement and evaluation of the result. For a carmaker or a certification body in

China, this is the text a reversing alert is judged against.

This document specifies the terms and definitions, requirements, test methods for vehicle reversing warning sounds. This document is applicable to vehicles of categories N2, N3, M2 (maximum design gross mass greater than 3500 kg), as well as category M3. Other vehicles shall refer to it.

2 Normative references

The contents of the following documents constitute the essential terms of this document through normative references in the text. Among them, for dated references, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies to this document.

GB/T 3785.1 Electroacoustics - Sound level meters - Part 1: Specifications

GB/T 15173 Electroacoustics - Sound calibrators

GB/T 22157 Acoustics - Specification of test tracks for measuring noise emitted by road vehicles and their tyres

GB/T 28046.4-2011 Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 4: Climatic loads

GB/T 30038 Road vehicles - Degrees of electrical equipment protection (IP-Code)

GB/T 34828 Acoustics - Test methods for the qualification of free-field environments

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Warning sound for vehicle reversing

4.1.1.1 Warning sound shall be intermittent and contain at least one silent component in each cycle.

4.1.1.2 Warning sound shall be one of the following: buzzer tone, broadband tone, 1/3 octave tone or voice combination tone.

4.1.2 Warning sound type requirements

4.1.2.1 Buzzer tone The buzzer tone emitted by the vehicle when reversing is played in a loop, including a sound with a main frequency, whose frequency range is 1000 Hz ~ 2800 Hz; the playback frequency is 90 times/min $\pm$ 30 times/min.

4.1.2.2 Broadband tone The broadband tone emitted by the vehicle when reversing is played in a loop, including sounds with multiple frequencies, whose frequencies are at least

continuous within 1000 Hz ~ 4000 Hz; the playback frequency is 90 times/min $\pm$ 30 times/min. 4.1.2.3 1/3 octave tone The 1/3 octave sound played in a loop when the vehicle is reversing has its main energy in one of the seven 1/3 octaves; the power spectrum density remains constant in the 1/3 octave. The center frequencies of the seven 1/3 octaves are 800 Hz, 1000 Hz, 1250 Hz, 1600 Hz, 2000 Hz, 2500 Hz, 3125 Hz, respectively. The playback frequency is 90 times/min $\pm$ 30 times/min.

4.1.2.4 Voice combination tone The voice combination tone consists of voice and one of the buzzer tone, broadband tone, or 1/3 octave tone. The voice is played after the buzzer tone, broadband tone, or 1/3 octave tone. The voice is "Reverse, please pay attention" and shall be in clear and recognizable Mandarin. The playback frequency is 30 times/min $\pm$ 10 times/min.

4.2.1 General requirements

4.2.1.1 The non-self-adjusting sound device shall contain at least the normal level.

4.2.1.2 The multiple warning device system shall cover at least two sound pressure level modes, one of which is the normal level.

4.2.1.3 The sound emitted by the warning sound device shall reach the minimum sound pressure level within two cycles.

5.1 Test equipment

5.1.1 Meteorological measuring instruments Meteorological measuring instruments are mainly used to monitor environmental conditions during the test; their accuracy shall meet the following requirements: - Temperature measuring instruments: ± 1 °C; - Wind speed measuring instruments: ± 1 m/s; - Air pressure measuring instruments: ± 5 hPa; - Relative humidity measuring instruments: $\pm 5\%$.

5.1.2 Acoustic measuring instruments

5.1.2.1 Requirements for acoustic measuring instruments The sound level meter or other equivalent measuring instruments, which are used for measurement, shall meet the requirements of Class 1 sound level meters specified in GB/T 3785.1. The "A" frequency weighting characteristics and "F" time weighting characteristics described in GB/T 3785.1 shall be used for measurement. When using an instrument that can periodically monitor the A-weighted sound pressure level, the time interval between its readings shall not be greater than 30 ms. For voice combination warning sounds, the measuring instrument shall be able to measure the sound pressure level of the buzzer warning sound, broadband warning sound, 1/3 octave warning sound, voice warning sound, respectively, that is, the sound pressure waveforms of the measured buzzer warning sound, broadband warning sound, 1/3 octave warning sound, voice warning sound are easy to identify and process. When

measuring frequency, the digital sound recording instrument shall be quantized to at least 16 bits; its average auto-power spectrum shall be determined using a Hanning window and at least 66.6% overlap average, meanwhile cover the relevant frequency band.

5.1.2.2 Calibration of acoustic measuring instruments Before and after measurement, the sound level meter shall be calibrated according to the manufacturer's requirements using a Class 1 sound calibrator that complies with the provisions of GB/T 15173. Without any adjustment, if the difference between the latter calibration reading and the previous calibration reading exceeds

0.5 dB(A), the results of the relevant tests after the previous calibration are invalid. The above calibration work for sound calibrators, sound level meters or other equivalent measuring instruments shall be carried out, by qualified testing institutions in accordance with the relevant standards.

5.2.1 Outdoor conditions

5.2.1.1 Outdoor meteorological conditions During the test, the meteorological conditions shall meet the following requirements: - Temperature: $-10\text{ }^{\circ}\text{C} \sim 50\text{ }^{\circ}\text{C}$; - Wind speed: less than or equal to 5 m/s. When the wind speed exceeds 2 m/s, it is recommended that the microphone use a windshield; - Meteorological equipment shall provide representative data of the test site and shall be placed in an area close to the test area, at a height that is the typical microphone height; - During the test, there shall be no precipitation in the air (such as rain, hail, etc.); meanwhile the surface of the test site shall be kept dry; - During the test interval, the values of temperature, wind speed, wind direction, relative humidity, air pressure shall be recorded.

5.2.1.2 Outdoor site conditions The site meets one of the following requirements.

a) Test site that meets the requirements of GB/T 22157.

b) The site shall be an open space with a radius of not less than 50 m. The space shall not have large reflective objects such as walls, rocks, bridges or buildings. The central part used for measurement shall be level, within a radius of not less than 20 m. The site shall be a flat open ground made of concrete, dense asphalt or similar hard materials without obvious pores. It shall not be snow, haystacks, loose soil or other ground with sound absorption characteristics.

5.2.2 Indoor semi-anechoic or anechoic chamber conditions Anechoic chambers or semi-anechoic chambers shall meet the requirements of GB/T 34828.

5.3 Test method of background noise sound pressure level When measuring background noise, the measurement shall be continued for at least 10 s. When calculating background noise using a 10 s sound obtained from the measurement, it shall be ensured that the sound is typical background noise and does not contain any transient interference. The