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Tyre sound emission test-Methods of drum

轮胎噪声测试方法 转鼓法

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1 Scope

This Standard specifies the terms and definitions, test environment, equipment and instruments, test conditions, test procedures and test report for the tyre noise test method carried out in the laboratory by using a drum.

This Standard applies passenger car radial tyres and truck radial tyres.

2 Normative references

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

GB/T 521, Test method of measuring peripheral dimensions for tyres GB/T 2977, Size designation, dimensions, inflation pressure and load capacity for truck tyres GB/T 2978, Size designation, dimensions, inflation pressure and load capacity for passenger car tyres GB 3102.7, Quantities and units of acoustics GB/T 3947, Acoustical terminology GB/T 6326, Tyre terms and definitions GB/T 6882, Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for anechoic rooms and hemi-anechoic rooms GB/T 15173, Electroacoustics - Sound calibrators GB/T 22036, Coast-by methods for measurement of tyre-to-road sound emission

3 Terms and definitions

Terms and definitions determined by GB/T 6326, GB/T 22036, GB 3102.7 and GB/T 3947 are applicable to this document.

4.1.1 Equipment composition

The test equipment is mainly composed of a drum driving system and a loading device.

4.1.2 Drum diameter

The nominal diameter of the test drum shall be at least 1 700 mm, and the tolerance of the drum diameter shall be $\pm 1\%$.

4.1.3 Drum surface quality

The outer peripheral surface of the drum shall be a smooth steel surface and shall be kept dry and clean. The roughness of the steel surface shall comply with the requirements given in A.6 of Appendix A.

4.1.4 Drum width

The width of the drum surface shall be greater than the width of the running surface of the test tyre.

4.1.5 Test rims

The width and deviation of the test rim shall meet the requirements of A.2.

4.1.6 Positioning and accuracy

The positioning of the tyre and its load shall comply with the requirements given in A.3.

The control accuracy shall meet the requirements of A.4.

4.2 Test environment

4.2.1

The noise test shall be carried out in an anechoic room or a hemi-anechoic room, which shall meet the requirements of GB/T 6882; its background noise sound pressure level shall be less than 35 dB(A), and the cut-off frequency shall be less than 100 Hz.

4.2.2

The indoor wind speed (especially after the air conditioner is turned on) during the noise test shall not exceed 5 m/s.

4.2.3 When the drum driving device, load loading device and other necessary

equipment (such as air conditioner) are turned on, the sound pressure level of equipment noise measured in the laboratory shall comply with the requirements in Table 1, and the position of the microphone in the laboratory is shown in Figure 1.

The noise data measurement and analysis system can be used for real-time and multi-channel analysis of noise and vibration. It can simultaneously perform real-time FFT, CPB (1/n octave) and total value analysis, including data acquisition, automatic calibration, measurement, analysis, post-processing and data export.

The microphone and its sound calibrator shall comply with the requirements given in A.7.

5.1 Indoor ambient temperature

The indoor ambient temperature shall be $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. Measure the ambient temperature at the noise test points (M1 and M2 points).

5.2 Drum surface temperature

At the beginning of the test, the temperature measured on the outer peripheral surface of the drum using the contact sensor shall be close to the ambient temperature, and the deviation shall be $\pm 1\text{ }^{\circ}\text{C}$.

5.3 Indoor ambient humidity

The relative humidity of the indoor environment shall be less than 75%.

5.4 Parking interval

Trim the tyre surface clean; then, park it for at least 1 h after inflating to carry out the noise test. The interval between two tests of the same tyre shall be at least 4 h.

5.5 Microphone arrangement

The positions of the side microphone M1 and the front microphone M2 are shown in Figure 1. Microphones can be added according to actual needs.

5.6 Tyre load

The tyre load during the test shall be 75% of the load corresponding to its load index.

5.7 Tyre pressure

The calculation of the test tyre pressure P_t of each tyre at the indoor ambient temperature is shown in Formula (1):

Where:

6.5 Warm-up

According to the load specified in 5.6 and the test tyre pressure specified in 5.7, run the tyre at a speed of 100 km/h for 10 minutes to warm-up.

6.6 Noise test

Start the noise test immediately after the warming-up is completed; carry out the test according to the test conditions specified in 5.6 ~ 5.8; record the sound pressure level and spectrum data received by each microphone. Record data once every 1 min, and record data continuously for 3 times. For the side microphone M1 specified in 5.5, if the difference between the maximum and minimum values in the 3 data is less than or equal to 0.2 dB(A), the noise test result shall be the average value of these 3 data, and the noise test shall end. If the difference between the maximum value and the minimum value in the three data is greater than 0.2 dB(A), continue to record the data every 1 min until the difference between the maximum value and the minimum value in the three consecutive data is less than or equal to 0.2 dB(A).

6.7 Tyre noise rating quantities

Increase the measurement substitution of the rear microphone, considering the influence of directional and asymmetric patterns.

The rating quantities of tyre noise is the A-weighted sound pressure level of tyre noise, namely: A sound level.

The tyre noise A sound level is the arithmetic mean of the three tyre noise test results.

7 Test report

The test report should include the following contents:

- a) specifications of the test tyre, manufacturer name or trademark, load index or level, speed symbol, production number (tyre number), test purpose, test entrusting unit (person);
- b) pattern code, pattern maximum depth, test rim specification;
- c) inflated parking time and the interval between two tests (if any);
- d) ambient temperature and relative humidity at the beginning of the test and at the end of the test;
- e) test date, tyre load, tyre pressure, test speed;
- f) noise A sound level value of each microphone;