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Replacing GB/T 17469-2012

Evaluation of the friction characteristics of automotive brake linings - Small sample bench test method

汽车制动器衬片摩擦性能评价 小样台架试验方法

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1 Scope

China's national small-sample bench test for the friction characteristics of automotive brake linings - the test that assigns a friction coefficient grade to a brake material. It specifies the test equipment, the test preparation, the test procedure, the treatment of results, the classification and grade marking of the friction coefficient, and the test report, and it applies to disc and drum brake linings for automobiles. It does not apply to parking brake linings. The friction coefficient of a brake lining is not a constant. It falls as the material heats, recovers as it cools, changes with sliding speed and with contact pressure, and differs between the first stops of a new lining and the same lining after bedding. A material that gives a high coefficient cold and loses it at temperature is a fade risk; a material with a low coefficient that holds it is often the safer one. The purpose of the test is to characterise that behaviour on a small specimen rather than on a full brake assembly, which makes it fast enough to be used for development, for production control and for the grade code that appears on the edge of the lining. A small specimen is cut from the lining and rubbed against a rotating disc of specified material under controlled pressure and speed, through a prescribed sequence of bedding, heating, fade and recovery stages, with the coefficient recorded throughout. The classification then reduces that curve to two letters - the normal

and the hot coefficient bands - which is the code a workshop reads when matching a replacement part. Because the answer depends entirely on how the specimen was run, the standard fixes the machine, the disc material and surface, the specimen dimensions and preparation, the bedding, the pressures and speeds, and the temperature sequence, and the informative annexes give the data recording sheet and the report format. Issued on 29 September 2024 and in force since 1 April 2025, it replaces GB/T 17469-2012.

This document specifies the test equipment, test preparation, test procedure, result processing, friction coefficient classification and friction coefficient grade marking, and test report for the small sample bench test method for friction performance evaluation of brake linings for automobile. This document applies to automotive disc brake linings and automotive drum brake linings (hereinafter referred to as "linings"). This document does not apply to parking brake linings.

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 5620 Road vehicles - Vocabulary and definition for braking of automotive vehicles and their trailers

3 Terms and definitions

For the purpose of this document, the terms and definitions defined in GB/T 5620 apply.

4 Test equipment

4.1 Test machine The schematic diagram of small sample bench test machine for friction materials is shown in Figure

1.The test machine shall have the following functions.

4.2 Temperature measurement system

4.2.1 The temperature measurement system shall consist of a welded thermocouple and a measuring and recording device capable of rotating temperature measurement.

4.2.2 The accuracy of the temperature measurement system is ±2 % of the full scale.

4.3 Friction measurement system The accuracy of the friction measurement system is ±2 % of the full scale, and the deviation of the test load is ±2 %.

4.4 Brake drum

4.4.1 The accuracy of the brake drum speed measurement system is ±2 % of the full scale.

4.4.2 The temperature rise of the brake drum is adjusted as follows and maintained during the test. the brake drum speed is 417 r/min, cool the brake drum from 149 °C to 93 °C with cooling air, then turn off the cooling air; when it cools naturally to 82 °C, turn on the heater and start timing, and heat for 10 min. The brake drum temperature shall rise to 221 °C ± 14 °C in 10 min.

4.4.5 The brake drum shall be used within the range of inner diameter 277.4 mm to 279.9 mm. There are three thermocouple installation positions as shown in Table 2, which are (2.55 ± 0.10) mm (position 1), (3.05 ± 0.10) mm (position 2) and (3.55 ± 0.10) mm (position 3) from the surface of the brake drum with an inner diameter of 277.4 mm.

4.5 Other apparatus Apparatus for measuring the thickness, mass and top height of test pieces.

5 Test preparation

5.1 Preparation of test pieces Installation position Brake drum's inner diameter phi/mm

5.1.1 Randomly select 5 linings from each batch of products. Prepare a test piece from each lining.

5.1.2 The test piece shall be cut from the middle part of the lining, and the distance from the sampling position to the periphery of the lining shall be roughly equal.

5.1.3 The length and width of the test piece is (25.4 ± 0.2) mm x (25.4 ± 0.2) mm; the test friction surface is arc-shaped, and the radius of the arc shall match the brake drum; the back is flat, and the thickest thickness (or the test piece plus the silencer) is (6.0 ± 0.5) mm.

5.1.4 For test pieces that have been ground, at least

0.3 mm shall be ground off from the friction surface, but not more than

0.5 mm. For unground test pieces (taken directly from the mold),

1.2 mm shall be ground off from the friction surface so that the resin impregnation layer on the lining surface can be completely removed.

5.1.5 The test friction surface of the prepared test pieces shall not be touched by hand, and foreign impurities shall be avoided.

5.2 Processing of brake drum surface

5.2.1 When using a new or re-ground brake drum, before the first test, remove all wear marks with 320 sandpaper or emery cloth, then polish with 320 sandpaper, and remove dust on the brake drum with clean dry air or soft cloth. Finally, use the reference test piece to run continuously at a speed of 417 r/min, a load of 440 N, and a temperature below 93

°C until the friction coefficient stabilizes.

5.2.2 Before each test, the surface of the brake drum shall be polished with 320 sandpaper or emery cloth, and then polished with 320 sandpaper. Remove dust on the brake drum with clean dry air or soft cloth.

5.3 Running-in of test pieces Under the conditions of brake drum speed of 312 r/min, load of 440 N, and maximum temperature of 93°C, the test piece is run-in for not less than 20 min. If the contact area of the test piece is still less than 95 % after running-in for 20 min, the test piece is abandoned and re-prepared.

5.4 Measurement of initial thickness and mass Take out a run-in test piece, take three points (outside, center, inside) on the center line parallel to the axis of the test piece and the brake drum to measure the thickness (to the nearest

0.1 mm) and record it. At the same time, weigh the mass of the test piece (to the nearest 1 mg) and record it.

6 Test procedure

6.1 First baseline At a brake drum speed of 417r/min, load (load 667 N) the test piece for 10 s and unload for 20 s, for a total of 20 times. The test starts from the brake drum temperature of 82 °C ~ 93 °C, and the cooling air is used to maintain the brake drum temperature at 82 °C ~ 104 °C during each loading. The cooling air is turned off for the 20th loading.

6.2 First decay Turn off the heating and air cooling, and let the brake drum rotate at 417 r/min to cool naturally. When the brake drum temperature drops to 82 °C, load the test piece and turn on the heater at the same time. Continuously drag-wear at a speed of 417 r/min and a loading force of 667 N.

6.3 First recovery After the first decay (6.2) is completed, turn off the heater and turn on the cooling air. At a test speed of 417 r/min, during the process of brake drum temperature dropping from 288 °C to 93 °C, load (load 667 N) the test piece for 10 s at 260 °C, 204 °C, 149 °C and 93 °C, and record the friction force and friction coefficient at each loading.

6.4 Second wear measurement Perform wear measurement according to 5.5.

6.5 Wear test At a brake drum speed of 417 r/min, load (load 667 N) the test piece for 20 s and unloaded for 10 s, for a total of 100 times. The test starts from the brake drum temperature of 193 °C ~ 204 °C, and the brake drum temperature shall be kept between 193 °C ~ 216 °C, which can be achieved by using a heater or air cooling.

6.6 Third wear measurement After the wear test (6.5) is completed, when it cools to 88 °C ~ 99 °C, perform wear measurement again according to 5.5.

6.7 Second decay After the third wear measurement (6.6) is completed, turn off the heater