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

GB/T 22311-2023

Road vehicles - Brake linings - Compressive strain test method

道路车辆 制动衬片 压缩应变试验方法

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Foreword

This document was issued on 28 December 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 July 2024.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

1 Scope

GB/T 22311-2023 covers how much a brake lining squashes under load and how that is measured - the symbols used; the principle, with method A measuring the compressive strain of a friction material sample and a further test method alongside it; the test equipment, built around a compressibility bench or a uniaxial load frame that loads the sample surface evenly; the technical requirements for the device, including the tabulated maximum contact pressure and loading rate for each method; the preparation of samples; the test methods themselves; the deflection compensation, in which the apparent movement of the machine is subtracted from the total movement so that only the sample's deformation is reported; the periodic verification of the equipment against reference

samples such as calibrated springs or dynamometers; and the test report, with a form in Appendix A. A lining that compresses too much swallows pedal travel and gives a long, soft pedal, while one that is too stiff makes the brake harsh and noisy; and because a compliant machine deforms alongside the sample, an uncompensated bench reports the wrong figure and comparisons between suppliers collapse. Written for friction material manufacturers, brake and vehicle makers, and testing laboratories.

This document specifies the principle, test equipment, technical requirements for test equipment, sample preparation, test methods, deflection compensation of test equipment, verification of test equipment using reference samples and test report for the compressive strain test method of brake linings of road vehicles.

This document applies to the measurement of compressive strain of cut samples of brake lining disc brake pad assemblies, disc or drum friction materials.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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

Terms and definitions determined by GB/T 5620, as well as the following, are applicable to this document.

3.1

compressibility

Change of thickness or deflection of the lining caused by uniaxial compressive load in the direction same as the compressive force and perpendicular to the friction surface, when the maximum test pressure is reached in the last loading cycle.

3.2

compressive strain

5 Principle

5.1 General

This test measures:

- Test method A: compressive strain of friction material sample;
- Test method B: Compressive deflection of disc brake pad assembly.

According to the type of the sample, choose test method A or test method B for testing, and the two test results shall not be directly compared.

5.2 Test method A - friction material samples

Test method A applies pressure per unit area to the contact interface of the sample. Test method A can be used to evaluate disc or drum friction materials for commercial vehicles, as well as non-back-plate friction materials for research and development purposes.

For larger brake pads used in commercial vehicles, respectively measure the compressive strains of the left and right halves or the compressive strain of the slices in the radial direction. In other cases, the sample size should take into account inhomogeneity of materials. The surface of the friction material sample shall be flat.

Unless otherwise stated, the compressive strain value (ϵ_p) shall be reported.

5.3 Test method B - Disc brake pad assembly

Test method B simulates a 10 MPa or 16 MPa hydraulic pipeline pressure-loaded disc brake pad assembly.

Note: Test method B is typically used for hydraulic disc brake pad assemblies in passenger cars and light trucks.

Unless otherwise stated, compressive deflection or compressibility (C) shall be reported in microns (μm).

6 Test equipment

The test equipment shall contain the following devices.

- a) Compressibility test bench or uniaxial material test load frame: Providing uniform load on the surface of the sample.

- b) Loading cylinder for simulation: Including loading indenter for test method A (where the surface shall be larger than the contact surface of the sample) and caliper piston device for test method B.
- c) Pressure plate.
- d) Devices for applying pressure: Its accuracy is 1% of the full scale of the equipment.
- e) Deflection measuring device: Measuring the deflection of the sample as it changes with time; its accuracy is 0.001 mm. It is placed on the loading cylinder or pressure plate, with the center line close to the loading indenter.
- f) Recording device or computer: It is used to record the changes in load, pressure, displacement and temperature over time.
- g) Heating device: Used to heat the pressure plate to the specified temperature.
- h) Thermocouple (recommended diameter 1.5 mm): It is used to measure the temperature of the back plate. The thermocouple is located close to the center line of the back plane and embedded 3 mm below the surface of the back plate.
- i) Thermocouple or other device for measuring the sample temperature.
- j) Micrometer for measuring the sample thickness.

7 Technical requirements for test device

7.1 Loading

7.1.1 Test method A

Table 2 gives the maximum pressure and loading rate on the contact surface. When determining the actual contact area and contact surface pressure of the sample, all grooves, chamfers and holes shall be removed.

Keys:

- 1 - thermocouple probe;
- 2 - back plate;
- 3 - friction material.

Figure 5 - Thermocouple position for thermal conduction measurement