

ICS 43.040.40

CCS T 24



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

GB/T 31970-2025

Replacing GB/T 31970-2015

**Performance requirements and bench test methods for air
brake caliper assemblies of vehicles**

汽车气压制动钳总成性能要求及台架试验方法

Issued on: August 29, 2025

Implemented on: March 1, 2026

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

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1 Scope

This document specifies the performance requirements, test-related requirements and describes the bench test methods for automotive pneumatic brake caliper assemblies.

This document applies to floating pneumatic brake caliper assemblies (excluding brake chambers) whose working medium is compressed air.

2 Normative references

GB/T 5620

GB/T 10125-2021

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 5620 as well as the followings apply.

3.1 Clamp force

The force acting on the axial end face of the brake disc between the two pad assemblies inside the caliper, when the brake caliper assembly is actuated by the control device Td. When the brake caliper assembly is released, the remaining brake disc rotation resistance torque.

4.1 Starting force

The starting force shall not exceed 100 N.

4.2 Mechanical efficiency

The mechanical efficiency shall not be less than 92%.

4.3 Caliper body rigidity

The total deformation of the caliper body along the center line of the push rod shall not be greater than 2 mm.

4.4 Sliding resistance of the caliper body

The sliding resistance of the caliper body shall not be greater than 90 N.

4.5 Brake clearance self-adjustment function

The total clearance between the pad assembly of the brake caliper assembly and the brake disc shall be maintained within the range of 0.6 mm ~ 1.2 mm. The difference in the brake clearance between the two pistons of a dual-piston brake caliper shall not exceed 0.2 mm.

4.6 Drag torque

The drag torque shall not exceed 7 N·m.

4.7 Waterproofing

There shall be no water stains on the surfaces of the internal components of the caliper, the guide pin holes, or the guide pin surfaces.

4.8 Working durability

Conduct the test according to 6.8. During the test, the brake caliper assembly shall not be stuck or have any other abnormalities. The performance indicators after the test shall meet the following requirements.

- a) The caliper body and exposed non-metallic parts must be free of surface cracks or deformation that could affect function;
- b) The starting force must not exceed 110 N;
- c) The mechanical efficiency must not be less than 85%;
- d) The sliding resistance of the caliper body must not exceed 100 N;
- e) The brake clearance self-adjustment function must meet the requirements of 4.5.

4.9 Vibration durability

When testing according to 6.9, the brake caliper assembly shall not have any damage, such as damage such as parts falling off or breakage that affects its function.

4.10 Torsional fatigue strength

Carry out the test according to 6.10. During the test, the brake caliper assembly shall not show any signs of sticking or other phenomena. The performance indicators after the test shall meet the following requirements.

- a) The caliper body must be free of surface cracks or deformation that could affect its

function;

- b) The pad assembly must be uniformly worn, free of penetrating cracks or extensive, severe damage;
- c) The caliper body's sliding resistance must not exceed 100 N;
- d) The brake clearance self-adjustment function must meet the requirements of 4.5.

4.11 Wear alarm function

When the brake lining wear limit alarm is triggered, the minimum remaining thickness of the brake lining shall be $3 \text{ mm} \pm 1 \text{ mm}$.

4.12 Salt spray corrosion

No corrosion products with a diameter greater than 2 mm shall be produced within any 100 cm² area on the outer surface of the brake caliper body. The total corrosion area shall not exceed 5 cm².

4.13 Mud resistance

There shall be no mud accumulation in the sealed cavities of the caliper. The sliding resistance of the caliper shall not exceed 100 N. The brake clearance self-adjustment function shall meet the requirements of 4.5.

5.1.1 Test bench for basic brake caliper performance

The rigidity of the simulated fixture used to measure clamp force in place of the brake disc and pad assembly must be no less than that of the actual vehicle's brake disc and pad assembly. The force transducer used for the caliper rigidity test must not deflect more than 0.1 mm under a 100 kN load. The simulated fixture must not affect the proper contact between the push disc and pad assembly.

5.1.2 Drag torque test bench

The spindle speed on the test bench, where the brake disc is mounted, can be adjusted freely within the range of 0 r/min ~ 50 r/min. The system detection error of torque shall be within $\pm 1.0\%$ of the full scale. The resolution shall be no less than 0.1 N·m. The sampling frequency of speed and torque shall be no less than 50 Hz.

5.1.3 High and low temperature test chambers

The error between the actual temperature of the test chamber and the set temperature shall be within $\pm 2^\circ\text{C}$. The test chamber shall have a passage connecting the air pipe. It shall have sealing measures for heat insulation and moisture insulation.