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**Dynamic testing methods of
brake performance for automobiles**

汽车制动性能动态检测方法

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Dynamic testing methods of brake performance for automobiles

1 Scope

This Standard specifies the technical conditions and methods for the automobile inspection agency to perform dynamic detection of the brake performance of the automobiles in use.

This Standard is applicable to the dynamic testing and verification of brake performance for automobiles.

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 7258, *Safety specifications for power-driven vehicles operating on roads*

GB/T 18314, *Specifications for global positioning system (GPS) surveys*

GB 21861-2014, *Items and methods of motor vehicles safety technology inspection*

GB/T 28529, *Platform brake tester*

GB/T 28945, *Portable braking performance tester for vehicles*

JJF 1168, *Calibration Specification for Portable Braking Performance Tester for Motor Vehicle*

JJF 1193, *Calibration Specification for Non-contact Automotive Speedometer*

JJG 1020, *Platform Brake Testers*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

pressure gauge shall be no more than 750kPa;

- e) Brake pedal force for hydraulic braking: passenger vehicle with a seat number of not more than 9 seats shall be no more than 400N; other vehicles shall be no more than 450N.

4.2 Technical conditions for testing on the road are as follows:

- a) The test pavement shall be hard, clean, dry, flat cement or asphalt pavement; the pavement adhesion coefficient shall not be less than 0.7; the longitudinal slope of the pavement shall be no more than 1%; and the pavement shall not have obvious damage, protrusions and depressions;
- b) The test pavement length shall be no less than 100m and the width shall be no less than 6m;
- c) Test lane edge shall be drawn;
- d) The wind speed shall not exceed 5m/s when testing;
- e) Portable braking performance tester for dynamic testing of brake performance for automobiles shall comply with the provisions of GB/T 28945; its main metrological performance indicators shall meet the requirements of JJF 1168;
- f) The main metrological performance of the non-contact speedometer for dynamic testing of brake performance for automobiles shall meet the requirements of JJF 1193;
- g) The main technical performance of the GPS detection system for dynamic testing of brake performance for automobiles shall meet the requirements of GB/T 18314;
- h) The test results in both directions of the test road shall meet the requirements.

4.3 Technical conditions for testing by platform are as follows:

- a) The flat brake test bench shall be selected according to the axle load of the vehicle to be tested;
- b) The surface of the flat brake inspection table shall be clean and free of foreign matter and oil. The adhesion coefficient of the surface of the platform shall not be less than 0.75;
- c) The flat brake inspection station shall comply with the provisions of GB/T 28529, and its main measurement performance indicators shall meet the requirements of JJG 1020;

- a) Install the speed sensor in the proper position of the vehicle under test to meet the working requirements and connect with the host.
- b) Install the non-contact speedometer speed indicator in a position that is easy for the driver to observe.
- c) Install the pedal force gauge on the brake pedal and connect to the main unit.
- d) Operate the instrument, select the brake test mode and enter the test state.
- e) The vehicle under test starts, accelerates along the midline of the test lane to a slightly higher than the initial brake speed, and then sets the transmission to neutral. Step on the brake pedal when taxiing to the specified initial speed to stop the vehicle. Read the fully deduced average deceleration, braking initial speed, braking distance, speed, pedal force measured by the non-contact speedometer. And check if the vehicle has exited the test lane edge.
- f) If the difference between the detected initial braking speed and the specified initial braking speed exceeds $\pm 2\text{km/h}$, the test result is invalid. Or correct the measured braking distance according to formula (1):

$$S_0 = (v_0/v_e)^2 \times S_e \quad \dots\dots\dots(1)$$

Where,

S_0 - Braking distance at the specified initial braking speed, in meters (m);

v_0 - Specified initial braking speed, in kilometers per hour (km/h);

v_e - Measured initial braking speed, in kilometers per hour (km/h);

S_e - Measured braking distance, in meters (m).

5.1.2.3 The method of testing by using GPS technology is:

- a) Install the pedal force gauge on the brake pedal and connect to the main unit.
- b) Select a base station GPS receiving subsystem for an open, undisturbed location.
- c) Set up a mobile station GPS receiving subsystem on the car under test.
- d) Turn on the base station GPS receiving subsystem and the mobile station GPS receiving subsystem to enter the test state.

5km/h~10km/h. After the transmission is in neutral (for the automatic transmission, the vehicle can be in the "D" position), and it shall be straight on the platform.

- b) When the wheels being tested are all on the plate, the brakes are urgently pressed to stop the vehicle. The wheel load of each wheel is measured (the passenger vehicle and other vehicles with a total mass less than or equal to 3500kg shall be dynamic wheel load, and the left and right sides of the two-axle and three-axle vehicles can be counted according to one wheel), the maximum wheel braking force, the value of the whole process of the wheel braking force increase, etc. Calculate the braking rate, unbalance rate, vehicle braking rate and other indicators of each axle.
- c) Restart the vehicle and operate the parking brake operating device when the parking brake axle of the vehicle is on the plate. Measure the parking brake force value and calculate the parking brake rate.
- d) When the vehicle brake stops, if the detected wheel has left the plate, the brake test is invalid and shall be retested.
- e) For vehicles with slow braking response, if necessary, connect the pedal switch signal to check whether the brake coordination time meets the requirements.
- f) The vehicle shall be squared during the test and the steering wheel must not be turned.
- g) The inspector urgently steps on the brake pedal, and the action of stepping on the brake pedal shall be as uniform as possible.
- h) When the vehicle being inspected has been questioned by the flatbed test and its test results are questioned, the road test shall be used to decide.

5.2.3 Testing parameter calculation and result processing

The relevant braking performance parameters are calculated as follows.

- a) Shaft braking rate: for the measured sum of the maximum braking force of the left and right wheels of the axle and the percentage of the shaft axle load, for passenger vehicle and other axle loads of less than or equal to 3500kg, take the sum of the left and right wheel loads corresponding to the maximum moments of the left and right wheel braking forces, take the axis static axle load for other vehicles.
- b) Brake imbalance rate: the end point of the value is obtained when the left and right wheels of the coaxial axis are locked. If the left and right wheels cannot reach the lock slip, the moment when the maximum braking force

Annex B

(informative)

Record sheet of testing by platform

Table B.1 gives the data sheet for testing methods by platform.

Table B.1 -- Data record of testing methods by platform

Testing station name				Pilot		
Testing No.		Testing time		Tester		
Vehicle type		Brand model		Recorder		
Date of initial register		License plate No.		Supervisor		
Engine No.		Fuel type		Reviewer		
Driving type		Parking axle		Curb mass (kg)		
Testing data						
Testing item		One axis	Two axes	Vehicle	Parking	Remark
Wheel load (kg)	Left wheel					
	Right wheel					
Maximum driving force (10N)	Left wheel					
	Right wheel					
Dynamic wheel load (kg)	Left wheel					
	Right wheel					
Maximum difference of braking force process (10N)						
No-load brake	Driving brake rate (%)					

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