

Translated English of Chinese Standard: GBT34597-2017

www.ChineseStandard.net → Buy True-PDF → Auto-delivery.

Sales@ChineseStandard.net

GB

NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 43.040.40

T 24

GB/T 34597-2017

**Passenger cars - Stopping distance at straight-line
braking with ABS - Open loop test method**

乘用车 防抱制动系统 (ABS) 直线制动距离

开环试验方法

(ISO 21994:2007, Passenger cars - Stopping distance at straight-line braking
with ABS - Open-loop test method, NEQ)

Issued on: October 14, 2017

Implemented on: May 01, 2018

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China;**

**Standardization Administration of the People's Republic of
China.**

Table of Contents

Foreword 3

1 Scope 4

2 Normative references 4

3 Terms and definitions 4

4 Test conditions..... 5

5 Test requirements 7

6 Data processing and results analysis..... 11

Annex A (informative) Test report - Vehicle information..... 16

Annex B (informative) Test report - Test conditions and test results 18

Annex C (informative) Test sequence, specific terms and background
information..... 20

Annex D (normative) Calculation method for F_{ABS} 25

Foreword

This Standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard is developed using the redrafting method and referring to ISO 21994:2007 "Passenger cars - Stopping distance at straight-line braking with ABS - Open-loop test method". The degree of consistency with ISO 21994:2007 is non-equivalent.

This Standard was proposed by Ministry of Industry and Information Technology of the People's Republic of China.

This Standard shall be under the jurisdiction of National Technical Committee of Auto Standardization (SAC/TC 114).

Drafting organizations of this Standard: Technology Center of Dongfeng Motor Group Corporation, Dongfeng Motor Group Corporation, Technology Center of China FAW Group Co., Ltd., Pan Asia Automotive Technology Center Co., Ltd., China Automotive Technology Research Center, Bosch Automotive Parts (Suzhou) Co., Ltd., Wuhan Yuanfeng Automotive Electronic Control System Co., Ltd., National Automobile Quality Supervision and Test Center (Guangdong).

Main drafters of this Standard: Zhang Shemin, Zhang Yaoju, Chen Huarong, Ye Xiaoming, Yang Guoan, Chen Ji, Wen Tao, Wang Xuanfeng, Yuan Xuliang, Liu Di, Tian Feng, Lin Wentao, Wang Weiwei, Xiao Wenjian.

Passenger cars - Stopping distance at straight-line braking with ABS - Open loop test method

1 Scope

This Standard specifies a test method for measuring the brake distance of vehicles equipped with the anti-lock braking system (ABS) when braking during straight travelling.

This Standard is applicable to M₁ vehicles specified in GB/T 15089. N₁ vehicles may refer to this Standard.

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 - Braking of automotive vehicles and their trailers
- Vocabulary

GB/T 15089 Classification of power-driven vehicles and trailers

GB 21670 Technical requirements and testing methods for passenger car
braking systems

QC/T 556 Automotive brakes - Temperature measurement and
thermocouple installation

ISO 8855 Road vehicles - Vehicle dynamics and road-holding ability -
Vocabulary

ISO 15037-1:2006 Road vehicles - Vehicle dynamics test methods - Part 1:
General conditions for passenger cars

3 Terms and definitions

For the purpose of this document, the terms and definitions defined in GB/T 5620, GB/T 15089, GB 21670, ISO 8855, ISO 15037-1:2006 and the following

C.2.3.

4.4 Environmental conditions

4.4.1 Ambient wind speed

Ambient wind speed (regardless of wind direction) shall not exceed 3 m/s. When the wind speed is in the range of 3 m/s to 5 m/s, the same number of measurements shall be made in both directions of the track, and the total number of measurements remains the same.

4.4.2 Ambient temperature

The ambient temperature shall be between 5 °C and 35 °C. The variation in temperature during the test shall not exceed 10 °C.

4.4.3 Road surface temperature

During the test, the variation in road surface temperature shall not exceed 10 °C.

4.5 Test vehicle

4.5.1 Vehicle condition

The condition of the test vehicle shall be in accordance with the vehicle manufacturer's specifications, particularly with respect to the brake system, the suspension geometries, power train (e.g. differentials and locks) configuration and tyres used.

4.5.2 Tyres

4.5.2.1 Winter tyres shall not be used for test.

4.5.2.2 Generally, new tyres shall be used for test. If no new tyres are used, it is required that the tyre shall show a steady wear condition with a tread depth of at least 90 % of the original value across the whole breadth of the tread and around the whole circumference of that of the new tyre.

4.5.2.3 Tyres shall be fitted on the test vehicle according to the manufacturer's specifications. If not specified otherwise by the tyre manufacturer, tyres shall be fitted on the test vehicle or on an equivalent vehicle and run in for at least 150 km on a road surface with high adhesion coefficient. During running-in, there shall be no violent operation such as acceleration or braking with a longitudinal acceleration or deceleration exceeding 3 m/s² and cornering and hitting the kerb with a lateral acceleration exceeding 3 m/s². Thereafter, tyres shall be fitted at the same position on the vehicle for tests.

4.5.2.4 Tyres shall be manufactured not more than one year before the test.

5.4 Test preparation

5.4.1 Test road surface requirements

5.4.1.1 To ensure that the test results are comparable, the test shall be carried out in the same area on the test road.

5.4.1.2 To avoid road contamination or damage during long-term operation, the initial braking position shall vary on the trajectory when starting a new test.

5.4.2 Tyres and brake system

Before the test begins, the tyres and brake discs shall be subjected to the following operations on the test road surface:

- a) The test vehicle carries out 5 ABS brakings with an initial speed of 100 km/h and a stop speed of 0 km/h. The initial temperature of the brake discs shall be less than 120 °C of each braking;
- b) Cooling down the tyres (normal ride for about 10 km recommended).

5.5 Measurement requirements

5.5.1 Brake temperature

Before the start of each measurement, the initial temperature of the front brake discs shall be between 80 °C and 120 °C, the initial temperature of the rear brake discs shall be lower than 120 °C, and the initial temperature of the brake drums shall be lower than 100 °C. The temperature measurement of brakes is carried out according to the requirements of QC/T 556.

5.5.2 Initial driving condition

During the steady-state straight ahead run of the vehicle (see 6.2.2 of ISO 15037-1:2006), the longitudinal acceleration shall not exceed 0.3 m/s² and the yaw rate shall not exceed 0.5°/s.

The vehicle speed during braking operation is (100 ± 2) km/h. To minimize dynamic effects, the vehicle shall maintain a speed of 100 km/h for at least 1.5 s before braking.

Depending on the vehicle transmission type, one of the following operation modes shall be selected:

- a) automatic transmission: standard drive mode “D”;
- b) manual transmission: disengaging before the braking begins.

The vehicle travels in the midline of the test track before braking, and remains stable during braking. The yaw angle shall be less than or equal to 15°. It shall not deviate from the test track of 3.5 m wide. There shall be no abnormal vibration.

During the entire braking process, all direction corrections shall be recorded in the test report.

5.5.7 Number of measurements

A set of test data shall contain 10 single test data that meet all specified conditions.

6 Data processing and results analysis

6.1 General

In the test report, the vehicle information shown in Annex A shall be presented. Each change in vehicle equipment (e.g. different load conditions) shall be recorded. Applying this Standard will result in the following three results:

- a) Normalized brake distance $s_{A100,n}$: Distance travelled between initial brake pedal contact until the vehicle comes to a standstill. This brake distance is normalized to the nominal initial vehicle speed (100 km/h).
- b) Normalized ABS-brake distance $s_{L90,n(100)}$: Distance travelled from 90 km/h until vehicle comes to a standstill, under full ABS control.
- c) Normalized deceleration build-up brake distance $s_{F10,n(100)}$: Distance travelled during deceleration build-up (defined as interval of a vehicle speed decrease of 10 km/h), i.e. distance travelled between initial brake pedal contact (normalized to the nominal vehicle speed of 100 km/h) until the vehicle speed 90 km/h is reached.

b) and c) are optional.

The deceleration is calculated according to formula (1):

$$a_x = \frac{v_1^2 - v_2^2}{25.92 \times s_x} \quad \dots\dots\dots (1)$$

where:

a_x - the calculated value of deceleration, in meters per square second (m/s²);

v_1 - the measured value of initial vehicle speed, in kilometers per hour (km/h);

The brake pedal contact time t_A is the time from first brake pedal contact until first increase of hydraulic pressure.

The deceleration build-up time t_S is the time from first increase of hydraulic pressure until maximum pressure (correlating to pedal force) is achieved.

To make the test results comparable, the brake system response time in this Standard is defined to be the time to decrease the vehicle speed by 10 km/h from its initial value.

C.2 Test conditions and background information

C.2.1 Measuring equipment

When installing devices for measuring distance or vehicle speed, ensure that test results cannot be affected by spring deflection, vehicle rebound or by changed angle positions of sensors.

C.2.2 Road surface conditions

The friction coefficient is a characteristic of the test site, which depends on the road surface characteristics as well as on the interaction between the tyre and the road surface. Brake test results of identical vehicles on different test tracks will normally deviate among each other. Experience shows that not only absolute deceleration values but also the relative braking performance of different vehicle-tyre combinations change often.

Only test results can be compared which are measured on the same track under the same test and environmental conditions (see C.2.4).

C.2.3 Road surface adhesion coefficient

The adhesion coefficient can be measured according to GB/T 26987.

For example, the adhesion coefficient of 0.9 can be confirmed by the fact that there is a multitude of test results with a mean deceleration above 8.8 m/s^2 (0.9 g).

C.2.4 Weather conditions

Track and ambient temperatures have an impact on the adhesion coefficient between the tyre and the road surface and, consequently, the achievable brake distances. Test results can only be directly compared if weather and temperature conditions are comparable (see 4.4).

C.2.5 Running-in of test vehicles

C.2.5.1 Tyres

Annex D

(normative)

Calculation method for F_{ABS}

D.1 Definition of F_{ABS}

The brake pedal force F_{ABS} is the minimum pedal force applied to a given vehicle and under the existing conditions to achieve maximum deceleration of the vehicle, i.e. ABS is fully active. Multiplying this brake pedal force by the factor of 1.5 results in the minimum brake pedal force that shall be applied in the braking specified in this Standard.

NOTE: For most passenger cars, the pedal force required to achieve a consistent ABS control at both front and rear axles is below 333 N. Therefore, a pedal force of 500 N is more than 1.5 times F_{ABS} . According to this Standard, a minimum pedal force of 500 N is required to carry out the brake operation. When it is ensured that F_{ABS} is below 333 N, F_{ABS} does not require accurate measurement and calculation. Otherwise, F_{ABS} needs to be calculated according to the procedure described below (if the F_{ABS} characteristic curve of this clause appears in the test, it is recommended to re-match the brake system).

D.2 Test procedure

Calculate F_{ABS} (as defined in 5.2.2) based on the following five brake data, as follows:

- a) The brake pedal shall be applied slowly, with as constant increase of deceleration. The pedal force shall increase continuously (e.g. monotonic linear increase). This force shall be significantly higher than the force required to activate an ABS control (F_{ABS}) and shall be increased until standstill of the vehicle or until it reaches the maximum pedal force.
- b) The maximum deceleration shall be reached within the period of 1.5 s ~ 2.5 s after contacting the brake pedal (with ABS fully engaged). The deceleration curve shall be within ± 0.5 s near the center line of deceleration. The center line of deceleration starts at the "0 s" point and reaches a braking strength of 1.0 at the "2 s" point.
- c) The measurement shall be made within the variation range of deceleration increase (see Figure D.1). The test shall be repeated at least 5 times.

D.1 and Figure D.2.

To calculate a_{ma_i} and F_{ABS} , a 2 Hz low-pass filter is required to handle the longitudinal deceleration and pedal force signals.

CALCULATE F_{ABS} as follows:

a) CALCULATE the deceleration a_{ABS} during ABS control

- 1) OBTAIN the maximum vehicle deceleration (a_{ma_i}) for a single braking from the five independent curves. The mean value of these five individual maximum values (a_{max}) represents the upper limit of deceleration that can be achieved.

$$a_{max} = \frac{\sum_{i=1}^5 a_{ma_i}}{5} \dots\dots\dots (D.1)$$

where:

a_{ma_i} - the maximum vehicle deceleration for a single braking;

i - the number of braking, $i = 1, 2, 3, 4, 5$.

- 2) AVERAGE all measurement values above 90 % a_{max} in the five brakes. This mean value “a” is the ABS deceleration (a_{ABS}) in this Standard.
 - 3) AVERAGE the five individual deceleration versus pedal force curves. The five deceleration values of these five curves shall be averaged in 1 N pedal force steps. This result is the mean deceleration versus brake pedal force curve, which is the “curve 1” in Figure D.2 in this annex.
- b) DETERMINE the minimum pedal force (F_{min}) that can achieve the a_{ABS} deceleration calculated in a). It is defined as the F value corresponding to $a = a_{ABS}$ on the maF curve.
- c) Using a linear fit regression, draw a straight line through all maF curve values below the pedal force F_{min} and above 70 % a_{ABS} .
- d) The F value at the intersection between the regression line and the horizontal line of $a = a_{ABS}$ is defined as F_{ABS} (point A in Figure D.2). The pedal force is defined as $F_{spec} = 1.5F_{ABS}$ (point B in Figure D.2).

D.4 Principle chart

Figure D.2 shows the measurement principle of F_{ABS} .

This is an excerpt of the PDF (Some pages are marked off intentionally)

Full-copy PDF can be purchased from 1 of 2 websites:

1. <https://www.ChineseStandard.us>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Select your country (currency), for example: USA (USD); Germany (Euro).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Tax invoice can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with download links).

2. <https://www.ChineseStandard.net>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Add to cart. Only accept USD (other currencies - <https://www.ChineseStandard.us>).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with PDFs attached, invoice and download links).

Translated by: Field Test Asia Pte. Ltd. (Incorporated & taxed in Singapore. Tax ID: 201302277C)

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

----- The End -----