Road vehicles - Brake stopping distance test procedure

1. Scope

This standard covers the brake stopping distance test procedure for automobiles. This standard does not apply to motorcycles.

2. Normative reference

The following standards, when referred to in this standard, constitute a part of the specifications of this standard. As required, the most recently updated version of the applicable standard (including addenda) shall be applied.

JIS D0102: Road vehicles -- Dimensions, masses, weights and performances -- Vocabulary
JIS D0106: Road vehicles -- Brake types, braking mechanics and brake operation -- Vocabulary automobiles.
JIS D0210: General rules of brake test method of automobiles and motor cycles
JASO C402: Service brake road test procedure - Passenger car
JASO C404: Service brake road test procedure - Truck and bus
JASO C464: ABS equipped vehicle obstacle avoidance performance test procedure

3. Definitions

The definitions of the main terms used in this standard shall be in accordance with **JIS D0102**, **JIS D0106** and as follows.

a) Stopping distance
The distance that a vehicle travels within the period from when the driver depresses the pedal until the vehicle stops.

b) Dry road surface
A flat, hard, paved road that has a coefficient of adhesion (K value) of dry concrete or an equivalent.

c) Wet road surface
A completely wet road surface obtained after rainfall on a dry road surface or by artificially spraying water thereon.

d) Icy or packed snow road surface
A packed snow road surface or icy road surface.

e) Artificial low μ road surface
An artificially conditioned road surface with a low μ reproducing an icy or a packed snow road surface.

f) Coefficient of adhesion (K value)
Quotient obtained by dividing the maximum braking force at which wheel lock does not occur by the dynamic load applied on the axle to be braked. This value corresponds to the coefficient of friction between the road surface and the tyre. The calculation method shall be as specified in **JASO C464**.

g) Test speed
The vehicle speed at which the braking operation is started.

h) Brake temperature
For each wheel, the temperature either on the frictional surface of the brake disc or drum, external surfaces, and internal surface of the pad or lining shall be measured. Brake temperature shall be measured in accordance with **6** in **JIS D0210** Temperature measuring method.

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i) Initial brake temperature

The highest brake temperature among those measured immediately before braking.

j) Whole stroke braking

Operation throughout the whole operation range, when the range of the operation device is clearly set.

4. Test conditions

The test conditions shall be as follows.

4.1 Classification of vehicles

Vehicles shall be classified as shown in **Table 1**.

Table 1 Classification of vehicles

Classification	Category	Total vehicle mass	Passenger capacity
M1	Passenger cars	-	Less than 10
M2	Passenger cars (Class 1 buses)	5 t max.	10 min.
M3	Passenger cars (Class 2 buses)	More than 5 t	10 min.
N1	Trucks cars (Class 1 trucks)	3.5 t max.	-
N2	Trucks cars (Class 2 trucks)	More than 3.5 t, 12 t max.	-
N3	Trucks cars (Class 3 trucks)	More than 12 t	-

Remark: Vehicles classified as N1 may be tested under M1 test conditions. In this case, all conditions shall be set as M1's.

4.2 Vehicle conditions

Vehicle conditions during the test shall be in accordance with **4.1** Vehicle condition in **JIS D0210** and as follows.

4.2.1 Burnish

Burnishing shall be carried out as follows.

a) Brake device

A new brake device after appropriate burnishing shall be used. Burnishing conditions shall preferably be in accordance with **JASO C402** and **JASO C404**. If a burnishing method other than that described in these standards is carried out, the method shall be reported. The last 50 times of burnishing shall be carried out on a dry road surface.

If there is some time after burnishing until the test during which the device is left untouched, re-burnishing shall be preferably carried out (35 times on dry road surface) to condition the device appropriately.

b) Tyre

New tyres after appropriate breaking-in shall be used. If brake burnishing is carried out while the test tyres are mounted on the vehicle, tyre breaking-in may be considered to have been completed appropriately and simultaneously. When only tyre breaking-in is carried out, warm-up running of the test vehicle at 150 to 200 km without harsh braking or steering shall be preferable.

4.2.2 Load conditions

The tests shall be carried out under a light loaded condition and a fully loaded condition.

a) The light loaded condition shall be a load equivalent to the unloaded vehicle plus two passengers.

b) The fully loaded condition shall be the sum of the manufacturer's designated value, loads, and the total vehicle mass.

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4.2.3 Pneumatic pressure of air brake system or air-over-hydraulic brake system

The pneumatic pressure of the air brake system etc. shall be as follows.

a) In the case of devices with an unloader valve, the tank pressure stabilized after operation of the unloader valve.

b) In the case of pressure-limited compressors, 90 % of the asymptotic pressure.

4.2.4 Tyre

The pneumatic pressure and the wear condition of the tyres shall be appropriate over the entire period of the test. The pneumatic pressure shall be that recommended by the car manufacturer, and shall be adjusted when the tyre is cooled and in contact with the ground.

4.3 Test road and weather conditions

4.3.1 Road surface

The road surfaces used for the tests shall be a dry surface, a wet surface, and low μ surfaces.

The gradient of the dry surface and the wet surface where braking operation is carried out shall be ±1 % or less in both the testing direction and the direction perpendicular thereto.

Regarding the low μ road surfaces, distinction shall be made between an artificial low μ road surface and a natural low μ road surface shall be made, and the K value and the precise conditions of the packed snow road and the icy road shall be reported.

4.3.2 Road surface conditions

a) Test road surface

The temperature of the dry road surface shall preferably be 35 °C±10 °C.

b) Wet road surface

The ideal wet road shall have a water depth of approximately 2 mm. The surface temperature shall be 27 °C±5 °C.

4.3.3 Ambient temperature

The ambient temperature during the test on dry/wet surfaces shall be 4 °C min. and 35 °C max.

4.3.4 Wind velocity

The average wind velocity shall be 5 m/sec max.

4.4 Setting of test road

The test road width shall be as follows in accordance with the classification of the vehicle:

in the case of M1 and N1, 3.5 m;

in the case of M2, M3, N2 and N3, 3.7 m; and

in the case of vehicles with a total width of more than 2.5 m, total width +1.2 m.

5. Test method

5.1 Warm-up

Warming up of the brake device shall be carried out the appropriate number of times until the brake temperature reaches the specified temperature, in the same way as used in burnish.

5.2 Checking of test vehicle and instrument

The brake test shall be carried out on the dry surface road at most three times, and the vehicle and the instruments shall be checked.

5.3 Initial brake temperature

The initial brake temperature shall be 65 °C to 100 °C.

5.4 Transmission position

The transmission position shall be neutral. However, in the case of vehicles where performance changes when the transmission position is set to neutral, such as electric vehicles, the transmission position shall be a normal drive position.

5.5 Drive mode

In the case of vehicles that have multiple drive mode such as part time 4WD, the drive mode set for the test shall be recorded.

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