BS ISO 7975:2019

BSI Standards Publication

Passenger cars — Braking in a turn — Open-loop test method

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National foreword

This British Standard is the UK implementation of ISO 7975:2019. It supersedes BS ISO 7975:2006, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AUE/15, Safety related to vehicles.

A list of organizations represented on this committee can be obtained on request to its secretary.

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CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by ISO/TC 22, *Road vehicles*, Subcommittee SC 33, *Vehicle dynamics and chassis components.*

This fourth edition cancels and replaces the third edition (ISO 7975:2006), which has been technically revised. The main changes compared to the previous edition are as follows:

— recognizing regenerative braking and active control systems.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The main purpose of this document is to provide repeatable and discriminatory test results.

The dynamic behaviour of a road vehicle is a very important aspect of active vehicle safety. Any given vehicle, together with its driver and the prevailing environment, constitutes a closed-loop system that is unique. The task of evaluating the dynamic behaviour is therefore very difficult since the significant interaction of these driver-vehicle-environment elements are each complex in themselves. A complete and accurate description of the behaviour of the road vehicle will necessarily involve information obtained from a number of different tests.

Since this test method quantifies only one small part of the complete vehicle handling characteristics, the results of these tests can only be considered significant for a correspondingly small part of the overall dynamic behaviour.

Moreover, insufficient knowledge is available concerning the relationship between overall vehicle dynamic properties and accident avoidance. A substantial amount of work is necessary to acquire sufficient and reliable data on the correlation between accident avoidance and vehicle dynamic properties in general and the results of these tests in particular. If this test method is used for regulation purposes, the correlation between test results and accident statistics should be checked.

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Passenger cars — Braking in a turn — Open-loop test method

1 Scope

This document specifies an open-loop test procedure to examine the effect of braking on course holding and directional behaviour of a vehicle. Specifically, the method determines how the steady-state circular response of a vehicle is altered by a braking action only. This document is applicable to passenger cars as defined in ISO 3833 and to light trucks.

The open-loop manoeuvre specified in this test method is not representative of real driving conditions but is useful to obtain measures of vehicle braking behaviour resulting from control inputs under closely controlled test conditions.

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.

ISO 4138, *Passenger cars — Steady-state circular driving behaviour — Open-loop test methods*

ISO 15037-1:2019, *Road vehicles — Vehicle dynamics test methods — Part 1: General conditions for passenger cars*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8855 and ISO 15037-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Principle

The purpose of this test is to examine the effect of braking on course holding and directional behaviour of a vehicle. Specifically, the method determines how the steady-state circular response of a vehicle is altered by braking action only.

The initial conditions are defined by constant longitudinal velocity and by a circle with a given radius, as specified by the constant-radius test method of ISO 4138. The steering-wheel angle required for the steady-state circular run shall be constantly maintained during the entire test. During the test, the driver input and the vehicle response are measured and recorded. From the recorded signals, characteristic values are calculated.

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5 Variables

5.1 Reference system

The reference system specified in ISO 15037-1 shall apply.

5.2 Variables to be measured

The following variables shall be determined:

— moment of brake application (t_0);

— steering-wheel angle (δ_H);

— lateral acceleration (a_Y);

— longitudinal acceleration (a_X);

— longitudinal velocity (v_X);

— yaw velocity ($d\psi/dt$); and

— sideslip angle (β and/or lateral velocity (v_Y).

Strictly speaking, test results based on lateral acceleration should not be used for comparison of the performance of different vehicles. This is because lateral acceleration is measured at right angles to the intermediate X-axis and not perpendicular to the vehicle path. To overcome this difficulty, lateral acceleration can be corrected for vehicle sideslip angle, which gives the centripetal acceleration. However, the extent of this correction is not likely to exceed a few percent and may generally be neglected.

It is recommended that the following variables be determined:

— pressure at master cylinder output or in the brake circuit which activates at least one of the front wheel brakes p_B); and

— wheel rotation speed ($\omega_1 - \omega_4$).

The variables are defined in ISO 8855 except for stopping distance and the moment of brake application, t_0, which is the instant at which the brake pedal is operated. The actuation of the brake pedal may be determined by the use of a contact switch mounted directly on the brake pedal or a sensor for the brake pedal force which set a trigger signal when the brake pedal force exceeds 10 N.

6 Measuring equipment

6.1 Description

ISO 15037-1:2019, Table 1 shall apply with the following additions from Table 1:

Table 1 — Variables, typical operating ranges and recommended maximum errors

Variable	Typical operating range	Recommended maximum error of the combined transducer/recorder system
Moment of brake application	—	0,05 s
Pressure of braking system	30 MPa[a]	±0,3 MPa
Wheel rotation speed	0 s^{-1} to 200 s^{-1}	±2 s^{-1}

[a] 1 MPa = 10 bar = 10^6 N/m^2.

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