BS ISO 14794:2011

BSI Standards Publication

Heavy commercial vehicles and buses — Braking in a turn — Open-loop test methods

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National foreword

This British Standard is the UK implementation of ISO 14794:2011. It supersedes BS ISO 14794:2003 which is withdrawn.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.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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ISBN 978 0 580 72783 2

ICS 43.020

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2011.

Amendments issued since publication

Date	Text affected

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INTERNATIONAL STANDARD

ISO 14794

Second edition
2011-02-15

Heavy commercial vehicles and buses — Braking in a turn — Open-loop test methods

Véhicules utilitaires lourds et autobus — Freinage en virage — Méthodes d'essai en boucle ouverte

Reference number
ISO 14794:2011(E)

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Contents

Page

Foreword iv
Introduction v
1 Scope 1
2 Normative references 1
3 Principle 1
3.1 Test objectives 1
3.2 General conditions 1
4 Reference system 2
5 Variables 2
6 Measuring equipment 3
7 Test conditions 3
8 Tests 3
8.1 General 3
8.2 Brake temperature 3
8.3 Initial driving condition 4
8.4 Application of braking 4
9 Data evaluation and presentation of results 5
9.1 General 5
9.2 Time histories 5
9.3 Brake application 5
9.4 Reference variables and steady-state values 7
9.5 Characteristic values 7
Annex A (normative) **Test report — General data and test conditions** 9
Annex B (normative) **Test report — Presentation of results** 10
Bibliography 22

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Full document details: BS ISO 14794:2011

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14794 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 9, *Vehicle dynamics and road-holding ability*.

This second edition cancels and replaces the first edition (ISO 14794:2003), which has been technically revised.

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Introduction

The main purpose of this International Standard 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 is each complex in itself. A complete and accurate description of the behaviour of the road vehicle must 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. Consequently, any application of this test method for regulation purposes will require proven correlation between test results and accident statistics.

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INTERNATIONAL STANDARD ISO 14794:2011(E)

Heavy commercial vehicles and buses — Braking in a turn — Open-loop test methods

1 Scope

This International Standard specifies open-loop test methods for determining the effect of braking on the course-holding and directional behaviour of heavy vehicles or heavy vehicle combinations when braking is accomplished using

— the service-brake system, or

— the retarder or engine brake only.

This International Standard is applicable to heavy vehicles — i.e. commercial vehicles, commercial vehicle combinations, buses and articulated buses as defined in ISO 3833 — covered by Categories M3, N2, N3, O3 and O4 of UNECE (United Nations Economic Commission for Europe) and EC vehicle regulations. These categories pertain to trucks and trailers with a maximum mass above 3,5 t and to buses and articulated buses with a maximum mass above 5 t.

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.

ISO 3833, *Road vehicles — Types — Terms and definitions*

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

ISO 15037-2:2002, *Road vehicles — Vehicle dynamics test methods — Part 2: General conditions for heavy vehicles and buses*

3 Principle

3.1 Test objectives

The primary objective of these test methods is to determine the effect of braking on the course-holding and directional behaviour of heavy vehicles.

Constant longitudinal velocity and a steady-state circular path of a given radius define the initial conditions. The brake system is then applied in a step-wise manner. The control inputs and the vehicle responses are measured and recorded during the test. From the recorded signals, characteristic values are calculated.

3.2 General conditions

The applicable provisions for general test conditions specified in ISO 15037-2 shall apply, with the modifications and additions as indicated in the following clauses.

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4 Reference system

The variables of motion used to describe the effect of braking on course-holding and directional behaviour of the vehicle relate to the intermediate axis system (X, Y, Z) (see ISO 8855).

For the purposes of this International Standard, the reference point shall be the centre of gravity of the vehicle unit.

NOTE This provision overrides the similar provision of ISO 15037-2.

5 Variables

The following variables shall be determined.

a) For single-unit vehicles or for the first vehicle unit of a vehicle combination:

— lateral acceleration, a_Y;

— longitudinal acceleration, a_X;

— brake-application signal;

— longitudinal velocity, v_X;

— steering-wheel angle, δ_H;

— yaw velocity, $\dot{\psi}$.

b) For vehicle combinations:

— articulation angles, Γ, or angular velocity of articulation angles between adjacent vehicle units.

c) For tests using the service-brake system:

— brake pressure at the outlet of the master cylinder or in a brake circuit that activates at least one of the front wheel brakes, p_B, or

— brake-pedal position, s_B, if brake pressure is not the signal that activates the brake system — as, for example, in the case of electronic brake systems.

In addition, the following variables should be determined.

d) For the first vehicle unit:

— wheel rotational speeds, $\omega_{i,\ i=1,\ldots n}$,

— sideslip angle, β.

e) For trailing units:

— lateral acceleration, a_Y,

— yaw velocity, $\dot{\psi}$,

— wheel rotational speeds, $\omega_{i,\ i=1,\ldots n}$,

— sideslip angle, β.

Other variables which may be determined are given in ISO 15037-2.

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6 Measuring equipment

The measuring and recording equipment shall be in accordance with ISO 15037-2.

Typical operating ranges and recommended maximum errors for the transducer and recording systems of the variables not given in ISO 15037-2 are shown in Table 1.

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

Variable	Range	Recommended max. error of combined transducer and recorder system
Brake pressure in air systems	0 kPa to 1 500 kPa	± 15 kPa
Brake pressure in hydraulic systems	0 MPa to 30 MPa	± 0,3 MPa
Brake-pedal position, if rotational	0° to 45°	± 0,5°
Brake-pedal position, if translational	0 m to 0,2 m	± 0,001 m
Wheel rotational speed	0 °/s to 6 000 °/s	± 5 °/s

7 Test conditions

Limits and specifications for the ambient and the vehicle test conditions shall be in accordance with ISO 15037-2. Although the standard condition specified by ISO 15037-2 is a dry clean road, because it could be particularly useful, this test may be conducted on other relevant surfaces with appropriate adjustments to levels and increments of accelerations.

8 Tests

8.1 General

The braking-in-a-turn test consists of a series of test runs, in each of which the vehicle is initially placed in a steady-state turn of specified speed and lateral acceleration and is then subjected to a rapid application of either the service-brake system or the retarder or engine brake.

In conducting the braking-in-a-turn test, the general test specifications shall be in accordance with ISO 15037-2.

Test runs shall be conducted using both left- and right-hand turns. All the data may be taken in one direction followed by all the data in the other direction. As an alternative, data may be taken successively in each direction for each acceleration level proceeding from the lowest to the highest level. The method chosen shall be noted in the general data. (See Annex A.)

The series of tests should be performed at least three times.

8.2 Brake temperature

An acceptable range for initial brake temperature shall be specified for tests in which braking is to be accomplished using the service brakes. Prior to each individual run of such tests, the brakes shall be warmed up or allowed to cool as required such that the initial brake temperatures are within the specified range. The initial temperature of the brakes shall be reported in the general data. (See Annex A.)

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