

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

ICS 43.020

National foreword

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The UK participation in its preparation was entrusted to Technical Committee AUE/15, Safety related to vehicles, which has the responsibility to:

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Summary of pages

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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*



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Foreword

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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*.

Introduction

The road-holding ability of heavy vehicles is a most important part of the active vehicle safety. Any given heavy vehicle, together with its driver and the prevailing environment, forms a unique closed-loop system. The task of evaluating road-holding ability is therefore very difficult since there is a significant interaction between these driver–motor-vehicle–trailer–road elements, each of which is complex in itself. A complete and accurate description of the behaviour of the heavy vehicle must necessarily involve information obtained from a number of tests of different types. Since they quantify only a small part of the whole handling field, the results of these tests can only be considered significant for a correspondingly small part of the overall handling behaviour.

Moreover, insufficient knowledge is available concerning the relationship between overall vehicle dynamic properties and accident avoidance. Since the number of variants of heavy vehicles is tremendously large, each vehicle is unique. Accordingly, results obtained using these test methods apply only to the individual test vehicle and not to other vehicles, regardless of how similar they may appear. Therefore, it is not appropriate to use these methods and test results for regulatory purposes.

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.

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, I , 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, $\omega_i, i=1, \dots, n$;
- sideslip angle, β .

e) For trailing units:

- lateral acceleration, a_Y ,
- yaw velocity, $\dot{\psi}$,
- wheel rotational speeds, $\omega_i, i=1, \dots, n$;
- sideslip angle, β .