



**International
Standard**

ISO 9815

**Road vehicles — Passenger-car
and trailer combinations — Lateral
stability test**

*Véhicules routiers — Ensembles voiture particulière et remorque
— Essai de stabilité latérale*

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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.

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 document 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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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 33, *Vehicle dynamics, chassis components and driving automation systems testing*.

This fourth edition cancels and replaces the third edition (ISO 9815:2010), which has been technically revised.

The main changes are as follows:

- additions have been made to [6.2.1](#), [6.2.2](#) and [6.2.3](#);
- additions have been made to [7.2.1](#), [7.2.2](#), [7.2.3](#) and [7.2.4](#);
- references have been updated to ISO 4138:2021 and ISO 15037-1:2019.

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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 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 requires proven correlation between test results and accident statistics.

Road vehicles — Passenger-car and trailer combinations — Lateral stability test

1 Scope

This document specifies a lateral stability test for passenger-car and trailer combinations. It is applicable to passenger cars in accordance with ISO 3833, and also to light trucks and their trailer combinations.

The lateral stability test determines the damping characteristic of the yaw oscillation of such towing-vehicle-trailer combinations excited by a defined steering impulse. The combination is initially driven in a steady-state, straight-ahead driving condition. Oscillation of the vehicle is then initiated by the application of a single impulse of steering, followed by a period in which steering is held fixed and the oscillation of the combination is allowed to damp out. Testing is conducted at several constant speeds. Where non-periodic instability is of interest, a steady-state circular test is specified.

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 2416, *Passenger cars — Mass distribution*

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

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

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

3 Terms, definitions

For the purposes of this document, the terms and definitions given in ISO 3833, ISO 8855 and the following apply.

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

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

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1

yaw articulation angle

$\Delta\psi$

angle of the X_C axis relative to the X_T axis, i.e. angle between the X axes of each of the two units, with the polarity determined by the rotation of the towing vehicle relative to the trailer

Note 1 to entry: The letters “C” and “T” are used as subscripts to distinguish between variables associated with the towing vehicle (car or light truck) and the trailer, respectively. For example, the longitudinal axis of the intermediate axis system of the towing vehicle is designated as X_C , and the lateral acceleration of the trailer is designated as a_{YT} .

3.2

mean gradient of the test track

$\bar{G}$

change in elevation of the track surface between two points along the path of the vehicle divided by the horizontal distance between those points, where the two points are those that define, as closely as is practicable, that segment of the track travelled by the test vehicle between the times t_2 and $t_{\Delta\psi n}$, respectively for t_2 and $t_{\Delta\psi n}$, see 6.2.2 and 7.2.3, respectively

Note 1 to entry: This gradient is dimensionless and is positive for a test vehicle travelling uphill and negative for a test vehicle travelling downhill.

4 Measurement variables

When performing this test procedure, the following shall be measured:

- steering-wheel angle, δ_H ,
- longitudinal velocity of the towing vehicle, v_X ,
- lateral acceleration of the trailer, a_{YT} ,
- yaw articulation angle between towing vehicle and trailer, $\Delta\psi$.

The following should be measured:

- yaw velocity of the towing vehicle, $\frac{d\psi_C}{dt}$;
- yaw velocity of the trailer, $\frac{d\psi_T}{dt}$.

NOTE These variables are not intended to comprise a complete list.

5 General conditions

5.1 Conformity

The general conditions of the test shall be in accordance with ISO 15037-1, with the additions and exceptions given in this clause.

5.2 Measuring equipment

The measurement variables given in [Clause 4](#) shall be monitored using appropriate transducers. Typical operating ranges and recommended maximum errors for variables are given in [Table 1](#).

A steering-wheel stop or marking may be used. The use of a steering machine is optional.

Table 1 — Variables, operating ranges and recommended maximum errors

Variable	Typical operating range	Recommended maximum error (of combined transducer/recorder system)
Articulation angle	$\pm 20^\circ$	$\pm 0,2^\circ$

5.3 Test track

In addition to the test track requirements of ISO 15037-1, the mean gradient of the test track along the path of the vehicle, $\bar{G}$, shall be within the range $\pm 0,01$. $\bar{G}$ shall be recorded for each test run. See 6.2.1 and 7.2.1 for related requirements. In addition, the test surface shall be maintained over a track with a minimum width of 8 m. An increased run-off area should be provided in addition to the specified test surface.