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Heavy commercial vehicles and buses — Test method for yaw stability — Sine with dwell test

Véhicules utilitaires lourds et autobus — Méthodes d'essai pour la stabilité en lacet — Essai de sinus modifié avec pause

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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 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 on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 33, *Vehicle dynamics and chassis components*.

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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 are each complex in themselves. A complete and accurate description of the behaviour of the road vehicle requires 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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Heavy commercial vehicles and buses — Test method for yaw stability — Sine with dwell test

1 Scope

This International Standard describes an open-loop test method for determining the yaw stability of a vehicle on a low friction road surface. It applies to heavy vehicles, that is commercial vehicles, commercial vehicle combinations, buses and articulated buses as defined in ISO 3833 (trucks and trailers with maximum weight above 3,5 tonnes and buses and articulated buses with maximum weight above 5 tonnes, according to ECE and EC vehicle classification, categories M3, N2, N3, O3 and O4).

The method is intended for vehicles equipped with electronic yaw-stability control systems.

As the results of this test depend largely on local and temporary changes in road surface friction, this International Standard gives recommendations about keeping the friction level as uniform as possible for good reproducibility of the test results.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8855, ISO 15037-2 and the following apply.

3.1
beginning of steer input
T_0
time when the steering-wheel angle input is started

3.2
end of steer input
T_1
time when the steering-wheel angle returns to zero at the completion of the sine with dwell steer input

3.3
dwell time
T_d
time interval when the steer input remains constant at absolute maximum amplitude

3.4
steer frequency
f

$$f = \frac{1}{T_1 - T_0 - T_d}$$

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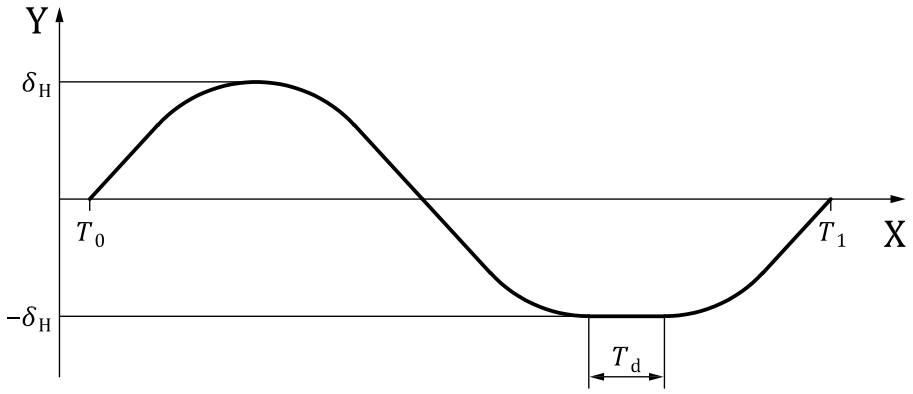
3.5
maximum steady-state lateral acceleration
maximum lateral acceleration that the vehicle can sustain for the selected test surface during steady-state cornering at the selected constant longitudinal velocity without yaw or roll instability when the electronic stability control system is disabled.

3.6
steady-state steering-wheel angle amplitude
δ_{Hss}
smallest steering-wheel angle amplitude at *maximum steady-state lateral acceleration* (3.5)

3.7
time delay
ΔT_i
time difference between the yaw velocity of the *i:th* unit and the yaw velocity of the first unit at their first zero crossing when performing the sine with dwell with steady-state steering-wheel angle amplitude, δ_{Hss}, when $0{,}5 / f + T_0 < t < T_1$

4 Principle

The objective of this test method is to study the yaw-stability control of a vehicle on a low friction surface with a selected initial longitudinal velocity, v_{x0}, which is subjected to a steering-wheel input by a steering machine. The steer input is a sine with dwell of steer frequency, f, and dwell time, T_d, as shown in Figure 1. The steering-wheel angle amplitude, δ_H, is increased in steps until yaw instability occurs. The results are evaluated with respect to responsiveness, yaw stability, and yaw angle after completion of steer.



Key
X time
Y steering wheel angle

Figure 1 — Steering-wheel angle input

5 Measuring equipment

The measuring equipment, transducer installation, and data processing shall be in accordance with ISO 15037-2.

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