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Road vehicles — Test method for the quantification of on-centre handling —

Part 1: Weave test

Véhicules routiers — Méthode d'essai pour la quantification du centrage —

Partie 1: Essai en petite sinusoïde au volant

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

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 13674-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 9, *Vehicle dynamics and road-holding ability*.

ISO 13674 consists of the following parts, under the general title *Road vehicles — Test method for the quantification of on-centre handling*:

— *Part 1: Weave test*

The following part is under preparation:

— *Part 2: Transition test*

Introduction

The dynamic behaviour of a road vehicle is a most important part of active vehicle safety. Any given vehicle, together with its driver and the prevailing environment, forms a unique closed-loop system. The task of evaluating the dynamic behaviour is therefore very difficult because of the significant interaction of these driver–vehicle–road elements, each of which is in itself complex. A complete and accurate description of the behaviour of the road vehicle must necessarily involve information obtained from a number of tests of different types.

Because they quantify only a small part of the whole handling field, the results of these tests can be considered significant only for a correspondingly small part of the overall dynamic behaviour.

Moreover, insufficient knowledge is available concerning the relationship between accident avoidance and the dynamic characteristics evaluated by these tests. A substantial amount of effort 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.

Therefore it is not possible to use these methods and test results for regulation purposes at present. The best that can be expected is that these on-centre handling tests are used as some among many other tests, which together describe an important part of the field of vehicle dynamic behaviour.

Finally, the role of the tyres is important and test results can be strongly influenced by the type and condition of tyres.

Road vehicles — Test method for the quantification of on-centre handling —

Part 1: Weave test

1 Scope

This part of ISO 13674 specifies a test schedule that addresses a particular aspect of the on-centre handling characteristics of a vehicle: the weave test. It is applicable to passenger cars in accordance with ISO 3833, and to light trucks.

NOTE The manoeuvre specified in this test method is not representative of real driving conditions but is useful for obtaining measures of vehicle on-centre handling behaviour in response to a specific type of steering input under closely controlled test conditions. Other aspects of on-centre handling are addressed in the companion ISO/TS 20119 and ISO 13674-2, the latter being under preparation.

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 1176, *Road vehicles — Masses — Vocabulary and codes*

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 15037-1:1998, *Road vehicles — Vehicle dynamics test methods — Part 1: General conditions for passenger cars*

3 Terms, definitions and symbols

For the purposes of this document, the terms, definitions and symbols given in ISO 1176, ISO 2416, ISO 3833, ISO 8855 and the following apply.

3.1
on-centre handling
description of the steering “feel” and precision of a vehicle during nominally straight-line driving and in negotiating large radius bends at high speeds but low lateral accelerations

3.2
ordinate deadband
vertical width of the hysteresis loops at abscissa zero

3.3
abscissa deadband
horizontal width of the hysteresis loops at ordinate zero

3.4
gradient
ratio of change in the ordinate with respect to a unit change in the abscissa, evaluated on each side of the hysteresis loop

4 Principle

On-centre handling represents that part of the straight-line directional stability characteristics of the vehicle existing at lateral acceleration levels, typically, no greater than 1 m/s^2. On-centre handling is concerned primarily with features that directly influence the driver's steering input, such as steering system and tyre characteristics. Thus test schedules for the evaluation of on-centre handling behaviour seek to minimize other factors that influence the wider aspects of straight-line directional stability, such as disturbance inputs due to ambient winds and road irregularities.

This part of ISO 13674 defines a test schedule that involves driving the vehicle in a nominally straight line at a constant forward speed. During the test, driver inputs and vehicle responses are measured and recorded. From the recorded signals, characteristic values are calculated.

5 Variables

5.1 Reference system

The variables of motion used to describe vehicle behaviour in a test-specific driving situation relate to the intermediate axis system (X, Y, Z) (see ISO 8855).

The location of the origin of the vehicle axis system (X_V, Y_V, Z_V) is the reference point and therefore should be independent of the loading condition. The origin is therefore fixed in the longitudinal plane of symmetry at half-wheelbase and at the same height above the ground as the centre of gravity of the vehicle at complete vehicle kerb mass (see ISO 1176).

5.2 Variables to be measured

When using this test method, the following variables shall be measured:

— steering-wheel angle, δ_H;

— steering-wheel torque, M_H;

— yaw velocity, $\frac{d\psi}{dt}$;

— longitudinal velocity, v_X.

The following variables should be measured:

— lateral acceleration, a_Y;

— steering-wheel angular velocity, $\frac{d\delta_H}{dt}$.

See ISO 8855.

6 Measuring equipment

6.1 Description

All variables shall be measured by means of appropriate transducers and their time histories shall be recorded by a multi-channel recording system. Typical operating ranges and recommended maximum errors of the combined transducer and recording system are shown in Table 1.

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

Variable	Typical operating range[a]	Recommended maximum error of combined system[b]
Steering-wheel angle	± 50°	± 0,1°
Steering-wheel torque	± 0,1 N·m	± 0,1 N·m
Yaw velocity	± 10 °/s	± 0,1 °/s
Longitudinal velocity	0 m/s to 50 m/s	± 0,5 m/s
Lateral acceleration	± 5 m/s^2	± 0,1 m/s^2
Steering wheel angular velocity	± 100 °/s	± 1 °/s
Transducers for measuring some of the listed variables are not widely available and are not in general use. Many such instruments are developed by users. If any system error exceeds the recommended maximum value, this and the actual maximum error shall be stated in the test report (see ISO 15037-1:1998, Annex A).		
[a] These transducer ranges are appropriate for the standard test conditions and might not be suitable for non-standard test conditions. [b] The values for maximum errors are provisional until more experience and data are available.		

6.2 Transducer installations

The transducers shall be installed according to the manufacturers' instructions where such instructions exist, so that the variables corresponding to the terms and definitions of ISO 8855 can be determined.

If a transducer does not measure a variable directly, appropriate transformations into the specified reference system shall be carried out.

NOTE Lateral acceleration, as defined, is measured in the intermediate XY-plane. However, for the purpose of this test procedure, measurement of "sideways" acceleration in the vehicle $X_V Y_V$-plane (i.e. corrupted by vehicle roll) is typically adequate, provided that the roll angle versus lateral acceleration characteristic for the vehicle is known and an appropriate correction in respect of roll angle can be made to the "sideways" acceleration.

6.3 Data processing

See ISO 15037-1:1998, 4.3.

7 Test conditions

7.1 General

See ISO 15037-1:1998, clause 5.