
**Passenger cars — Simulation model
classification —**

**Part 1:
Vehicle dynamics**

*Voitures particulières — Classification des modèles de simulation —
Partie 1: Dynamique du véhicule*



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Published in Switzerland

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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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

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

A list of all parts in the ISO 11010 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document has been developed in response to worldwide demand for the standardization of simulation models and their requirements for use in specific applications and driving manoeuvres. During the development and testing of road vehicles questions arise around which simulation models should be applied and how well matched they need to be for performing certain applications with related driving manoeuvres. In the absence of standards it is common practice that experts in different organizations develop their own methods and processes as response to these questions. This causes obstacles when it comes to comparability and model exchange between project partners. Currently, unless the requirements for simulation models undergo extensive elaboration and coordination among the experts involved, there will be major uncertainty with their implementation and quality.

The main purpose of this document is to provide a framework that enables a systematic assignment of certain applications and driving manoeuvres to suitable simulation models and their elements and characteristics. This document classifies the simulation models into certain model classes, their designation number and related elements, characteristics and common modelling method. Assigning models to classes related to specific applications is the responsibility of the user or other regulations and standards. This document contains recommendations in the sense of an appropriate simulation quality in terms of performance tests, thus enabling the user to specify the requirements for the models with reference to this document. This document thus also creates the basis for model recommendations relevant to vehicle dynamics with regard to advanced driver assistance systems and automated driving (ADAS/AD)^[19].

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Part 1: Vehicle dynamics

1 Scope

A systematic framework has been created that facilitates the definition of the requirements of simulation models for certain applications and driving manoeuvres in a standardized manner.

For this purpose, the proposed framework systematically divides the vehicle model into model classes and all model classes into different model types, corresponding to various model characteristics and common modelling methods. The vehicle dynamics manoeuvres have been additionally structured and clustered. Manoeuvres can be assigned to model classes and model types using an allocation and requirements table. This document thus also creates the basis for model recommendations relevant to vehicle dynamics with regard to advanced driver assistance systems and automated driving (ADAS/AD).

The application of the framework and the specification of the model requirements are the responsibility of the user. Alternatively, they may be determined by other regulations and standards. This document contains recommendations for selectable model characteristics in terms of adequate simulation quality with respect to performance tests and associated application patterns. The recommendations can be adapted accordingly to be applied to functional testing.

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

3 Terms and definitions

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

ISO and IEC maintain terminological 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 simulation model

mathematical model for the calculation of the system state variables based on equations describing a vehicle or vehicle sub-system

Note 1 to entry: The vehicle's environment is only modelled as far as required, i.e. friction of the road surface, wind, etc. Models in this context are both, the unit under test (UuT) as well as models to supplement or complete the simulation loop.

3.2 model class

mathematical model based on the vehicle or vehicle sub-systems