



**International
Standard**

ISO 5101

**Road vehicles — Field load
specification for brake actuation
and modulation systems**

*Véhicules routiers — Spécification de la charge pour les systèmes
d'actionnement et de modulation des freins*

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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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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, chassis components and driving automation systems testing*.

This first edition cancels and replaces the first edition of ISO/PAS 5101:2021, which has been technically revised.

The main changes are as follows:

- introduction of methodology to structure and calculate the contribution of regenerative braking;
- addition of temperature distributions for electric vehicles;
- extension of base assumptions by further parameters.

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

Vehicle development programs tend to grow in complexity and integration of the braking system with chassis dynamics and mechatronics, demanding more robust and comprehensive evaluation programs. Also, to remain competitive, braking systems and their components' functionality and application across multiple vehicle architectures and platforms are increased.

The proper selection and adaptation of field load spectra and profiles to the specific program ensure functionality, reliability and braking system availability. This document defines a library of field load schedules to help developing simulation and testing programs tailored to the vehicle or system specification and requirements. Specific cycles and load collectives including the main functions associated with everyday driving and operation and exceptional load cases are described to ensure safe braking behaviour. This document's field load was typically derived from analysing field data collected from more than 1 million vehicles having driven more than 70 000 000 000 km. Several vehicle and brake system suppliers from vehicles used in different regions worldwide contributed to this field data collection. In addition, data from driving studies with specific measurement equipment was used. Wherever the data available from field or studies was not sufficient, existing specifications or expert judgement served to derive conservative assumptions.

This document provides field loads independent of the vehicle technology, vehicle specification, intended use and field usage. It remains the manufacturer's responsibility to include and adapt the field loads to the specific vehicle configuration. The adaptation at least:

- defines sampling and testing plans, including vehicle configuration(s), road conditions selection of the specific profiles and load spectra of this document;
- defines level of evaluation and integration of simulation, Hardware-in-the-Loop, physical testing methods, along with other components and software functions part of the testing program;
- agrees on performance and reliability criteria (including statistical tools and metrics);
- reflects specific system architectures and control technologies for the unit(s) under testing.

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Road vehicles — Field load specification for brake actuation and modulation systems

1 Scope

This document specifies expected field loads for functions provided by the braking system actuator and modulator and applies to passenger cars and light commercial vehicles (classes M1 and N1, according to UNECE).

Functions addressed in this document are:

- dynamic stability functions (e.g. electronic stability control);
- brake torque optimizing functions (e.g. electronic brake force distribution);
- brake assistance functions (e.g. hill start assist).

This document only covers functions where data of appropriate maturity are available. There are additional functions of a braking system, which are not covered by this document.

By describing the expected field loads, this document specifies representative manoeuvres and occurrences for different functions. These serve as an orientation for the derivation of test procedures.

This document applies to vehicles up to conditional automation (SAE J 3016 level 3).

NOTE Field loads for automation levels above level 3 are under consideration for future editions.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 blending

applying the driver-requested torque by combining the available regenerative brake torque and friction torque

3.2 brake booster

part of the actuation unit, excluding master cylinder, in systems with separate actuator and modulator

Note 1 to entry: A brake booster is not part of braking systems with integrated actuator and modulator (see [Figure 2](#)).