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Earth-moving machinery — Laboratory evaluation of operator seat vibration

*Engins de terrassement — Évaluation en laboratoire des vibrations
transmises à l'opérateur par le siège*



Reference number
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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 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety, ergonomics and general requirements*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 151, *Construction equipment and building material machines - Safety*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 7096:2000), which has been technically revised.

The main changes compared to the previous edition are as follows:

- [Clause 1](#), horizontal direction drills added to the list of machines with low vertical vibration inputs;
- crawler dumpers added to [Table 4](#) and aligned with [Figure 7](#);
- whole document, update of normative references;
- skid steer loaders with tracks have been added;
- [5.4](#), reference to the posture of the test person added and total mass of heavy person updated;
- [5.5.2](#), informative note for bag filling;
- [5.5.3](#), damping test for active and semi-active suspension systems added;
- [Table 2](#), Power Spectral Density of class EM 1 and EM 3 modified;
- [Table 3](#), Filter cut-off frequencies of class EM 1 modified;
- [Table 4](#), Characteristics of the simulated input vibration modified for the following machine types:
 - Articulated or rigid frame dumper >4 500 kg;
 - Wheel loader >4 500 kg.

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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 is a type-C standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organisations, market surveillance etc.)

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e. g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

The operators of earth-moving machinery are often exposed to a low frequency vibration environment partly caused by the movement of the machines over uneven ground and the tasks carried out. The seat constitutes the last stage of suspension before the operator. To be efficient at attenuating the vibration, the suspension seat should be chosen according to the dynamic characteristics of the machine. The design of the seat and its suspension are a compromise between the requirements of reducing the effect of vibration and shock on the operator and providing him with stable support so that he can control the machine effectively.

Thus, seat vibration attenuation is a compromise of a number of factors and the selection of seat vibration parameters needs to be taken in context with the other requirements for the seat.

The performance criteria provided in this document have been set in accordance with what is attainable using what is at present the best design practice. They do not necessarily ensure the complete protection of the operator against the effects of vibration and shock. They could be revised in the light of future developments and improvements in suspension design.

The test inputs included in this document are based on a very large number of measurements taken in situ on earth-moving machinery used under severe but typical operating conditions. The test methods are based on ISO 10326-1:2016, which is a general method applicable to seats for different types of machines.