

## **Mullatöömasinad. Operaatori istme vibratsiooni laboratoorne hindamine**

Earth-moving machinery - Laboratory evaluation of operator seat vibration

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN ISO 7096:2008 sisaldab Euroopa standardi EN ISO 7096:2008 ingliskeelset teksti.</p> <p>Standard on kinnitatud Eesti Standardikeskuse 15.12.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 17.09.2008.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN ISO 7096:2008 consists of the English text of the European standard EN ISO 7096:2008.</p> <p>This standard is ratified with the order of Estonian Centre for Standardisation dated 15.12.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.</p> <p>Date of Availability of the European standard text 17.09.2008.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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ICS 13.160, 53.100

**Võtmesõnad:** cabs, damping tests, earth-moving equipment, ergonomics, laboratory tests, operator seats, seats, test dummies, tests, vibration, vibration tests

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Aru 10 Tallinn 10317 Eesti; [www.evs.ee](http://www.evs.ee); Telefon: 605 5050; E-post: [info@evs.ee](mailto:info@evs.ee)

English Version

Earth-moving machinery - Laboratory evaluation of operator seat  
vibration (ISO 7096:2000)

Engins de terrassement - Évaluation en laboratoire des  
vibrations transmises à l'opérateur par le siège (ISO  
7096:2000)

Erdbaumaschinen - Laborverfahren zur Bewertung der  
Schwingungen des Maschinenführersitzes (ISO 7096:2000)

This European Standard was approved by CEN on 25 August 2008.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

The text of ISO 7096:2000 has been prepared by Technical Committee ISO/TC 127 “Earth-moving machinery” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 7096:2008 by Technical Committee CEN/TC 151 “Construction equipment and building material machines - Safety” the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 7096:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

For relationship with EU Directives, see informative Annexes ZB and ZC, which are integral parts of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

### Endorsement notice

The text of ISO 7096:2000 has been approved by CEN as a EN ISO 7096:2008 without any modification.

NOTE: Normative references to International Standards are listed in annex ZA (normative).

## Annex ZA (normative)

### Normative references to international publications with their relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

Publication	Year	Title	EN	Year
ISO 6165	1997	Earth-moving machinery - Basic types - Vocabulary	EN ISO 6165	2006
ISO 8041	1990	Human response to vibration – Measuring instrumentation	ENV 28041	1993
ISO 10326-1	1992	Mechanical vibration - Laboratory method for evaluating vehicle seat vibration - Part 1: Basic requirements	EN 30326-1	1994
ISO 13090-1	1998	Mechanical vibration and shock - Guidance on safety aspects of tests and experiments with people - Part 1: Exposure to whole-body mechanical vibration and repeated shock	EN ISO 13090-1	1998

## **Annex ZB (informative)**

### **Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC**

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive Machinery 98/37/EC, amended by 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements **1.5.9** and **3.2.2** of that Directive and associated EFTA regulations.

**WARNING** — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

## **Annex ZC (informative)**

### **Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC**

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements **1.1.8** and **1.5.9** of that Directive and associated EFTA regulations.

**WARNING** — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

## Introduction

The operators of earth-moving machinery are often exposed to a low frequency vibration environment partly caused by the movement of the vehicles over uneven ground and the tasks carried out. The seat constitutes the last stage of suspension before the driver. To be efficient at attenuating the vibration, the suspension seat should be chosen according to the dynamic characteristics of the vehicle. 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 International Standard 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 may be revised in the light of future developments and improvements in suspension design.

The test inputs included in this International Standard 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, which is a general method applicable to seats for different types of vehicles.



# Earth-moving machinery — Laboratory evaluation of operator seat vibration

## 1 Scope

**1.1** This International Standard specifies, in accordance with ISO 10326-1, a laboratory method for measuring and evaluating the effectiveness of the seat suspension in reducing the vertical whole-body vibration transmitted to the operator of earth-moving machines at frequencies between 1 Hz and 20 Hz. It also specifies acceptance criteria for application to seats on different machines.

**1.2** This International Standard is applicable to operator seats used on earth-moving machines as defined in ISO 6165.

**1.3** This International Standard defines the input spectral classes required for the following earth-moving machines. Each class defines a group of machines having similar vibration characteristics:

- rigid frame dumpers > 4 500 kg operating mass<sup>1)</sup>
- articulated frame dumpers
- scrapers without axle or frame suspension<sup>2)</sup>
- wheel-loaders > 4 500 kg operating mass<sup>1)</sup>
- graders
- wheel-dozers
- soil compactors (wheel type)
- backhoe-loaders
- crawler loaders
- crawler-dozers  $\leq$  50 000 kg operating mass<sup>1), 3)</sup>
- compact dumpers  $\leq$  4 500 kg operating mass<sup>1)</sup>
- compact loaders  $\leq$  4 500 kg operating mass<sup>1)</sup>
- skid-steer loaders  $\leq$  4 500 kg operating mass<sup>1)</sup>

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1) See ISO 6016.

2) For tractor scrapers with suspension, either a seat with no suspension may be used, or one having a suspension with high damping.

3) For crawler dozers greater than 50 000 kg, the seat performance requirements are suitably provided by a cushion type seat.

**1.4** The following machines impart sufficiently low vertical vibration inputs at frequencies between 1 Hz and 20 Hz to the seat during operation that these seats do not require suspension for the attenuation of transmitted vibration:

- excavators, including walking excavators and cable excavators<sup>4)</sup>
- trenchers
- landfill compactors
- non-vibratory rollers
- milling machines
- pipelayers
- finishers
- vibratory rollers

**1.5** The tests and criteria defined in this International Standard are intended for operator seats used in earth-moving machines of conventional design.

**NOTE** Other tests may be appropriate for machines with design features that result in significantly different vibration characteristics.

**1.6** Vibration which reaches the operator other than through his seat, for example that sensed by his feet on the platform or control pedals or by his hands on the steering-wheel, is not covered.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2041:1990, *Vibration and shock — Vocabulary*.

ISO 2631-1:1997, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*.

ISO 6016:1998, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*.

ISO 6165:1997, *Earth-moving machinery — Basic types — Vocabulary*.

ISO 8041:1990, *Human response to vibration — Measuring instrumentation*.

ISO 10326-1:1992, *Mechanical vibration — Laboratory method for evaluating vehicle seat vibration — Part 1: Basic requirements*.

ISO 13090-1:1998, *Mechanical vibration and shock — Guidance on safety aspects of tests and experiments with people — Part 1: Exposure to whole-body mechanical vibration and repeated shock*.

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4) For excavators, the predominant vibration is generally in the fore and aft (X) axis.