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**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 (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 (ISO 13090-1:1998)

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Mechanische Schwingungen und Stöße - Leitfaden zur Sicherheit von Prüfungen und Versuchen mit Menschen - Teil 1: Einwirkung von mechanischen Ganzkörper-Schwingungen und wiederholten Stößen (ISO 13090-1:1998)

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Vibrations et chocs mécaniques - Lignes directrices concernant les aspects de sécurité des essais et des expérimentations réalisés sur des sujets humains - Partie 1: Exposition de l'ensemble du corps aux vibrations mécaniques et aux chocs répétés (ISO 13090-1:1998)

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**ICS:**

13.160	Vpliv vibracij in udarcev na ljudi	Vibration and shock with respect to human beings
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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 (ISO 13090-1:1998)

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This European Standard was approved by CEN on 14 May 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

## Foreword

The text of the International Standard ISO 13090-1:1998 has been prepared by Technical Committee ISO/TC 108 "Mechanical vibration and shock" in collaboration with Technical Committee CEN/TC 231 "Mechanical vibration and shock", 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 December 1998, and conflicting national standards shall be withdrawn at the latest by December 1998.

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

## Endorsement notice

The text of the International Standard ISO 13090-1:1998 was approved by CEN as a European Standard without any modification.

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

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**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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN</u>	<u>Year</u>
ISO 10326-1	1992	Mechanical vibration – Laboratory method for evaluating vehicle seat vibration – Part 1: Basic requirements	EN 30326-1	1994

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**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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*Vibrations et chocs mécaniques — Lignes directrices concernant  
les aspects de sécurité des essais et des expérimentations réalisés sur des  
sujets humains* — ISO 13090-1:2000

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*Partie 1: Exposition de l'ensemble du corps aux vibrations mécaniques et  
aux chocs répétés* — ISO 13090-1:2000



Reference number  
ISO 13090-1:1998(E)

## ISO 13090-1:1998(E)

## Contents

	Page
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Definitions</b> .....	<b>2</b>
<b>4 Hazards of mechanical vibration and repeated shock experiments on human test subjects</b> .....	<b>2</b>
<b>5 Classifying experiments according to severity of vibration exposure</b> .....	<b>4</b>
<b>6 Practice for laboratory tests and experiments</b> .....	<b>5</b>
<b>7 Selection of human test subjects</b> .....	<b>8</b>
<b>Annexes</b>	
<b>A (informative) Severity of exposure</b> .....	<b>9</b>
<b>B (informative) Example of consent form for a human test subject in mechanical vibration and repeated shock experiments</b> .....	<b>11</b>
<b>C (informative) Medical contra-indications to participation in experiments involving whole-body mechanical vibration and repeated shock</b> .....	<b>12</b>
<b>D (informative) Principles pertaining to the use of human subjects</b> .....	<b>14</b>
<b>E (informative) Design of equipment</b> .....	<b>16</b>
<b>F (informative) Guidelines for the preparation of an experimental or test protocol for submission to an Ethical Committee</b> .....	<b>20</b>
<b>G (informative) Bibliography</b> .....	<b>23</b>

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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.

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.

International Standard ISO 13090-1 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*, Subcommittee SC 4, *Human exposure to mechanical vibration and shock*.

ISO 13090 consists of the following parts, under the general title *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*
- *Part 2: Exposure to whole-body impact*

Annexes A to G of this part of ISO 13090 are for information only.

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## Introduction

People may be exposed to mechanical vibration and repeated shock intentionally in the course of experiments to determine their response to such environments and in the course of experiments or tests performed for other purposes. It is widely accepted that exposure to mechanical vibration and repeated shock of sufficient magnitude can cause injury or impair health.

In this part of ISO 13090, guidance is provided on the safety aspects of equipment or procedures which are particular to experiments involving mechanical vibration and repeated shock and which affect the safety of those involved.

The purpose of this part of ISO 13090 is to reduce the chance of the subjects, or those monitoring or conducting the experiments, being exposed to undue risk of injury or impaired health arising from such exposure, or of injury attributable to the malfunction or poor operation of the equipment used to generate the mechanical vibration and repeated shock. Guidance on the design of equipment is included in annex E.

In accordance with accepted practice for experiments in which human subjects are involved, the experimenter should obtain approval from an independent Ethical Committee, or "Human Use Committee", giving details of the planned experiment together with a written justification. Some guidelines are included in annex F.

This part of ISO 13090 represents the best international consensus at this time and may be subject to change in the light of future developments in scientific knowledge and experience.

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# 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

### 1 Scope

This part of ISO 13090 provides guidance on the safety aspects of the design of equipment and the conduct of tests and experiments in the laboratory in which human subjects<sup>1)</sup> are exposed to mechanical vibration and repeated shock.

This part of ISO 13090 is concerned with tests and experiments in which subjects are exposed to whole-body mechanical vibration and repeated shock, as described in ISO 2631-1. Local vibration is not within the scope of this part of ISO 13090, but some of the general procedures may be applicable.

The experiments to which this part of ISO 13090 is applicable include those performed to determine the response of subjects to mechanical vibration and repeated shock stimuli. They also include those experiments in which mechanical vibration and repeated shock are part of the environment in which other investigations are performed, and to experiments or tests to compare the attributes of equipment intended to alleviate the effects of mechanical vibration and repeated shock on the user (e.g. testing of seat suspensions, seat cushions and other attenuating devices, including tests according to ISO 10326-1).

NOTE Measures in addition to those described in this part of ISO 13090 may be necessary in those countries which have relevant national requirements.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 13090. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 13090 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO 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 5805:1997, *Mechanical vibration and shock — Human exposure — Vocabulary*.

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

1) Hereinafter referred to as "the subject" or "subjects".

### 3 Definitions

For the purposes of this part of ISO 13090, the definitions given in ISO 2041 and ISO 5805 apply.

## 4 Hazards of mechanical vibration and repeated shock experiments on human test subjects

### 4.1 General

Those who engage in experiments which involve exposing subjects to mechanical vibration and repeated shock, and those who supply equipment for such experiments, should address three types of hazard specific to such experiments, in addition to the general responsibility for safety, as follows:

- a) the inherent hazard that exposure to the mechanical vibration or repeated shock which the experiment is intended to reproduce may lead to injury or ill-health, either immediately or at some time in the future (see 4.2);
- b) the extraneous hazard that malfunction or inadvertent operation of the equipment used to generate the mechanical vibration or repeated shock may cause the subject to be exposed unintentionally to motions so severe as to cause injury or ill-health;
- c) the hazard of injury to the subject, the experimenter, or others in the vicinity arising from any of the following:
  - 1) the relative motion between the vibration equipment and its surroundings,
  - 2) mechanical, electrical or other failures,
  - 3) falling.

### 4.2 Inherent hazards in mechanical vibration and repeated shock experiments

#### 4.2.1 General

The inherent hazard that exposure of a subject to mechanical vibration or repeated shock may lead to injury or ill-health depends on the following two possible causes:

- a) use of mechanical vibration or repeated shock that is too severe in terms of magnitude or duration, see 4.2.2;
- b) failure to exclude from the test a subject who is medically unfit or otherwise particularly sensitive to mechanical vibration or shock.

NOTE Precautions to be taken with subjects are given in clause 7 and annex D.

#### 4.2.2 Severity of mechanical vibration or shock stimulus

The effects on subjects of mechanical vibration and repeated shock depend on the magnitude, frequency content, direction of action and duration of the stimuli, all of which should be included in assessing the severity.

In all cases, the mechanical vibration is to be measured at the interface of the subject with the vibrating surface. Vibration may be characterized as deterministic (including periodic) or random and, for the purposes of this part of ISO 13090, vibration is restricted to frequencies between 0,5 Hz and 80 Hz. Repeated shocks may be applied with or without the presence of vibration, with various characteristics.

Mechanical vibration and repeated shock should be characterized from measurements of acceleration in three mutually perpendicular axes (see figure 1).

R.m.s. values of acceleration should be obtained using frequency weightings according to ISO 2631-1. The r.m.s. value should be determined using linear integration over the full period of exposure.