

This document is a preview generated by EVS

**Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration - Part 1: General requirement**

Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration - Part 1: General requirement

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN ISO 5349-1:2002 sisaldab Euroopa standardi EN ISO 5349-1:2001 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 14.02.2002 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN ISO 5349-1:2002 consists of the English text of the European standard EN ISO 5349-1:2001.</p> <p>This document is endorsed on 14.02.2002 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
--	---

<p><b>Käsitlusala:</b> This standard specifies general requirements for measuring and reporting hand-transmitted vibration exposure in three orthogonal axes. It defines a frequency weighting and band-limiting filters to allow uniform comparison of measurements. The values obtained can be used to predict adverse effects of hand-transmitted vibration over the frequency range covered by the octave bands from 8 Hz to 1 000 Hz.</p>	<p><b>Scope:</b> This standard specifies general requirements for measuring and reporting hand-transmitted vibration exposure in three orthogonal axes. It defines a frequency weighting and band-limiting filters to allow uniform comparison of measurements. The values obtained can be used to predict adverse effects of hand-transmitted vibration over the frequency range covered by the octave bands from 8 Hz to 1 000 Hz.</p>
--	--

ICS 13.160

**Võtmesõnad:** effects, ergonomics, guide books, hand-arm systems, health and safety requirements, human body, human factors engineering, measurement, measuring instruments, people, safety r, safety requirements, vibration, work safety

**English version**

Mechanical vibration

**Measurement and evaluation of human exposure to  
hand-transmitted vibration**

Part 1: General requirements  
(ISO 5349-1 : 2001)

Vibrations mécaniques – Mesurage et  
évaluation de l'exposition des indivi-  
dus aux vibrations transmises par la  
main – Partie 1: Exigences générales  
(ISO 5349-1 : 2001)

Mechanische Schwingungen – Mes-  
sung und Bewertung der Einwirkung  
von Schwingungen auf das Hand-Arm-  
System des Menschen – Teil 1: Allge-  
meine Anforderungen  
(ISO 5349-1 : 2001)

This European Standard was approved by CEN on 2001-05-10.

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 Management Centre or to any CEN member.

The European Standards exist 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 Management Centre has the same status as the official versions.

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

**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

**Management Centre: rue de Stassart 36, B-1050 Brussels**

## Foreword

International Standard

ISO 5349-1 : 2001 Mechanical vibration – Measurement and evaluation of human exposure to hand-transmitted vibration – Part 1: General requirements,

which was prepared by ISO/TC 108 'Mechanical vibration and shock' of the International Organization for Standardization, has been adopted by Technical Committee CEN/TC 231 'Mechanical vibration and shock', the Secretariat of which is held by DIN, as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by February 2002 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

## Endorsement notice

The text of the International Standard ISO 5349-1 : 2001 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to international publications are listed in Annex ZA (normative).

## Contents

Page

Foreword.....	2
Introduction .....	3
1 Scope .....	4
2 Normative references .....	4
3 Terms, definitions and symbols.....	5
3.1 Terms and definitions .....	5
3.2 Symbols .....	5
4 Characterization of hand-transmitted vibration .....	5
4.1 General considerations.....	5
4.2 Measuring equipment for hand-transmitted vibration .....	6
4.3 Coupling of the hand to the vibration source.....	8
4.4 Quantity to be measured.....	8
4.5 Multi-axis vibration .....	8
5 Characterization of hand-transmitted vibration exposure .....	9
5.1 General.....	9
5.2 Daily exposure duration.....	9
5.3 Daily vibration exposure .....	9
6 Information to be reported.....	10
Annex A (normative) Frequency-weighting and band-limiting filters.....	11
Annex B (informative) Guidance on health effects of hand-transmitted vibration.....	14
Annex C (informative) Relationship between vibration exposure and effects on health .....	18
Annex D (informative) Factors likely to influence the effects of human exposure to hand-transmitted vibration in working conditions .....	21
Annex E (informative) Preventive measures to be adopted by those responsible for occupational health and safety.....	22
Annex F (informative) Guidelines for reporting additional information .....	24
Bibliography .....	27

## Introduction

Intensive vibration can be transmitted to the hands and arms of operators from vibrating tools, vibrating machinery or vibrating workpieces. Such situations occur, for example, when a person handles tools such as pneumatic, electric, hydraulic or internal combustion engine-driven chain saws, percussive tools or grinders.

Depending on the type and place of work, vibration can enter one arm only, or both arms simultaneously, and may be transmitted through the hand and arm to the shoulder. The vibration of body parts and the perceived vibration are frequently a source of discomfort and possibly reduced proficiency. Continued, habitual use of many vibrating power tools has been found to be connected with various patterns of diseases affecting the blood vessels, nerves, bones, joints, muscles or connective tissues of the hand and forearm.

The vibration exposures required to cause these disorders are not known precisely, neither with respect to vibration magnitude and frequency spectrum, nor with respect to daily and cumulative exposure duration. The guidance given in this part of ISO 5349 is derived from limited quantitative data available from both practical experience and laboratory experimentation concerning human response to hand-transmitted vibration, and on limited information regarding current exposure conditions. It is thus difficult to propose a comprehensive method for the evaluation of vibration exposure. However, the use of the information given in this part of ISO 5349 should protect the majority of workers against serious health impairment associated with hand-transmitted vibration. It may also assist in the development of new hand-operated power tools to reduce the risk of vibration-related health effects. It does not define safe exposure ranges in which vibration diseases cannot occur.

The use of this part of ISO 5349 will contribute to the gathering of consistent data in order to improve occupational safety. In particular, it is hoped that such data will serve to extend the present knowledge of dose-effect relationships.

This part of ISO 5349 specifies the general requirements for the measurement and evaluation of human exposure to hand-transmitted vibration. It is supplemented by the information given in ISO 5349-2, which gives practical guidance for the implementation of appropriate measurement and evaluation techniques at the workplace. Instrumentation to be used for measurements made in accordance with ISO 5349 is fully specified in ISO 8041.

Annex A contains definitions for the frequency weighting  $W_h$  and for band-limiting filters, required for measurement of frequency-weighted acceleration in accordance with ISO 5349.

Annex B contains information on the health effects of hand-transmitted vibration, while annex C gives guidance which may assist competent authorities responsible for the definition of exposure limits or action levels as required. Annex D contains information on other factors which can affect human response to hand-transmitted vibration and annex E contains guidance on preventive measures for those responsible for occupational health and safety.

To facilitate further progress in this field and to allow the quantitative comparison of exposure data, uniform methods for measuring and reporting exposure of human beings to hand-transmitted vibration are desirable. Further information is contained in annex F.

## 1 Scope

This part of ISO 5349 specifies general requirements for measuring and reporting hand-transmitted vibration exposure in three orthogonal axes. It defines a frequency weighting and band-limiting filters to allow uniform comparison of measurements. The values obtained can be used to predict adverse effects of hand-transmitted vibration over the frequency range covered by the octave bands from 8 Hz to 1 000 Hz.

This part of ISO 5349 is applicable to periodic and to random or non-periodic vibration. Provisionally, this part of ISO 5349 is also applicable to repeated shock type excitation (impact).

NOTE 1 The time dependency for human response to repeated shocks is not fully known. Application of this part of ISO 5349 for such vibration is to be made with caution.

This part of ISO 5349 provides guidance for the evaluation of hand-transmitted vibration exposure, specified in terms of a frequency-weighted vibration acceleration and daily exposure time. It does not define limits of safe vibration exposure.

NOTE 2 Annex C is concerned with the approximate relative importance of various characteristics of the vibration exposure which are believed to produce health effects.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 5349. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 5349 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, *Vibration and shock — Vocabulary.*

ISO 5349-2, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 2: Practical guidance for measurement at the workplace.*

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

IEC 61260, *Electroacoustics — Octave-band and fractional-octave-band filters.*