

Mechanical vibration — Guidelines for the measurement and the assessment of human exposure to hand-transmitted vibration

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This British Standard, having been prepared under the direction of the General Mechanical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 January 1993

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National foreword

This Draft for Development has been prepared under the direction of the General Mechanical Engineering Standards Policy Committee and is the English language version of ENV 25349:1992 *Mechanical vibration — Guidelines for the measurement and the assessment of human exposure to hand-transmitted vibration*, published by the European Committee for Standardization (CEN). It is identical with ISO 5349:1986 published by the International Organization for Standardization (ISO). EN 25349:1992 was produced as a result of international discussion in which the UK took an active part.

The lifetime of a European Prestandard is first limited to three years. This applies also to this Draft for Development. After two years action will be taken requesting comments within six months on the future of the European Prestandard.

Following consideration of the comments received, the Prestandard will be confirmed, or given one extension in its present form for a further two years, or replaced, or withdrawn.

The future of this Draft for Development is bound to that of ENV 25349 and the Draft for Development will not be separately reviewed or developed.

This publication is not to be regarded as a British Standard.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ENV title page, pages 2 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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Descriptors: Vibration, measurements, measuring instruments, human body, human factor engineering, hand (anatomy), safety rules, work safety

English version

Mechanical vibration — Guidelines for the measurement and the assessment of human exposure to hand-transmitted vibration

(ISO 5349:1986)

Vibrations mécaniques — Principes directeurs pour le mesurage et l'évaluation de l'exposition des individus aux vibrations transmises par la main
(ISO 5349:1986)

Mechanische Schwingungen — Leitfaden zur Messung und Beurteilung der Einwirkung von Schwingungen auf das Hand-Arm-System des Menschen
(ISO 5349:1986)

This European Prestandard was approved by CEN on 1992-10-19 as a prospective standard for provisional application. The period of validity of this ENV is limited to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

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CEN

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

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Foreword

Following consideration of the result of a Primary Questionnaire among members, the CEN Technical Board decided in October 1991 to submit the International Standard

ISO 5349:1986, *Mechanical vibration — Guidelines for the measurement and the assessment of human exposure to hand-transmitted vibration*.

to the Formal Vote for approval as European Prestandard.

The result of the formal vote was positive.

The Technical Committee CEN/TC 231, Mechanical vibration and shock, is of the opinion that the International Standard ISO 5349:1986 shall be revised, especially to take into account the following:

- to check validity of dose-effect relationship in Annex A
- to better explain the differences between field measurements and type test measurements (see the Introduction to the European Prestandard)
- to study the possibility to include information on influence of factors such as mass of the machine, feed and grip forces, ergonomic design of the machine, etc.
- to propose a procedure to evaluate the exposure time.

According to the Common CEN/CENELEC Internal Regulations, the following countries are bound to announce this European Prestandard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Introduction to the European Prestandard

There are two primary reasons for measuring the vibration on hand held or hand guided machinery.

The first is to determine the vibration dose by combining the measured vibration accelerations with the time history over which the tool is used during a typical working day. The measured vibration values should be obtained in such a way as to represent in as realistic way as possible the actual working situation. They should be measured over a sufficient time period to allow a good average value to be measured representing the actual daily exposure. It may be necessary to use a number of transducer locations in order to take account of different vibration levels over the grip surface or handle. The vibration dose can then be converted to an equivalent level which would be considered to be constant over a reference period (e.g. 4 hours). This equivalent vibration value can then be used to evaluate the risk of damage due to the vibration exposure using agreed damage risk criteria.

The second reason would be to compare the vibrations from different tools or machinery or different models of the same tool. The machinery safety directive 89/392/EEC requires that measurements be made and values put into the instructions and sales literature if the values are greater than $2,5 \text{ ms}^{-2}$ and, if the value is lower than $2,5 \text{ ms}^{-2}$, that fact shall be stated.

The first measurements are called field measurements and the second are called type test measurements. Field measurements require accurate vibration measurements coupled with the appropriate time history and the result is very dependent on the particular process or way in which the tool is being used. This means that field measurements cannot be used to type test tools.

Type test measurements require accurate and reproducible measurements. It is essential that different laboratories obtain the same results within specified limits. This requires that the process or way in which the tool or machinery is used during the measurement is precisely defined. Normally this process will be typical of the way the tool or machine is used in practice. Unfortunately in some cases, in order to obtain sufficient accuracy, an artificial process, which is not typical of the way the tool is used in the field, has to be used. Vibration magnitude in type tests should be within the range of measurements made in the field, but with less variability. It is clear that type test measurements cannot replace field measurements to assess vibration exposure at the workplace.

ENV 25349 defines the parameters and gives general guidance on how field measurements and assessment of risk may be made. In specific standards guidance will be given as to how to perform field tests for different types of machinery.

EN 28662-1 defines the general requirements that are needed for type test measurements and the tool specific parts of EN 28662 define precise methodologies for the type testing of specific tools.

0 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 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 the source of discomfort and possibly reduced proficiency. Continued, habitual use of many vibrating 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 exactly, either with respect to vibration intensity and frequency spectrum, or with respect to daily and cumulative exposure duration. In view of the complexity of the problem and the shortage of quantitative data concerning the occupational health effect of hand-transmitted vibration, it is difficult to propose a comprehensive method for assessing vibration exposure. However, based on the limited data available and on experience with current exposure conditions, the information proposed in this International Standard together with its annexes represents the best guidance available to protect the majority of workers against serious health impairment and to assist in the development of hand-operated tools the use of which will reduce the risk of disorders in man caused by vibrations.

The purpose of this International Standard is to further the gathering of consistent data in order to improve occupational safety. In particular, it is hoped that the data will serve to extend the present knowledge on the dose-effect relationship.