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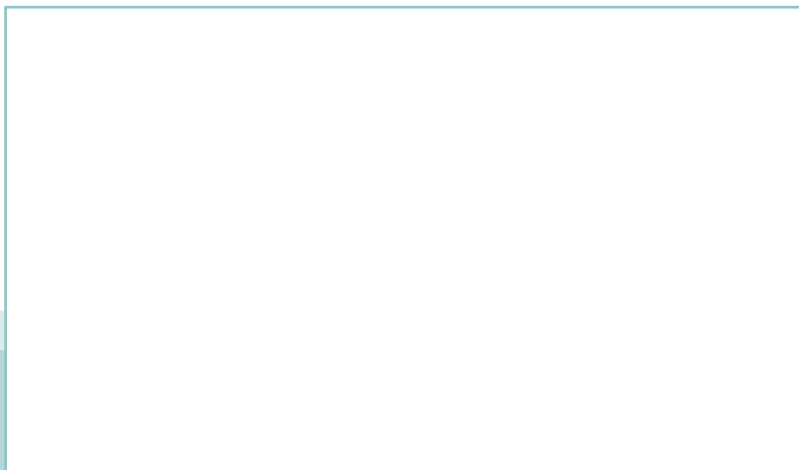
SS-EN ISO 5349-1



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Vibration och stöt – Mätning och bedömning av vibrationer som överförs till handen – Del 1: Allmänna riktlinjer (ISO 5349-1:2001)

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



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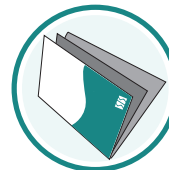
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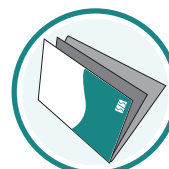
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Europastandarden EN ISO 5349-1:2001 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 5349-1:2001.

Denna standard ersätter SS-ENV 25349, utgåva 1 och SS-ISO 5349-1, utgåva 1.

The European Standard EN ISO 5349-1:2001 has the status of a Swedish Standard. This document contains the official English version of EN ISO 5349-1:2001.

This standard supersedes the Swedish Standard SS-ENV 25349, edition 1 and SS-ISO 5349-1, edition 1.

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 5349-1

August 2001

ICS 13.160

Supersedes ENV 25349:1992

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 individus aux vibrations transmises par la main - Partie 1: Exigences générales (ISO 5349-1:2001)

Mechanische Schwingungen - Messung und Bewertung der Einwirkung von Schwingungen auf das Hand-Arm-System des Menschen - Teil 1: Allgemeine Anforderungen (ISO 5349-1:2001)

This European Standard was approved by CEN on 10 May 2001.

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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 Management Centre has the same status as the official versions.

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Foreword

The text of the International Standard from Technical Committee ISO/TC 108 "Mechanical vibration and shock" of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 231 "Mechanical vibration and shock", the secretariat of which is held by DIN.

This European Standard replaces ENV 25349:1992.

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 February 2002, and conflicting national standards shall be withdrawn at the latest by February 2002.

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 5349-1:2001 has been approved by CEN as a European Standard without any modification.

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

SS-EN ISO 5349-1 (E)
ISO 5349-1:2001(E)**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.

Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration —

Part 1: General requirements

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*.

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this part of ISO 5349, the terms and definitions given in ISO 2041 apply.

NOTE For the convenience of users of this part of ISO 5349, a glossary of terms relating to medical conditions is given in annex B.

3.2 Symbols

In this part of ISO 5349, the following symbols are used.

$a_{hw}(t)$	instantaneous single-axis acceleration value of the frequency-weighted hand-transmitted vibration at time t , in metres per second squared (m/s^2);
a_{hw}	root-mean-square (r.m.s.) single-axis acceleration value of the frequency-weighted hand-transmitted vibration, in metres per second squared (m/s^2);
a_{hw_x} , a_{hw_y} , a_{hw_z}	values of a_{hw} , in metres per second squared (m/s^2), for the axes denoted x , y and z respectively;
a_{hv}	vibration total value of frequency-weighted r.m.s. acceleration (sometimes known as the vector sum or the frequency-weighted acceleration sum); it is the root-sum-of-squares of the a_{hw} values for the three measured axes of vibration, in metres per second squared (m/s^2);
$a_{hv(eq,8h)}$	daily vibration exposure (8-h energy-equivalent vibration total value), in metres per second squared (m/s^2);
$A(8)$	a convenient alternative term for the daily vibration exposure $a_{hv(eq,8h)}$;
D_y	group mean total (lifetime) exposure duration, in years;
T	total daily duration of exposure to the vibration a_{hv} ;
T_0	reference duration of 8 h (28 800 s);
W_h	frequency-weighting characteristic for hand-transmitted vibration.

4 Characterization of hand-transmitted vibration

4.1 General considerations

The method specified in this part of ISO 5349 takes account of the following factors which are known to influence the effects of human exposure to hand-transmitted vibration in working conditions:

- the frequency spectrum of vibration;
- the magnitude of vibration;
- the duration of exposure per working day;
- the cumulative exposure to date.

Other factors which may influence the effects of vibration exposure, but for which standardized methods for reporting do not yet exist, are listed in annex D.

4.2 Measuring equipment for hand-transmitted vibration

4.2.1 General

Measurement of hand-transmitted vibration shall be undertaken using instrumentation conforming to the requirements of ISO 8041. This equipment shall be checked for correct operation before and after use. The calibration shall be traceable to a recognized standard maintained by an accredited laboratory.

4.2.2 Vibration transducers

The vibration transducer may be an accelerometer which may be designed to make general vibration measurements (for non-percussive tools) or may be specifically designed for large peak accelerations such as those produced by percussive tools.

The vibration transducers shall be able to withstand the range of vibration magnitudes and shall have stable characteristics. The dimensions of the transducers shall be such that they do not interfere with the operation of the machine and such that the location of the point of measurement can be identified.

ISO 5349-2 contains further guidance on the selection of transducers.

4.2.3 Location and orientation of transducers

The vibration transmitted to the hand shall be measured and reported for three directions of an orthogonal coordinate system such as defined in Figure 1.

For practical vibration measurements, the orientation of the coordinate system may be defined with reference to an appropriate basicentric coordinate system (see Figure 1) originating, for example, in a vibrating appliance, workpiece, handle or control device gripped by the hand (see ISO 8727 for further information).

The vibration in the three directions should preferably be measured simultaneously. Measurements made sequentially along each of the three axes are acceptable, provided the operating conditions are similar for all three measurements. The measurements shall be made on the vibrating surface as close as possible to the centre of the gripping zone of the machine, tool or workpiece. The location of the transducers shall be reported.

NOTE The vibration magnitude can vary considerably with position on the vibrating surface.

Further guidance on transducer positioning is given in ISO 5349-2.

4.2.4 Mounting of transducers

The transducers should be mounted rigidly. Further information on accelerometer mounting is given in ISO 5348 and ISO 5349-2. Practical guidance on mounting transducers in difficult situations (such as on resilient surfaces or where the vibration is impulsive), and on the use of hand-held adaptors, is also given in ISO 5349-2.