INTERNATIONAL STANDARD

ISO 20643

First edition
2005-01-15

AMENDMENT 1
2012-07-15

Mechanical vibration — Hand-held and hand-guided machinery — Principles for evaluation of vibration emission

Amendment 1: Accelerometer positions

Vibration mécanique — Machines tenues et guidées à la main — Principes pour l'évaluation d'émission de vibration

Amendement 1: Positions de l'accéléromètre

Reference number
ISO 20643:2005/Amd.1:2012(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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

Amendment 1 to ISO 20643:2005 was prepared by Technical Committee ISO/TC 118, *Compressors and pneumatic tools, machines and equipment*, Subcommittee SC 3, *Pneumatic tools and machines*.

This amendment mainly concerns the subclauses 6.2, 6.4 and 7.2, regarding the accelerometer positions. In addition, related clauses have been modified accordingly.

Mechanical vibration — Hand-held and hand-guided machinery — Principles for evaluation of vibration emission

Amendment 1: Accelerometer positions

Page 2, Normative references

Replace "ENV 28041, *Human response to vibration — Measuring instrumentation (ISO 8041:1990)*" with the following:

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

Page 4, Clause 6

Replace the clause with the following:

6 Characterization of vibration

6.1 Direction of measurement

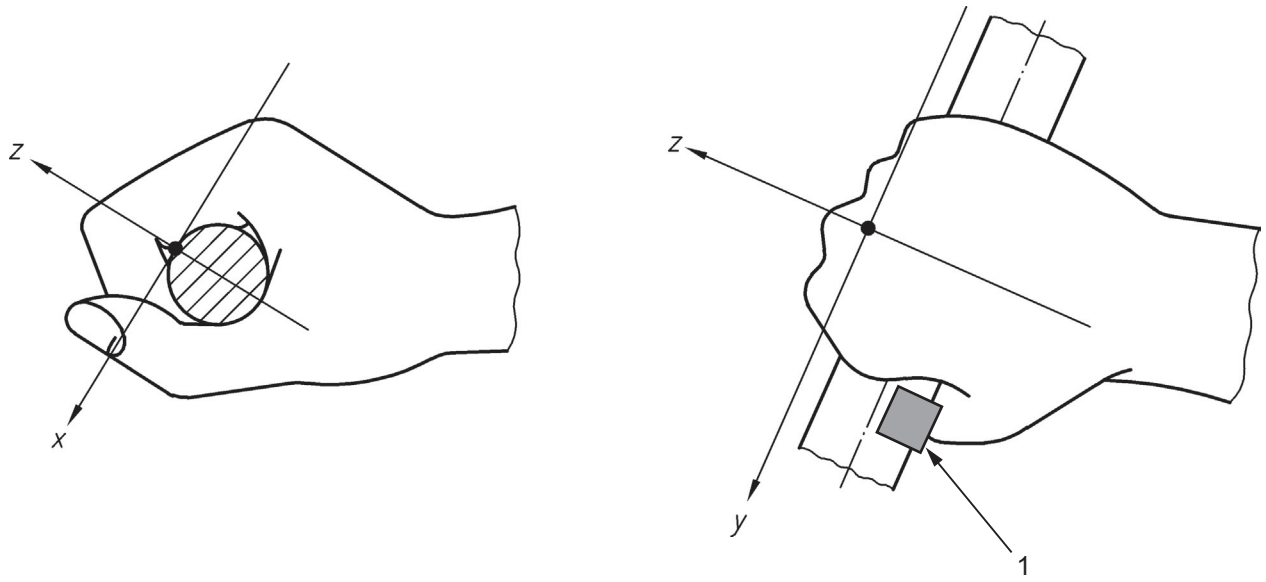
Translational vibration transmitted to the hand is related to the x, y or z directions shown in Figure 1. For a family of machinery, these directions of vibration measurement shall be defined in the vibration test code.

NOTE Other directions of vibration (e.g. rotational motion) are not dealt with in this document.

Where possible, measurements should be made simultaneously in three directions for each hand position.

If, in some cases, it is not possible due to technical reasons to make vibration measurements in three axes, the vibration test code may specify that measurements are made only in one or two axes, but the axis of greatest vibration shall be included (where this can be identified).

Measurements shall be carried out on the grip surface as close as possible to the hand between the thumb and the index finger at the grips or at such places where an operator normally holds the machine during a typical operation. The accelerometer shall not influence the normal gripping behaviour of the operators, as this will influence the vibration behaviour of the tool and, therefore, the measurements result.

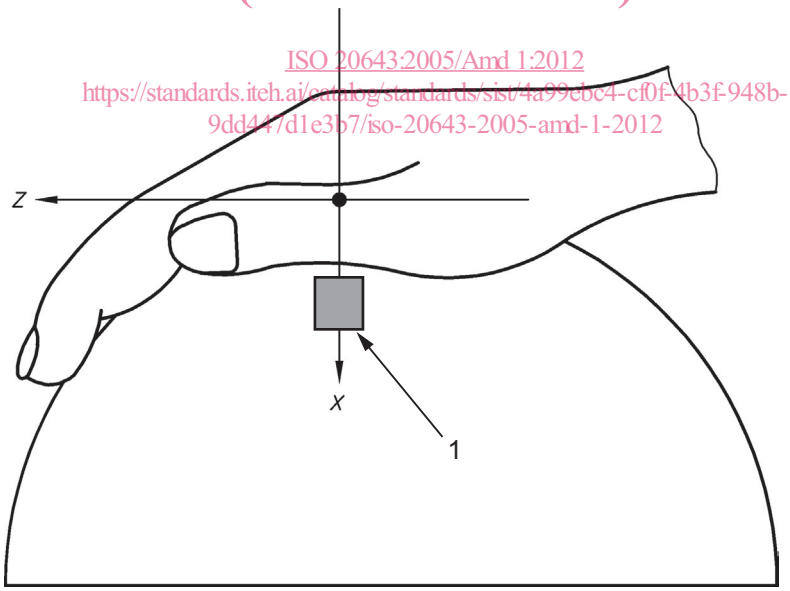


Key

1 accelerometer position

a) “Hand-grip” position (with accelerometer position)

(In this position, the hand grips a cylindrical hand grip.)



Key

1 accelerometer position

b) “Flat palm” position

(In this position, the hand presses down onto a spherical hand grip.)

Figure 1 — Directions of vibration measurement

6.2 Location of measurement

The specification for measurement positions shall be given in the vibration test code.

NOTE For practical reasons, the specified location of the transducers is not at the centre of the gripping zone, as recommended for workplace measurements in ISO 5349-1. The vibration test code can, therefore, give rise to over- or under-estimations of the vibration magnitude at the centre of the hand position.

When machines are operated with two hand grips, the vibration at both hand positions shall be measured and recorded. The measurements at both hand positions shall be carried out simultaneously whenever possible. Where it is necessary for the operator to hold the inserted tool in order to perform the expected work (e.g. in the cases of some chipping hammers), this is likely to be the hand position of greatest vibration and should be included in the evaluation of vibration emission. In such cases, a vibration emission value "greater than 30 m/s^2" shall be declared and measurement is not required.

EXAMPLE If a hammer is intended for use with a conventional chisel and this is in contact with the operator's hand in intended use, it is not usually practicable to measure the vibration on the chisel or bush. However, it is likely that the vibration at this hand position will be much greater than that measured on the hammer.

6.3 Magnitude of vibration

The quantity used to describe the magnitude of the vibration shall be the frequency-weighted acceleration a_{hw} in m/s^2.

The frequency weighting to be used is defined in 7.3.

The r.m.s. value a_{hw} in accordance with this document is defined as the r.m.s. value of the frequency-weighted acceleration signal $a_{hw}(t)$:

$$a_{hw} = \sqrt{\frac{1}{T}\int_0^T a_{hw}^2(t)\,dt} \tag{1}$$

Requirements for the integration time, T, are given in 7.4.

NOTE Frequency analysis is recommended in order to check the validity of the measurements and to provide additional information.

6.4 Combination of vibration directions

The vibration total value a_{hv} is determined from

$$a_{hv} = \sqrt{a_{hwx}^2 + a_{hwy}^2 + a_{hwz}^2} \tag{2}$$

where a_{hwx}, a_{hwy} and a_{hwz} are the r.m.s. values of the frequency-weighted acceleration in the x-, y- and z-direction, respectively.

If measurements cannot be made in all three directions, this shall be justified in the vibration test code. In this case, the value a_{hv} shall be determined using the measured dominant a_{hw} value(s) and a carefully considered multiplying factor. Where a multiplying factor is used to estimate the a_{hv}, its value shall be justified in the test code.

Page 7, 7.1 and 7.2

Replace the subclauses with the following:

7.1 General

The vibration measurement system shall be in accordance with ISO 8041.

Instrumentation for measuring other parameters (e.g. for controlling the working conditions), whose characteristics are not covered by ISO 8041, shall be specified in the vibration test code. The justification for use of such instrumentation shall be given, together with a detailed specification of the instrumentation.

7.2 Mounting of transducers

7.2.1 Specification of transducer

The vibration values as specified in 6.3 shall be measured using transducers and other appropriate measurement equipment conforming to ISO 8041.

The total mass of the vibration transducer and its mounting shall be small enough, compared with that of the tool, handle, etc. on which it is mounted, not to influence the measurement result.

NOTE This is particularly important for light-weight plastic handles (see ISO 5349-2 for further information).

Factors, such as the transverse sensitivity (less than 10 %), the ambient temperature range, the typical temperature transient sensitivity and the maximum shock acceleration, shall be considered in the selection of transducers.

7.2.2 Fastening of transducer

The transducer shall be rigidly attached to the vibrating surface. The accelerometer shall be attached as close as possible to the surface of the handle. If the distance of the accelerometer to the vibration surface is too large, the measurement result can be influenced by rotational movement of the machine.

Mechanical filters or other appropriate means may occasionally be needed to minimize measurement errors likely to occur when measuring vibration containing impulsive elements, such as occur in percussive tools.

NOTE 1 High acceleration in the high-frequency components of the vibration can cause the accelerometer to generate false signals (e.g. dc shift) in the frequency range of interest because of excitation of the resonance of the transducer itself.

NOTE 2 Guidance on the mounting of transducers and on the use of mechanical filters is given in ISO 5349-2.

Page 8, 7.6

In the second paragraph, replace “ENV 28041” with “ISO 8041”.

Page 8, 8.1

Replace the subclause with the following:

8.1 General

A vibration test code shall specify, precisely, the machine and its equipment and the operating parameters that have a significant influence on the vibration emitted by the machinery.

The operating conditions and working procedure shall be specified in as much detail as necessary to achieve appropriate reproducibility (see Annex C). Working procedures based on a typical real working

situation are preferred. The vibration test may simulate a single phase of a task or a working cycle, i.e. a set of operations where the operator is being exposed to vibration.

If the machinery is supplied with a feature, which can reduce the vibration emission in comparable operating conditions, this should be used, in accordance with the manufacturer's instructions, during vibration testing. If this requires a deviation from the type test method, this should be reported and explained.

Where possible, the vibration test code should be designed to reflect the efficiency and quality of the machine's performance where performing the defined tasks.

If, for reasons of better reproducibility, an artificial procedure is defined, the vibration source should produce approximately the same magnitude of vibration as that in a typical working situation.

Page 9, 8.5

Replace the subclause with the following:

8.5 Operator

The vibration of the machine is influenced by the operator. The operator shall, therefore, be skilled and able to operate the machine properly, which means that he/she shall be experienced in the use of the tool. The measurements shall be carried out with at least three operators. If it can be shown that the vibration is not affected by operator characteristics, the test code may permit measurements to be carried out with only one operator; the justification shall be stated in the test code. The vibration test code shall give the number and qualification of operators.

Page 11, Annex A, c)

Replace "if not covered by ENV 28041" with "if not covered by ISO 8041".