
**Hand-held portable power tools — Test
methods for evaluation of vibration
emission —**

**Part 11:
Stone hammers**

iTeh STANDARD PREVIEW
*Machines à moteur portatives — Méthodes d'essai pour l'évaluation de
l'émission de vibrations —
Partie 11: Casse-pierres*
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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

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Contents

Page

Foreword	iv
Introduction.....	vi
1 Scope	1
2 Normative references	1
3 Terms, definitions and symbols	1
3.1 Terms and definitions	2
3.2 Symbols.....	2
4 Basic standards and vibration test codes	2
5 Description of the family of machines	3
6 Characterization of vibration.....	4
6.1 Direction of measurement	4
6.2 Location of measurements.....	4
6.3 Magnitude of vibration	6
6.4 Combination of vibration directions.....	6
7 Instrumentation requirements	7
7.1 General	7
7.2 Mounting of transducers	7
7.3 Frequency weighting filter	7
7.4 Integration time.....	7
7.5 Auxiliary equipment.....	8
7.6 Calibration.....	8
8 Testing and operating conditions of the machinery.....	8
8.1 General	8
8.2 Operating conditions	8
8.3 Other quantities to be specified.....	9
8.4 Attached equipment, workpiece and task.....	9
8.5 Operator	11
9 Measurement procedure and validity.....	11
9.1 Reported vibration values	11
9.2 Declaration and verification of the vibration emission value	12
10 Test report.....	12
Annex A (informative) Model test report for vibration emission of stone hammers.....	14
Annex B (normative) Determination of uncertainty	16
Bibliography.....	18

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.

ISO 28927-11 was prepared by Technical Committee ISO/TC 118, *Compressors and pneumatic tools, machines and equipment*, Subcommittee SC 3, *Pneumatic tools and machines*.

This first edition of ISO 28927-11 cancels and replaces ISO 8662-14:1996, of which it constitutes a technical revision. The most important changes are **(standards.iteh.ai)**

- vibration measurement in three axes and at both hand positions,
- new transducer positions are used,
- definition of the transducer positions and orientation has been improved,
- needle scalers have been moved to a new part “Scaling hammers and needle scalers” (ISO 28927-9), and
- energy absorber has been deleted and all tools are tested on stone.

ISO 28927 consists of the following parts, under the general title *Hand-held portable power tools — Test methods for evaluation of vibration emission*:

- Part 1: *Angle and vertical grinders*¹⁾
- Part 2: *Wrenches, nutrunners and screwdrivers*²⁾
- Part 3: *Polishers and rotary, orbital and random orbital sanders*³⁾

1) Together with ISO 28927-4, replaces ISO 8662-4, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 4: Grinders*.

2) Replaces ISO 8662-7, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 7: Wrenches, screwdrivers and nut runners with impact, impulse or ratchet action*. All screwdrivers and nutrunners except for one-shot tools now covered.

3) Replaces ISO 8662-8, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 8: Polishers and rotary, orbital and random orbital sanders*.

- Part 4: Straight grinders⁴⁾
- Part 5: Drills and impact drills⁵⁾
- Part 6: Rammers⁶⁾
- Part 7: Nibblers and shears⁷⁾
- Part 8: Saws, polishing and filing machines with reciprocating action and small saws with oscillating or rotating action⁸⁾
- Part 9: Scaling hammers and needle scalers⁹⁾
- Part 10: Percussive drills, hammers and breakers¹⁰⁾
- Part 11: Stone hammers¹¹⁾
- Part 12: Die grinders¹²⁾

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- 4) Together with ISO 29827-1, replaces ISO 8662-4, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 4: Grinders*.
- 5) Replaces ISO 8662-6, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 6: Impact drills*. Non-impacting drills now covered.
- 6) Replaces ISO 8662-9, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 9: Rammers*.
- 7) Replaces ISO 8662-10, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 10: Nibblers and shears*.
- 8) Replaces ISO 8662-12, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 12: Saws and files with reciprocating action and saws with oscillating or rotating action*.
- 9) Together with this part of ISO 29827, replaces ISO 8662-14, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 14: Stone-working tools and needle scalers*.
- 10) To be published. Replaces ISO 8662-2, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 2: Chipping hammers and riveting hammers*, ISO 8662-3, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 3: Rock drills and rotary hammers*, and ISO 8662-5, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 5: Pavement breakers and hammers for construction work*. It also incorporates the Amendments ISO 8662-2:1992/Amd.1:1999, ISO 8662-3:1992/Amd.1:1999 and ISO 8662-5:1992/Amd.1:1999. Chipping and riveting hammers, rock drills and rotary hammers all covered.
- 11) Together with ISO 29827-9, replaces ISO 8662-14, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 14: Stone-working tools and needle scalers*.
- 12) Under preparation. Replaces ISO 8662-13, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 13: Die grinders*. It also incorporates the Technical Corrigendum ISO 8662-13:1997/Cor.1:1998.

Introduction

This document is a type-C standard as stated in ISO 12100.

When requirements of this type-C standard are different from those which are stated in type-A or -B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

The vibration test codes for portable hand-held machines given in ISO 28927 (all parts) are based on ISO 20643, which gives general specifications for the measurement of the vibration emission of hand-held and hand-guided machinery. ISO 28927 (all parts) specifies the operation of the machines under type-test conditions and other requirements for the performance of type tests. The structure/numbering of its clauses follows that of ISO 20643.

The basic principle for transducer positioning first introduced in the IEC 60745 series of European standards is followed, representing a deviation from ISO 20643 for reasons of consistency. The transducers are primarily positioned next to the hand in the area between the thumb and the index finger, where they give the least disturbance to the operator gripping the machine.

It has been found that vibrations generated by stone hammers vary considerably in typical use. For stone hammers, impacting action is the prime source of vibration. The variation is largely due to variations in the handling of the machine and the characteristics of the material to work on. Differences in the support of the material also cause differences in vibration. This part of ISO 28927 uses a working process where the machine is used to work on a stone surface. To improve reproducibility of the test, it is important that the material has good support and that inserted tools used are in good condition.

The values obtained are type-test values intended to be representative of the average of the upper quartile of typical vibration magnitudes in real-world use of the machines. However, the actual magnitudes vary considerably from time to time and depend on many factors, including the operator, the task and the inserted tool or consumable. The state of maintenance of the machine itself might also be of importance. Under real working conditions the influences of the operator and process can be particularly important at low magnitudes. It is therefore not recommended that emission values below 2,5 m/s² be used for estimating the vibration magnitude under real working conditions. In such cases, 2,5 m/s² is the recommended vibration magnitude for estimating the machine vibration.

If accurate values for a specific work place are required, then measurements [according to ISO 5349 (all parts)] in that work situation could be necessary. Vibration values measured in real working conditions can be either higher or lower than the values obtained using this part of ISO 28927.

Higher vibration magnitudes can easily occur in real work situations, caused by the use of excessively worn inserted tools.

The vibration test codes given in ISO 28927 (all parts) supersede those given in ISO 8662 (all parts), which has been replaced by the corresponding parts of ISO 28927 (see Foreword).

NOTE ISO 8662-11, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 11: Fastener driving tools*, could be replaced by a future part of ISO 28927.

Hand-held portable power tools — Test methods for evaluation of vibration emission —

Part 11: Stone hammers

1 Scope

This part of ISO 28927 specifies a laboratory method for measuring hand-transmitted vibration emission at the handles of hand-held stone hammers. It is a type-test procedure for establishing the magnitude of vibration in the gripping areas of a stone hammer when operated in laboratory conditions. It is intended that the results be used to compare different models of the same type of machine.

This part of ISO 28927 is applicable to engraving pens and stone hammers intended for use by stone masons (see Clause 5), driven pneumatically or by other means. It is not applicable to demolition hammers or to chipping hammers primarily intended for use on metal or in construction.

NOTE To avoid confusion with the terms "power tool" and "inserted tool", "machine" is used hereinafter for the former.

2 Normative references

[ISO 28927-11:2011](https://standards.iteh.ai/catalog/standards/sist/d4c3f61b-943f-4834-ae27-e60bffc2f22/iso-28927-11-2011)

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The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2787, *Rotary and percussive pneumatic tools — Performance tests*

ISO 5349, (all parts), *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration*

ISO 5391:2003, *Pneumatic tools and machines — Vocabulary*

ISO 17066, *Hydraulic tools — Vocabulary*

ISO 20643:2005, *Mechanical vibration — Hand-held or hand-guided machinery — Principles for evaluation of vibration emission*

EN 12096, *Mechanical vibration — Declaration and verification of vibration emission values*

3 Terms, definitions and symbols

For the purposes of this document, the terms and definitions given in ISO 5391, ISO 17066 and ISO 20643 and the following apply.

3.1 Terms and definitions

3.1.1

stone hammer

percussive machine for carving and chipping stone

NOTE Adapted form ISO 5391:2003, definition 2.2.6.

3.1.2

chisel

inserted tool with a straight edge, intended for carving stone

3.1.3

bush

inserted tool with teeth for levelling the surface of a stone workpiece and/or applying a pattern to the surface of the stone

3.1.4

bush hammering

mechanical process which produces textured surfaces

NOTE Textures vary from subtle to rough.

3.2 Symbols

Symbol	Description	Unit
a_{hw}	root-mean-square (r.m.s.) single-axis acceleration value of the frequency-weighted hand-transmitted vibration	m/s ²
a_{hv}	vibration total value of frequency-weighted r.m.s. acceleration, root sum of squares of the a_{hw} values for the three measured axes of vibration	m/s ²
$\overline{a_{hv}}$	arithmetic mean value of a_{hv} values of runs for one operator for one hand position	m/s ²
a_h	arithmetic mean value of $\overline{a_{hv}}$ values for all operators for one hand position	m/s ²
$\overline{a_h}$	arithmetic mean value of a_h values for one hand position on several machines	m/s ²
a_{hd}	declared vibration emission value	m/s ²
s_{n-1}	standard deviation for a test series (for a sample, s)	m/s ²
σ_R	standard deviation of reproducibility (for a population, σ)	m/s ²
C_v	coefficient of variation for a test series	
K	uncertainty	m/s ²

4 Basic standards and vibration test codes

This part of ISO 28927 is based on the requirements of ISO 20643 and corresponds to its structure in respect of clause subjects and numbering, except for the annexes.

Annex A presents a model test report and Annex B the means for determining the uncertainty, K .

5 Description of the family of machines

This part of ISO 28927 applies to stone hammers, which are usually pneumatically powered straight machines although some have a “D” handle or pistol grip handle. Some are fitted with spring-loaded sleeves to reduce vibration transmitted to the operator's hand. The chisel is generally not fixed in the hammer but held by the operator. Some chisels also have sleeves, attached either to the hammer or to the chisel with spring-loading to reduce vibration.

This part of ISO 28927 is applicable to hand-held power-driven portable stone hammers.

It is not applicable to demolition hammers or to chipping hammers primarily intended for use on metal or in construction.

Figures 1 to 3 show examples of stone hammers as specified in this part of ISO 28927. Figure 4 is an example of a sleeved chisel intended to be used when the chisel needs to be guided using the left hand.



Figure 1 — Straight hammer

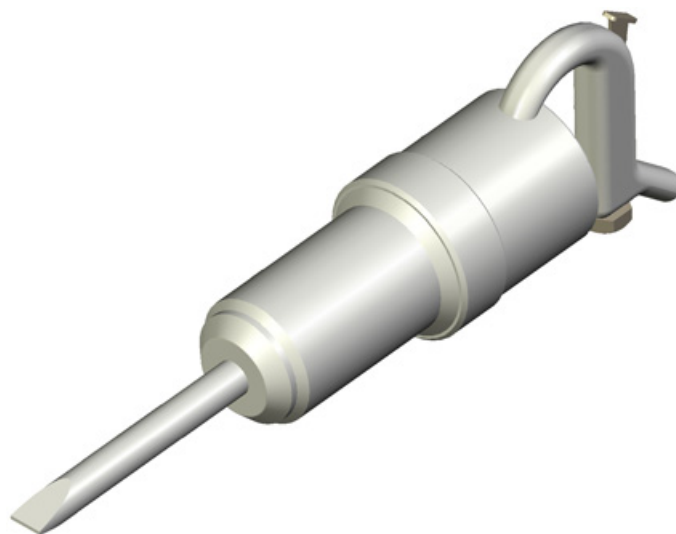


Figure 2 — Hammer with open or closed bow grip



Figure 3 — Pistol grip hammer



Figure 4 — Sleeved chisel

6 Characterization of vibration

6.1 Direction of measurement

The vibration transmitted to the hand shall be measured and reported for three directions of an orthogonal coordinate system. At each hand position, the vibration shall be measured simultaneously in the three directions shown in Figures 5 to 8.

6.2 Location of measurements

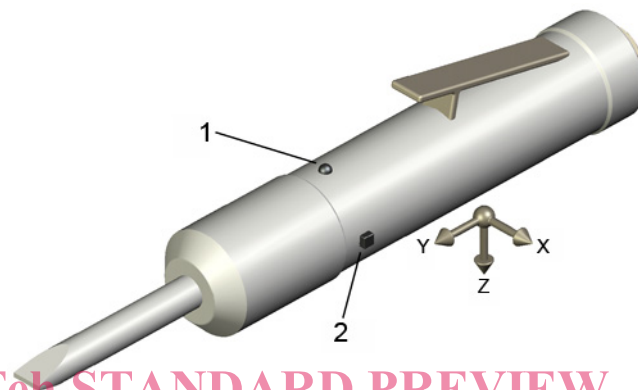
Measurements shall be made at the gripping zones, where the operator normally holds the machine and applies the feed force. For machines intended for one-handed operation, it is only necessary to measure at a single point.

The prescribed transducer location shall be as close as possible to the hand between the thumb and index finger. This shall apply to both hand positions, with the machine held as in normal operation. Whenever possible, measurements shall be made at the prescribed locations.

A secondary location is defined as being on the side of, and as close as possible to, the inner end of the handle where the prescribed location is found. If the prescribed location of the transducer cannot be used, this secondary location shall be used instead.

The prescribed or secondary locations shall also be used on anti-vibration handles.

Figures 5 to 8 show the prescribed and secondary locations and measurement directions for the hand positions normally used for the different types of machines in this family.



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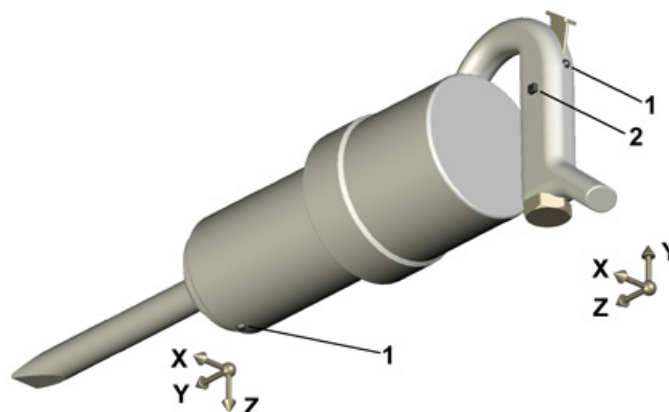
Key

- 1 prescribed location
- 2 secondary location

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Figure 5 — Straight hammer



Key

- 1 prescribed location
- 2 secondary location

Figure 6 — Hammer with open or closed bow grip