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

**Part 13:
Fastener driving tools**

*Machines à moteur portatives — Mesurage des vibrations au niveau
des poignées —*

Partie 13: Machines à enfoncer les fixations

ISO 28927-13:2022

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 118, *Compressors and pneumatic tools, machines and equipment*, Subcommittee SC 3, *Pneumatic tools and machines*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 231, *Mechanical vibration and shock*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 28927-13 cancels and replaces ISO 8662-11:1999 and ISO 8662-11:1999/Amd 1:2001, which have been technically revised. The main changes compared to the previous edition are as follows:

- vibration measurement in three axes and at both hand positions;
- new transducer positions;
- improved definition of transducer positions and orientation.

A list of all the parts in the ISO 28927-series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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 the 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. The 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 EN 60745 (all parts) 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.

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 will 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 $2,5 \text{ m/s}^2$ be used for estimating the vibration magnitude under real working conditions in such cases, $2,5 \text{ m/s}^2$ is the recommended vibration magnitude for estimating the machine vibration.

If accurate values for a specific workplace 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.

The vibration test codes given in the ISO 28927 (all parts) supersede those given in the ISO 8662 (all parts), whose parts have been replaced by the corresponding parts of ISO 28927.

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

Part 13: Fastener driving tools

1 Scope

This document specifies a laboratory method for measuring the vibration at the handle of fastener driving tools. It is a type test procedure for establishing the vibration value on the handle of a hand-held power tool operating under a specified load.

This document is applicable to fastener driving tools driven pneumatically or by other means, using nails, staples or pins.

This document is applicable to tools with single sequential actuation, contact actuation, contact actuation with automatic reversion or continual contact actuation (see [Figures 1 to 3](#)).

This document is not applicable to tools operating in full sequential mode due to their much longer intervals in between individual actuations. However, to provide an indication for comparison of different tools of this type (see [Figures 4 and 5](#)), [Annex C](#) provides informative guidance.

NOTE Today current knowledge does not allow any conclusions regarding physiological and pathological effects between isolated shocks and continuous shock sequences, and their repetition rates.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 5349-1:2001, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements*

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

ISO 17066:2007, *Hydraulic tools — Vocabulary*

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

ISO 20643:2005/Amd 1:2012, *Mechanical vibration — Hand-held and hand-guided machinery — Principles for evaluation of vibration emission – Amd 1: Accelerometer positions*

ISO 28927-5:2009, *Hand-held portable power tools — Test methods for evaluation of vibration emission — Part 5: Drills and impact drills*

ISO 28927-5:2009/Amd 1:2015, *Hand-held portable power tools — Test methods for evaluation of vibration emission — Part 5: Drills and impact drills – Amd 1: Feed force*

EN 12096:1997, *Mechanical vibration — Declaration and verification of vibration emission values*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5391:2003, ISO 17066:2007, ISO 20643:2005 and ISO 20643:2005/Amd 1, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

fastener driving tool

stapler

power tool for driving nails/staples with one or more strokes

3.2

single sequential actuation

actuation mode which allows single driving operations via the trigger, after the workpiece contact has been operated, and further driving operations are only performed after the trigger has been returned to the non-driving position whilst the workpiece contact remains in the operating position

3.3

contact actuation

actuation mode which allows the tool to operate by operating the workpiece contact whilst the trigger is continually depressed and held

3.4

contact actuation with automatic reversion

actuation mode that is capable of *contact actuation* (3.3) or *continual contact actuation* (3.5) and reverts to single-sequential actuation, full-sequential actuation, neutral or off if the trigger is depressed for a specified period of time without operation of the workpiece contact

3.5

continual contact actuation

actuation mode in which the driving operations continue as long as the trigger and the workpiece contact remain in their operating positions

3.6

full sequential actuation

actuation mode which allows single driving operations via the trigger after the workpiece contact has been operated and further driving operations are only performed after the trigger and the workpiece contact have been returned to the non-driving position

Note 1 to entry: See ISO 11148-13:2017, 3.2.6, 3.2.7, 3.2.8, 3.2.9 and 3.2.10.

4 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 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
$a_{hv,3s}$	is the time averaged weighted single event vibration value normalised to one operation each three seconds	m/s^2
$a_{hv,max}$	is the time averaged weighted single for maximum continuous operation	m/s^2

Symbol	Description	Unit
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	
N_{\max}	maximum possible drive sequence	1/s
K	Uncertainty	m/s ²

5 Basic standards and vibration test code

This document is based on the requirements of ISO 20643:2005 and ISO 20643:2005/Amd 1:2012 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 .

6 Description of the family of machines

This document applies to hand-held machines intended for fastener driving tools.

[Figures 1](#) to [5](#) show examples of typical fastener driving tools covered by this document.

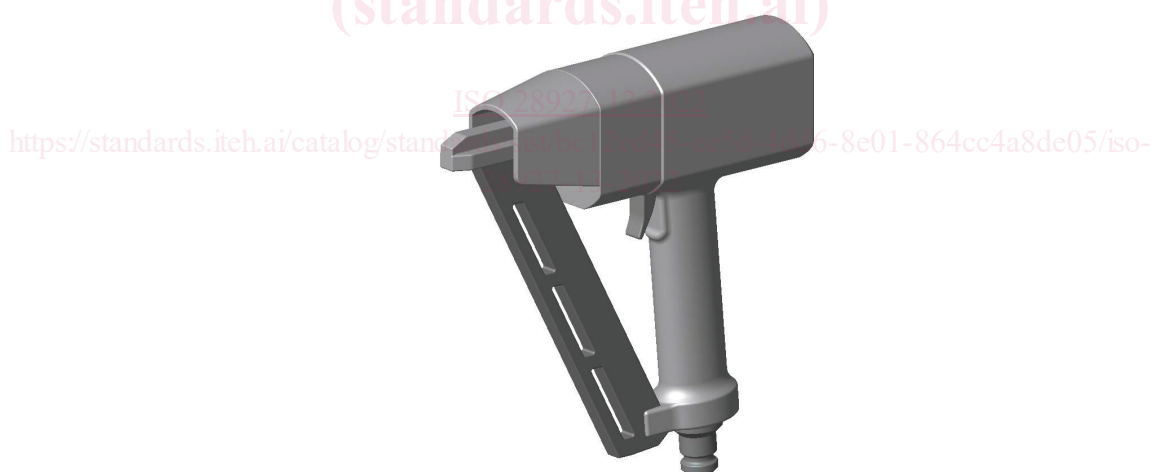


Figure 1 — Pneumatic fastener driving tool



Figure 2 — Battery fastener driving tool

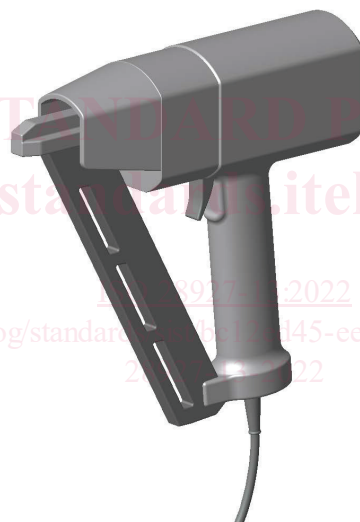


Figure 3 — Electric fastener driving tool

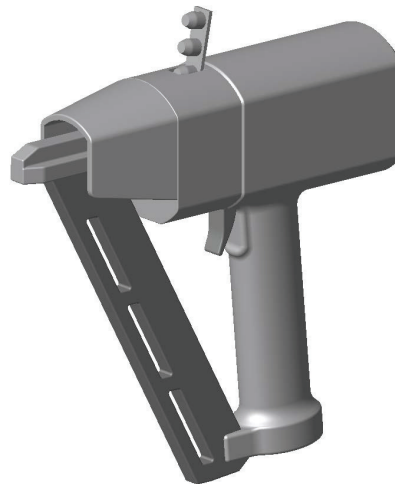


Figure 4 — Powder-driven (cartridges) fastener driving tool



Figure 5 — Gas fastener driving tool

7 Characterization of vibration

7.1 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 6 to 10](#).

7.2 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.