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

### **Part 2: Wrenches, nutrunners and screwdrivers**

*Machines à moteur portatives — Méthodes d'essai pour l'évaluation de l'émission de vibrations —*

*Partie 2: Clés, boulonneuses et visseuses*



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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.

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 28927-2 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 28927-2 cancels and replaces ISO 8662-7:1997, of which it constitutes a technical revision. The most important changes are

- vibration measurement in three axes and at both hand positions,
- new transducer positions,
- improved definition of transducer positions and orientation, and
- all types of screwdrivers and nutrunners, excepting one-shot nutrunners, now covered.

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*<sup>1)</sup>
- *Part 2: Wrenches, nutrunners and screwdrivers*
- *Part 3: Polishers and rotary, orbital and random orbital sanders*<sup>2)</sup>
- *Part 4: Straight grinders*<sup>3)</sup>

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

2) 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*.

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

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- *Part 5: Drills and impact drills<sup>4)</sup>*
- *Part 6: Rammers<sup>5)</sup>*
- *Part 7: Nibblers and shears<sup>6)</sup>*
- *Part 8: Saws, polishing and filing machines with reciprocating action and small saws with oscillating or rotating action<sup>7)</sup>*
- *Part 9: Scaling hammers and needle scalers<sup>8)</sup>*
- *Part 10: Percussive drills, hammers and breakers<sup>9)</sup>*
- *Part 11: Stone hammers<sup>10)</sup>*

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4) Replaces ISO 8662-6, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 6: Impact drills*. Non-impacting drills now covered.

5) Replaces ISO 8662-9, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 9: Rammers*.

6) Replaces ISO 8662-10, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 10: Nibblers and shears*

7) 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*

8) Together with Part 11, replaces ISO 8662-14, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 14: Stone-working tools and needle scalers*.

9) 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*. Chipping and riveting hammers, rock drills and rotary hammers all covered.

10) Together with Part 9, replaces ISO 8662-14, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 14: Stone-working tools and needle scalers*.

## 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 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 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 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 wrenches and nutrunners during tightening and unfastening of threaded fasteners vary considerably in typical use. For impact and impulse machines, this is largely due to misalignment between the machine and the fastener, to worn sockets or to the use of universal joints and angle heads. Owing to the very short tightening times in real use, the response times in the vibration measurement system used also become critical for the measurement results.

In order to provide a method that gives good measurement reproducibility, this part of ISO 28927 adopts a procedure for testing impact and impulse machines using a test device based on break blocks acting on the outer diameter of a test socket, and a free running test for other machines. The procedures of ISO 5349 are required whenever exposure at the workplace is to be assessed.

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 work place are required, then measurements (according to ISO 5349) 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 either misalignment between the machine and fastener, worn sockets or the use of universal joints or angle heads. The operator's hands ought never to be in contact with rotating parts such as the sockets or the extensions used.

The vibration test codes given in ISO 28927 supersede those given in ISO 8662, whose parts have 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*, and ISO 8662-13, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 13: Die grinders*, could be replaced by future parts of ISO 28927.