



BSI Standards Publication

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

Part 4: Straight grinders

National foreword

This British Standard is the UK implementation of EN ISO 28927-4:2010+A1:2018. It is identical to ISO 28927-4:2010, incorporating amendment 1:2018. It supersedes BS EN ISO 28927-4:2010, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment A1 is indicated by A1 A1.

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English Version

Hand-held portable power tools - Test methods for
evaluation of vibration emission - Part 4: Straight
grinders (ISO 28927-4:2010)

Machines à moteur portatives - Méthodes d'essai
pour l'évaluation de l'émission de vibrations -
Partie 4: Meuleuses droites (ISO 28927-4:2010)

Handgehaltene motorbetriebene Maschinen
- Messverfahren zur Ermittlung der
Schwingungsemission - Teil 4: Geradschleifer
ohne Spannzange (ISO 28927- 4:2010)

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European foreword

This document (EN ISO 28927-4:2010) has been prepared by Technical Committee ISO/TC 118 "Compressors and pneumatic tools, machines and equipment" in collaboration with Technical Committee CEN/TC 231 "Mechanical vibration and shock" the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by June 2011, and conflicting national standards shall be withdrawn at the latest by June 2011.

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

This document together with EN ISO 28927-1 supersedes EN ISO 8662-4:1995.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 28927-4:2010 has been approved by CEN as EN ISO 28927-4:2010 without any modification.

Foreword to amendment A1

This document (EN ISO 28927-4:2010/A1:2018) has been prepared by Technical Committee ISO/TC 118 "Compressors and pneumatic tools, machines and equipment" in collaboration with Technical Committee CEN/TC 231 "Mechanical vibration and shock" the secretariat of which is held by DIN.

This Amendment to the European Standard EN ISO 28927-4:2010 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2019, and conflicting national standards shall be withdrawn at the latest by June 2019.

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Endorsement notice

The text of ISO 28927-4:2010/Amd 1:2017 has been approved by CEN as EN ISO 28927-4:2010/A1:2018 without any modification.

Annex ZA (informative)

Relationship between this European Standard and the essential health and safety requirements of Directive 2006/42/EC aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/396 (Machinery) to provide one voluntary means of conforming to essential health and safety requirements of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in [Table ZA.1](#) confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential health and safety requirements of that Directive, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Annex I of Directive 2006/42/EC

Essential health and safety requirements of Directive 2006/42/EC	Clauses of this EN	Remarks/Notes
2.2.1.1. Instructions	Clauses 4, 5, 6, 7, 8, 9, 10, Annex B and Annex C.	None.

WARNING 1 Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

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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 28927-4 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 28927-4, together with [ISO 28927-1](#), cancels and replaces [ISO 8662-4:1994](#), of which it constitutes a technical revision. The most important changes are

- vibration measurement in three axes and at both hand positions;
- new transducer locations with improved definitions of the transducer positions and orientation are used;
- rotational speed is raised to no load free running speed;
- the test wheels are modified and the definition is improved.

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*
- *Part 2: Wrenches, nutrunners and screwdrivers* ¹⁾
- *Part 3: Polishers and rotary, orbital and random orbital sanders* ²⁾
- *Part 4: Straight grinders* ³⁾
- *Part 5: Drills and impact drills* ⁴⁾
- *Part 6: Rammers* ⁵⁾

1) 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.

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

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 7: Nibblers and shears* ⁶⁾
- *Part 8: Saws, polishing and filing machines with reciprocating action and small saws with oscillating or rotating action* ⁷⁾
- *Part 9: Scaling hammers and needle scalers* ⁸⁾
- *Part 10: Percussive drills, hammers and breakers* ⁹⁾
- *Part 11: Stone hammers* ¹⁰⁾
- *Part 12: Die grinders* ¹¹⁾

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 [ISO 28927-11](#) (to be published), replaces [ISO 8662-14](#), *Hand-held portable power tools — Measurement of vibrations at the handle — Part 14: Stone-working tools and needle scalers*.

9) 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.

10) To be published. Together with [ISO 28927-9](#), replaces [ISO 8662-14](#), *Hand-held portable power tools — Measurement of vibrations at the handle — Part 14: Stone-working tools and needle scalers*.

11) To be published. 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 8662-13:1999](#).

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 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 grinders vary considerably in typical use. The variation is largely due to the variances in the unbalance of the machine with the grinding wheel mounted. The unbalance also changes when the wheel is worn through the operation.

In order to provide a method that gives good measurement reproducibility, the procedure adopted in this part of ISO 28927 uses a test wheel of known unbalance mounted on a machine and run under no-load conditions. The unbalance for the different types of test wheels are chosen to give vibration values that are as far as possible in accordance with [ISO 20643](#). The procedures of ISO 5349 (all parts) are required whenever exposure at the workplace is to be assessed.

Underestimation of the vibration for machines equipped with technical means to automatically reduce unbalances is taken into account by multiplying the vibration values of such machines with a correction factor of 1,3. A_1 For grinders that are intended to be used with cupped wire-brushes, the vibration value is obtained by using a correction factor of 1,6. A_1

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 $2,5 \text{ m/s}^2$ 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 (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 unbalanced grinding wheels, worn flanges or bent spindles.

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 4: Straight grinders

1 Scope

This part of ISO 28927 specifies a laboratory method for measuring hand-transmitted vibration emission at the handles of straight grinders. It is a type-test procedure for establishing the magnitude of vibration in the gripping areas of a machine fitted with a specified test wheel and run under no-load conditions.

This part of ISO 28927 is applicable to hand-held machines (see [Clause 5](#)), driven pneumatically or by other means, intended for grinding and surface finishing using straight grinding wheels type 1, tapered wheels type 4 and cylindrical plugs, e.g. of type 16 (cylindrical plug, tapered cone), 18 (cylindrical plug, flat end), 18R (cylindrical plug, rounded end) and 19 (cylindrical plug, taper-roll shaped) A_1 and with wire brushes A_1 , for use on all kinds of materials. A_1 It is not applicable to die grinders where the inserted tool is mounted in a collet. A_1

NOTE 1 Typical machines covered by this part of ISO 28927 are illustrated in [Figures 1](#) to [3](#).

It is intended that the results be used to compare different models of the same type of machine.

NOTE 2 To avoid confusion with the terms “power tool” and “inserted tool”, “machine” is used hereinafter for the former.

2 Normative references

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 603-12:1999](#), *Bonded abrasive products — Dimensions — Part 12: Grinding wheels for deburring and fettling on a straight grinder*

[ISO 2787:1984](#), *Rotary and percussive pneumatic tools — Performance tests*

[ISO 4026:2003](#), *Hexagon socket set screws with flat point*

[ISO 4027:2003](#), *Hexagon socket set screws with cone point*

[ISO 4029:2003](#), *Hexagon socket set screws with cup point*

[ISO 5349-1:2001](#), *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements*

[ISO 5349-2:2001](#), *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 2: Practical guidance for measurement at the workplace*

[ISO 5391:2003](#), *Pneumatic tools and machines — Vocabulary*

[ISO 17066:2007](#), *Hydraulic tools — Vocabulary*