INTERNATIONAL STANDARD

ISO 8662-11

First edition
1999-06-01

AMENDMENT 1
2001-12-01

Hand-held portable power tools — Measurement of vibrations at the handle —

Part 11: Fastener driving tools

AMENDMENT 1

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

Partie 11: Machines à enfoncer les fixations

AMENDEMENT 1

Reference number
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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 3.

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 Amendment may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to International Standard ISO 8662-11:1999 was prepared by Technical Committee ISO/TC 118, *Compressors, pneumatic tools and pneumatic machines*, Subcommittee SC 3, *Pneumatic tools and machines*.

Hand-held portable power tools — Measurement of vibrations at the handle —

Part 11:
Fastener driving tools

AMENDMENT 1

Page 1, *clause 2, Normative references*

Correct the title of EN 792-13 to read:

EN 792-13, *Hand-held non-electric power tools — Safety requirements — Part 13: Fastener driving tools*.

Page 2, Figure 1

Figure 1 must show a transducer fixed to the hollow handle of the power tool and the transducer shall point upward. Therefore, replace the existing figure with the following:

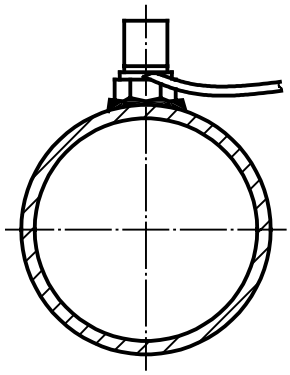

Figure 1 — Glueing of transducer

Page 3, subclause 6.1, second paragraph:

The usage of a threaded hose connector and secured with a hose clip is not in accordance with EN 792-13. For safety reasons, only quick-action connectors are allowed. Therefore replace

"via a threaded hose connector and secured with a hose clip" by

"via a quick-action connector".

Page 6, subclause 7.2, last line:

After "T is the integration time" add "in seconds".

Page 6, subclause 7.4, first line and first formula:

Make "V" in "CV" a subscript, so as to read:

"The variation coefficient of a test series, C_V, ..."

$$C_V = \frac{s_n - 1}{\bar{x}}$$

Page 11, Bibliography

Correct the title of EN 12549 to read:

EN 12549, *Acoustics — Noise test code for fastener driving tools — Engineering method*

ICS 13.160; 25.140.01

Price based on 2 pages

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Contents

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Foreword

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International Standard ISO 8662-11 was prepared by Technical Committee ISO/TC 118, *Compressors, pneumatic tools and pneumatic machines*, Subcommitttee SC 3, *Pneumatic tools and machines.*

ISO 8662 consists of the following parts, under the general title *Hand-held power tools — Measurement of vibrations at the handle*:

— *Part 1: General*

— *Part 2: Chipping hammers and riveting hammers*

— *Part 3: Rock drills and rotary hammers*

— *Part 4: Grinders*

— *Part 5: Pavement breakers and hammers for construction work*

— *Part 6: Impact drills*

— *Part 7: Wrenches, screwdrivers and nut runners with impact, impulse or ratchet action*

— *Part 8: Polishers and rotary, orbital and random orbital sanders*

— *Part 9: Rammers*

— *Part 10: Nibblers and shears*

— *Part 11: Fastener driving tools*

— *Part 12: Saws and files with reciprocating action and saws with oscillating or rotating action*

— *Part 13: Die grinders*

— *Part 14: Stone-working tools and needle scalers*

Annex A of this part of ISO 8662 is for information only.

Introduction

This part of ISO 8662 specifies a type test for the measurement of vibration (shocks) at the handles of fastener driving tools. It supplements ISO 8662-1, which gives the general specifications for measurement of vibration at the handles of hand-held portable power tools. It specifies the operation of the tool under type test and other requirements for the performance of the type test.

The principle of measurement in this part of ISO 8662 is intended to quantify vibration values for single events instead of continuous vibrations, such as vibrations from rotating and percussive tools, which is the case in most of the parts of ISO 8662. Fastener driving tools employ only a short-term operational mode, and measurements are made in order to give a value representing the vibration energy emitted during one operation. This is done by integrating the weighted acceleration from a counted number of operations during a known integration time. The result is presented as the measured vibration value normalized to one operation every three seconds.

This part of ISO 8662 is developed for type test measurements. As the effects of shock impact are not well known for the time being, results from measurements in accordance with this part of ISO 8662 are not suitable for risk assessment.

The principle of operation of these power tools is that energy is applied linearly to the loaded fastener for the purpose of driving it into a workpiece of defined material.

Influences of shock and its transmission to the hand-arm system during the use of fastener driving tools are determined by design, mass of the power tool, driving speed, handling, feed and gripping forces, density and solidity of the workpiece, as well as by the workpiece support.

Hand-held portable power tools — Measurement of vibrations at the handle —

Part 11:
Fastener driving tools

1 Scope

This part of ISO 8662 specifies a laboratory method for measuring the single-event vibration at the handle of fastener driving tools, where a single event is a mechanical shock or a series of individual shocks at intervals longer than 0,2 s. It is a type test procedure for establishing the vibration value in the handle of a hand-held power tool operating under a specified load.

NOTE Fastener driving tools are also referred to as nailers, pinners, tackers and staplers.

For fastener driving tools to which this part of ISO 8662 is applicable, the power required for operation can be supplied by pneumatic or hydraulic pressure, combustible gases in an internal combustion engine or from spring tension. The fastener driving tools may be actuated by single actuation, contact actuation or continuous actuation.

This part of ISO 8662 is applicable to fasteners comprising nails, staples, pins, corrugated fasteners, screws used as nails, dowels, sleeves, cable collars and base supports.

It is intended that the results of application of this part of ISO 8662 be used for comparing different models of the same type of power tool.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 8662. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 8662 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2787:1984, *Rotary and percussive pneumatic tools — Performance tests.*

ISO 8662-1:1988, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 1: General.*

EN 792-13, *Hand-held nonelectric power tools — Safety requirements — Part 13: Fastener driving tools — Definitions, safety requirements and verifications.*

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

3 Quantities to be measured

Quantities to be measured are as follows:

a) the time-averaged root-mean-square (r.m.s.) acceleration in accordance with ISO 8662-1:1988, 3.1 presented as a weighted acceleration in accordance with ISO 8662-1:1988, 3.3 and normalized to one operation every 3 s;

b) the pneumatic or hydraulic pressure or spring tension.

4 Instrumentation

4.1 General

The specifications for instrumentation given in ISO 8662-1:1988, 4.1 to 4.6 apply.

4.2 Transducer

The specification for the transducer given in ISO 8662-1:1988, 4.1 applies.

A single-component transducer should be used. For light handles, e.g. those made of plastic, care shall be taken not to load the handle with too large a mass when mounting the transducer. If the handle acts as a mechanical filter, then a light transducer may be glued to the surface; in this case the mass of the transducer including the connection cable should be less than 5 g.

4.3 Mechanical filter

A mechanical filter shall be used for vibration measurements on fastener driving tools, see ISO 8662-1:1988, 3.2.

The mechanical filter shall be in accordance with ISO 8662-1:1988, 4.2 and 4.3.

4.4 Fastening of transducer

Fastening of the transducer to the power tool shall be in accordance with ISO 8662-1:1988, 4.2, except that only glueing is acceptable. See Figure 1.

4.5 Auxiliary equipment

The supply air pressure shall be measured according to ISO 2787 using a precision-class pressure gauge. The hydraulic pressure or the spring tension shall be measured with the same accuracy as the air pressure.

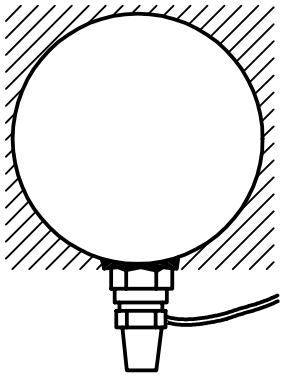


Figure 1 — Glueing of transducers

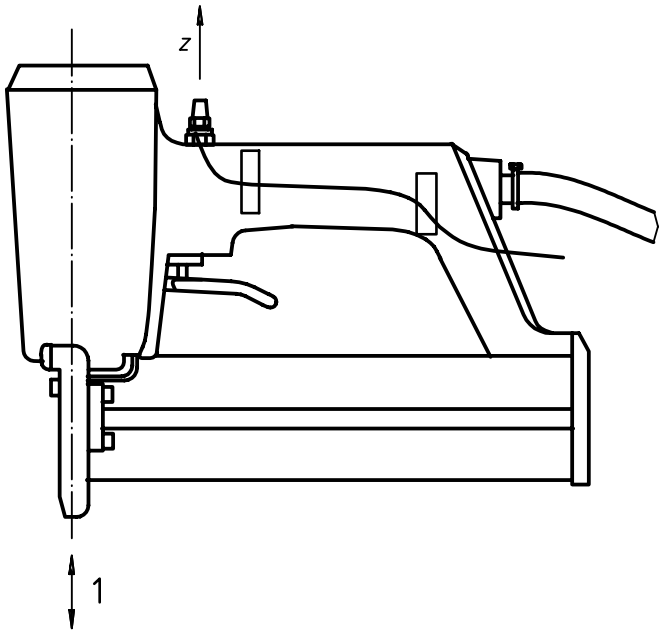
4.6 Calibration

Calibration shall be carried out in accordance with ISO 8662-1:1988, 4.8.

5 Measurement direction and measurement location

5.1 Measurement direction

Measurements shall be made in a direction parallel with the driving direction, normally the *z*-direction. See Figure 2.



Key

1 Driving direction

Figure 2 — Fastener driving tool — Measurement direction and position of transducer

5.2 Measurement location

Measurements shall be carried out on the handle from which the power tool is triggered, where the operator normally holds his hand.

The transducer shall be mounted as close as possible to the gripping area and be parallel to the driving direction. See Figure 2.

6 Working procedure

6.1 General

Measurements shall be carried out on a new, properly serviced and lubricated fastener driving tool.

During the test the power tool shall operate at rated pressure and be used in accordance with the manufacturer's specifications. For pneumatically driven tools, the air shall be supplied by a hose having a length of at least 2 m, which is attached to the power tool via a threaded hose connector and secured with a hose clip.

The fastener driving tool shall be operated perpendicularly to the workpiece.

A suitable feed force shall be applied to ensure stable and smooth operation of the power tool and to give rated performance in accordance with the manufacturer's specification.

During the test, the power tool shall be arranged so that the operator can have an upright, or almost upright, posture and work with his forearm and upper arm at an angle between 100° and 160°. The operator shall be able to hold the power tool comfortably during the test. See Figure 3.

For the measurements, a "single-actuation" trigger system as defined in EN 792-13 shall be used.

Deviations shall be stated in the test report.

NOTE 1 In accordance with EN 792-13, a "single-actuation" system is one in which the trigger needs to be actuated for each driving event.

NOTE 2 The working conditions for the test procedure are identical with those for noise measurement on fastener driving tools specified in EN 12549.

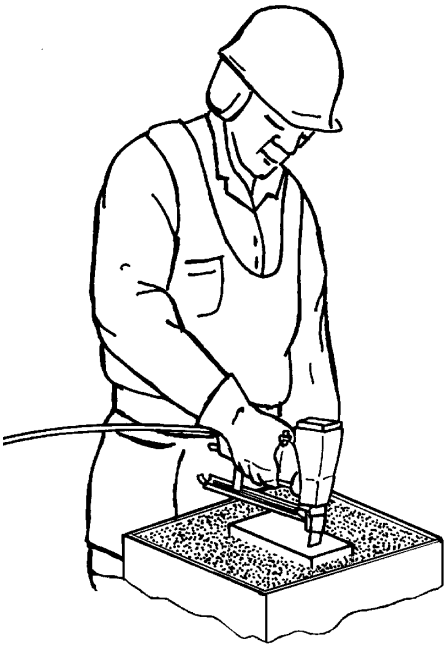


Figure 3 — Fastener driving tool — Working position of operator

6.2 Loading

During the measurement, the fastener driving tool shall operate with the largest fastener intended for the power tool.

The workpiece shall be made of pine wood, free from knots and with a straight grain. The average bulk density shall be 0,42 g/cm^3 to 0,48 g/cm^3 and the average wood humidity shall be (12 $\pm$ 3) %.

The thickness of the workpiece shall be at least 1,2 times the length of the longest fastener used. The point of insertion on the workpiece shall be at least 50 mm from the edge.

The workpiece shall be supported by a bed of dry sand, with the grain of the wood in a horizontal position and so that the surface of the workpiece is on a level with the top of the sand. The sand bed dimensions shall be at least 600 mm $\times$ 600 mm $\times$ 400 mm. The workpiece shall be surrounded on all sides with a sand layer which is at least 120 mm wide. The surface of the workpiece should be arranged so that the geometric centre of the fastener driving tool is positioned approximately 1 m above the floor. See Figure 4.

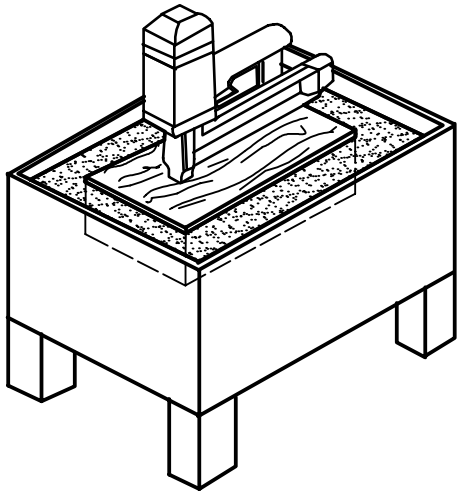


Figure 4 — Fastener driving tool — Test rig

6.3 Operating conditions

The pressure of compressed-air-operated fastener driving tools shall be adjusted so that the fasteners used are driven into the workpiece. Special cases shall be reported. The pressure used shall assure proper function of the fastener driving tool.

Non-compressed-air-operated fastener driving tools which are equipped with an impact force adjustment shall be regulated using this device.

The power supply shall be adjusted to ensure that:

— staples are driven flush to the surface;

— nails and pins are driven flush to the surface or countersunk up to 1 mm.

7 Measurement procedure and validity of measurements

7.1 Power supply

The pressure of pneumatically powered fastener driving tools or other data related to the power supply shall be measured and kept constant during the test procedure.

7.2 Performance of test

Three skilled operators shall each carry out one test series. A test series shall consist of at least five test runs. In each test run, stable operation shall be established.

Place the muzzle of the fastener driving tool against the workpiece.

Within a period of 30 s operate the fastener driving tool 10 times. Each operation shall comprise an isolated single actuation, without any tool movement caused by bumping.

Measure the time-averaged weighted vibration value, $a_{h,w}$, during this time. The result is equivalent to the mean value (of 10) of the time-averaged weighted single-event vibration values normalized to one operation every 3 s, $a_{h,w,3s}$.

If the measurements are made using a larger number of operations, n, or a longer integration time, T, the vibration value, $a_{h,w,3s}$, is calculated according to the following equation:

$$a_{h,w,3s} = a_{h,w}\sqrt{\frac{T}{3n}}$$

where

$a_{h,w}$ is the time-averaged weighted vibration value;

$a_{h,w,3s}$ is the time-averaged weighted single-event vibration value normalized to one operation every 3 s;

n is the number of operations;

T is the integration time.

7.3 Validity of test

Measurements shall be continued until a valid test series has been obtained, i.e. until the variation coefficient, see 7.4, of five consecutive weighted values is less than 0,15 or the standard deviation less than 0,30 m/s^2.

7.4 Coefficient of variation

The variation coefficient of a test series, CV, is defined as the ratio of the standard deviation, s_{n-1}, of a series of measurement values to the mean value $\overline{x}$ of the series:

$$CV = \frac{s_{n-1}}{\overline{x}}$$

where the standard deviation is

$$s_{n-1} = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(x_i - \overline{x}\right)^2}$$

and the mean value of the series is

$$\overline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

where

x_i is the i th value measured;

n is the number of measurement values.

7.5 Evaluation of results

The arithmetic mean value and the standard deviation of the measured values for each test series for each operator shall be calculated. The overall arithmetic mean value shall be calculated using the mean value obtained for each of the three operators. The overall arithmetic mean value shall be the basis for the declaration. The declared value shall take into account the spread in measurement and in production in accordance with EN 12096.

8 Test report

In addition to the information required in ISO 8662-1:1988, clause 7, the following information shall be given in the test report:

a) the type and dimensions of the fastener;

b) for compressed-air-operated fastener driving tools: operating pressure;

c) for non-compressed-air-operated fastener driving tools: typical value of the power supply and impact force adjustment.

A model test report is given in annex A.

Annex A
(informative)

Model test report for fastener driving tools

This test has been be carried out in accordance with ISO 8662-1, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 1: General,* and ISO 8662-11, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 11: Fastener driving tools.*

General

Tested by: ..... Reported by: .....

Date: .....

Power tool tested

Tool type: ..... Manufacturer: .....

Model No.:..... Serial No.:.....

Mass with filled magazine, kg: ..... Actuating system: .....

Driver length, exceeding the muzzle, mm:.....

Fastener driven

Staple: **Nail:**

Wire cross-section, mm^2:..... Shank diameter, mm: .....

Leg length, mm: ..... Nail length, mm: .....

Crown size, mm: ..... Shank type: smooth, ring, screw .....

Other: .....

Loading

Workpiece of pinewood, dimensions, mm: ..... Wood humidity, %: .....

Workpiece support, sand bed dimensions, mm:.....

Operating conditions

Pressure, kPa: ..... Feed force, N:.....

Impact force adjustment:.....

Measuring equipment

Accelerometer — manufacturer, type: .....

Accelerometer — mass, in g: .....

Mechanical filter — manufacturer, type: .....

Mechanical filter — mass, in g: .....

Amplifier — manufacturer, type: .....

Analyser — manufacturer, type: .....

Tape recorder — manufacturer, type: .....

Fastening of transducer and mechanical filter

Description of method for fastening of transducer and mechanical filter if any.

Signal processing

Type of signal integration and method of determining weighted acceleration.

Additional specifications

For the tape recorder, if used, report the correction factors per octave band or third octave band centre frequencies.

Report any other details, if applicable, concerning the measurement.

Results

The results shall be expressed as weighted values according to Tables 1 to 4:

Table 1 — Individual weighted single-event vibration values for Operator A

Test run	$m \cdot s^{-2}$
1	
2	
3	
4	
5	
Arithmetic mean value	
Variation coefficient	

Table 2 — Individual weighted single-event vibration values for Operator B

Test run	$m \cdot s^{-2}$
1	
2	
3	
4	
5	
Arithmetic mean value	
Variation coefficient	

Table 3 — Individual weighted single-event vibration values for Operator C

Test run	$m \cdot s^{-2}$
1	
2	
3	
4	
5	
Arithmetic mean value	
Variation coefficient	

Table 4 — Result

Single-event vibration value $m \cdot s^{-2}$	
Overall arithmetic mean value for three operators	

Bibliography

[1] EN 12549, *Acoustics — Noise emitted by machinery and equipment — Noise test code for fastener driving tools — Engineering method.*

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