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

Part 13: Die grinders

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

Partie 13: Meuleuses d'outillage

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Contents

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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.

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.

International Standard ISO 8662-13 was prepared by Technical Committee ISO/TC 118, *Compressors, pneumatic tools and pneumatic machines*, Subcommittee SC 3, *Pneumatic tools and machines*.

ISO 8662 consists of the following parts, under the general title *Hand-held portable 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 or random sanders*

— *Part 9: Rammers*

— *Part 10: Nibblers and shears*

— *Part 11: Fastener driving tools (nailers)*

— *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 how a type test for the measurement of vibration at the handle of portable die grinders shall be performed. It supplements ISO 8662-1, which gives the general specifications for the measurement of vibration at the handles of hand-held power tools. It specifies the operation of the tool under type test and other requirements for the performance of the type test.

It has been found that vibrations generated by a die grinder grinding on a workpiece vary considerably. The variance is partly due to differences in the unbalance of the die grinder together with its burr or mounted point. The unbalance also changes when the mounted point is used for grinding. In order to provide a method which gives good measurement reproducibility, the procedure adopted in this part of ISO 8662 uses a test device of known unbalance, mounted in a power tool and running free. Although the values measured are not obtained by grinding, there is a good correlation between the values obtained when the die grinder is running free at nominal working speed with a test device mounted and those obtained when grinding.

The principle of the operation of a die grinder is that the driving medium causes an output spindle to rotate. The spindle is adapted to carry a cutting or an abrasive device for material removal.

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

Part 13:
Die grinders

1 Scope

This part of ISO 8662 specifies a laboratory method for measuring the vibration at the handles of power-driven die grinders where the inserted tool is mounted in a collet. It is a type-test procedure for establishing the vibration value at the handles of the die grinder when fitted with a specified test device.

This part of ISO 8662 applies to die grinders which are pneumatically driven. A typical die grinder is shown in figure 1.

It is intended that the results be used to compare different models of the same power tool, i.e. those power tools intended to be used with the same burr or mounted point (same diameter and same maximum peripheral speed).

Dimensions in millimetres

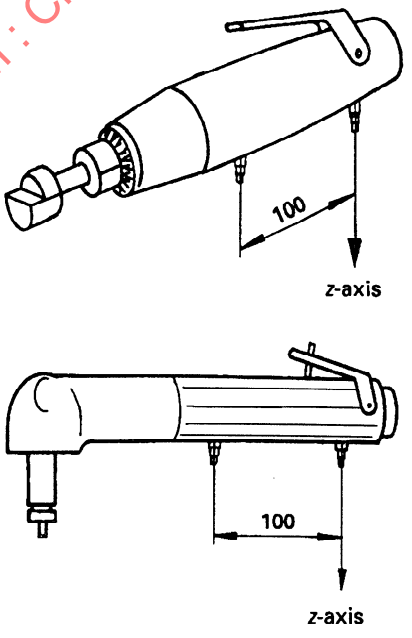


Figure 1 — Typical die grinders — Measurement direction and example of position of transducers

2 Normative references

The following standards provide provisions which, through reference in this text, constitute provisions of this part of ISO 8662. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this part of ISO 8662 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO 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.*

3 Quantities to be measured

Quantities to be measured are as follows:

a) the 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;

b) the air pressure;

c) the rotational frequency.

4 Instrumentation

4.1 General

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

4.2 Transducer

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

4.3 Mechanical filters

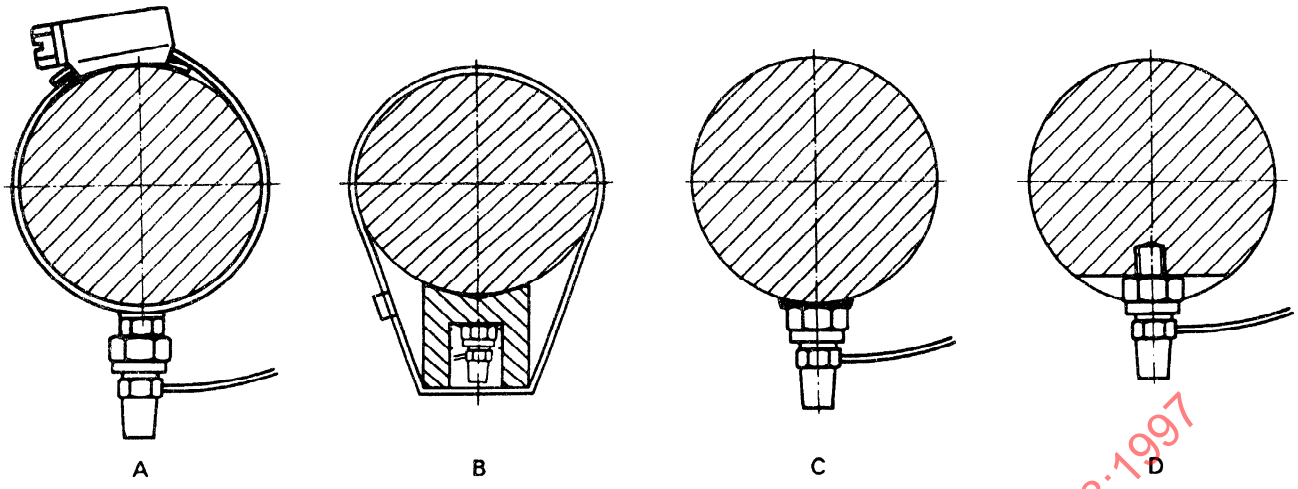
It is normally not necessary to use a mechanical filter for measurements in accordance with this part of ISO 8662 (see ISO 8662-1:1988, 4.3).

4.4 Fastening of the transducer

Fastening of the transducers on the power tool handle shall be in accordance with ISO 8662-1:1988, 4.2. Small transducers may be affixed by using a suitable adhesive wax on a flat surface. In all cases the fastening of the transducers shall be in accordance with the transducer manufacturer's instructions (see figure 2).

If the handle has a soft resilient cover, a clamp, on which the transducer is mounted, shall be tightened securely around it. Alternatively a special adaptor may be used, see ISO 8662-1:1988, 4.2.

NOTE — The test report should state the action taken, i.e. solid clamping or use of an adaptor.



The transducer may be mounted in four ways:

A: Using a hose clip to which a block is brazed or welded;

B: Using an adaptor to which the transducer is screwed; the adaptor is mounted with the use of plastic straps;

C: Using a suitable adhesive wax on a flat surface;

D: Grinding a flat surface and drilling and tapping a hole.

Figure 2 — Options for the fastening of transducers

4.5 Auxiliary equipment

The supply air pressure shall be measured using a precision class pressure gauge in accordance with ISO 2787.

The rotational frequency can be measured using a tachometer with an accuracy of at least ± 1 %. The rotational frequency can also be determined using the signal from the vibration transducer.

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 on the handle in one direction only, perpendicular to the rotational axis for straight die grinders and parallel to the output rotational axis for angle die grinders (see figure 1).

5.2 Measurement location

Measurements shall be made on the handle where the operator normally holds the power tool. For die grinders with a support handle, measurements shall be made at this handle as well.

The positions of the transducers shall be at the front of and behind the hand holding the power tool (see figure 1) and preferably attached to the underside of the handle. The distance between the transducers shall be 100 mm.

If the grip length is less than 100 mm, then the transducers shall be mounted at the extremities of the grip surface, and the positions noted in the test report.

The transducers shall be mounted perpendicularly to the surface of the handle even if the surface is not exactly perpendicular to the ideal axis described in 5.1. Deviations of ± 15° from this axis are acceptable. If the deviation is greater than ± 15° an appropriate block should be used.

6 Determination of working procedure

6.1 General

Measurements shall be carried out on a new, properly serviced and lubricated die grinder.

During the test, the die grinder shall be held as when grinding (see figure 3).

The weighted acceleration of die grinders using high-precision rotating files, measured in the process with the same transducer positions, is usually below 2,5 m/s^2. If claimed, this shall be shown.

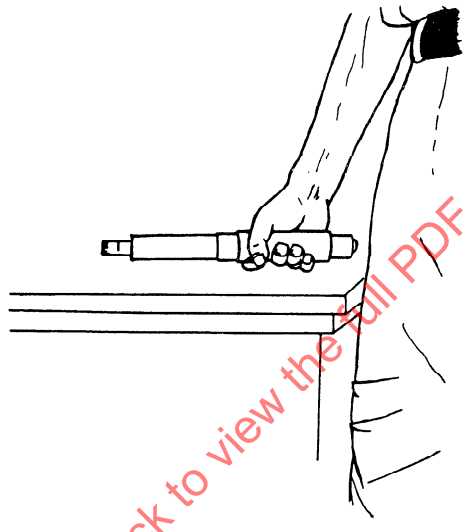


Figure 3 — Die grinder — Working position of operator

6.2 Operation of the die grinder

Pneumatic die grinders shall be supplied with air by a hose having a length of at least 2 m and be attached to the die grinder via a threaded hose connector.

Pneumatic die grinders shall be tested at nominal load frequency i.e. for

— ungoverned die grinders, 50 % ± 5 % of the rated no-load frequency;

— governed die grinders, 80 % ± 5 % of the rated no-load frequency.

The air pressure is adjusted to obtain the appropriate frequency. If the vibrational properties of the die grinder are influenced by the air pressure, the nominal load frequency shall be obtained by some other appropriate means which does not modify the internal unbalance of the die grinder.

For hand-held power tools designed with an isolating system, the no-load frequency is higher than when grinding. These tools thus shall be tested running free at the frequency marked on the dataplate of the tool. This frequency can be achieved by adjusting the inlet pressure. The test device shall be chosen corresponding to this test frequency.

6.3 Test device (inserted tool)

The test device (tool) to be mounted to the die grinder shall be made of steel of density (7 800 ± 20) kg/m^3. The specifications of the required tool are given in figure 4 and table 1. The tool shank diameter, d, shall be chosen to suit the die grinder tested.

6.4 Mounting of the test device (tool)

The shank of the tool shall be fully inserted, with no overhang. The tool shall be mounted with two rotational orientations, 180° apart. With the dimensional tolerances given in table 1, the unbalance, U, shall be within ± 4 % of the nominal value.

Table 1 — Dimensions of tools for die grinders

Test rotational frequency min^{-1}	*a* mm	*b* mm	*c* mm	*e* mm	*U* ± 4 % g · mm
4000 – 4899	20 ± 0,1	10 ± 0,5	17,7 ± 0,1	10 ± 0,1	92
4900 – 5999	18 ± 0,1	9 ± 0,5	16,1 ± 0,1	9 ± 0,1	61
6000 – 7299	16 ± 0,1	8 ± 0,5	15,4 ± 0,1	8 ± 0,1	41
7300 – 8999	14 ± 0,1	7 ± 0,5	15,1 ± 0,1	7 ± 0,1	27
9000 – 10999	12 ± 0,05	6 ± 0,5	16,0 ± 0,1	6 ± 0,05	18
11000 – 13399	11 ± 0,05	5 ± 0,5	13,9 ± 0,1	5,5 ± 0,05	12
13400 – 16399	10 ± 0,05	4 ± 0,5	12,6 ± 0,1	5 ± 0,05	8,2
16400 – 19999	9 ± 0,05	4 ± 0,5	11,6 ± 0,1	4,5 ± 0,05	5,5
20000 – 24499	8 ± 0,05	4 ± 0,5	11,1 ± 0,1	4 ± 0,05	3,7
24500 – 29999	7 ± 0,05	4 ± 0,5	11,2 ± 0,1	3,5 ± 0,05	2,5
30000 – 36999	6 ± 0,02	3 ± 0,3	8,5 ± 0,05	3 ± 0,02	1,2
37000 – 44999	5 ± 0,02	3 ± 0,3	6,6 ± 0,05	2,5 ± 0,02	0,54
45000 – 54999	4 ± 0,02	3 ± 0,3	4,3 ± 0,03	2 ± 0,02	0,18
55000 – 70000	4 ± 0,02	3 ± 0,3	2,9 ± 0,03	2 ± 0,02	0,12

Dimensions in millimetres

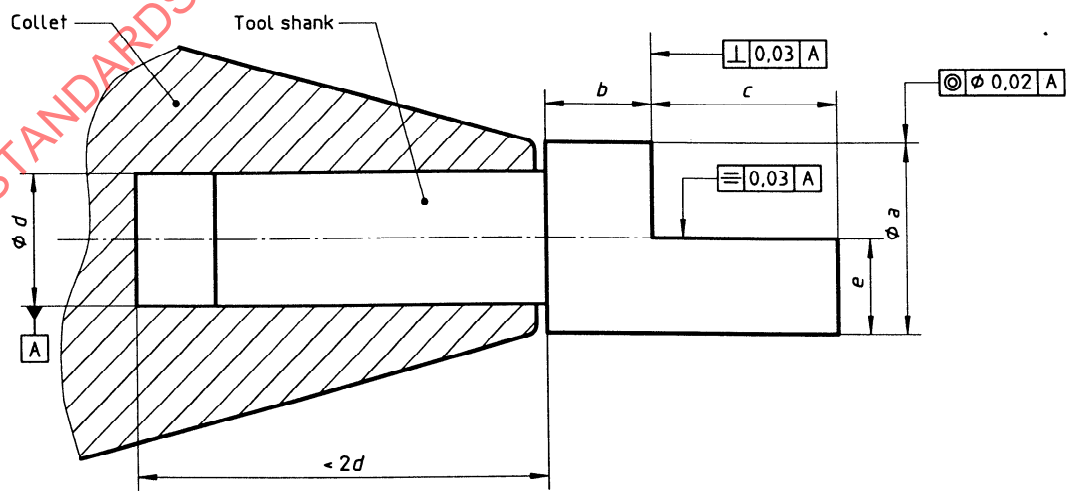


Figure 4 — Test device (inserted tool)

7 Measurement procedure and validity of measurements

7.1 Test procedure

7.1.1 Three different operators shall each carry out a series of two measurements in each orientation, by unfastening and then refastening the inserted tool (the measurements shall be made in the sequence 0°, 180°, 0°, 180°).

7.1.2 In addition, one measurement shall be made with the die grinder running free at the test rotational frequency with no tool inserted.

7.1.3 The time for each test run shall be such that, when stable operation has been established, the reading shall be carried out for no less than 8 s.

7.2 Validity of test

In order to validate the test sequence, the test shall be continued until the ratio between maximum and minimum values (for each transducer), obtained from measurements with the same orientation of the test tool, is less than 1,4.

7.3 Evaluation of results

The arithmetic mean of the four values for each transducer and for each operator shall be calculated. For throttle handle and support handle respectively, calculate the overall arithmetic mean values from the three operators. For each transducer position, calculate the overall arithmetic mean value using the mean value obtained for each of the three operators. The largest of these overall arithmetic mean values shall be the basis for the declaration.

8 Test report

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

a) the dimensions of the power tool;

b) the dimensions of the inserted tool;

c) the unbalance of the inserted tool;

d) the air pressure or other data concerning the energy source;

e) the rotational frequency;

f) the result of the vibration measurement (see 7.3).

A model test report is shown in annex A.