INTERNATIONAL STANDARD

ISO 8662-6

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

Part 6: Impact drills

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

Partie 6: Perceuses à percussion

Reference number
ISO 8662-6:1994(E)

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 8662-6 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 and random orbital sanders*

— *Part 9: Rammers*

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— *Part 10: Nibblers and shears*

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

— *Part 12: Saws and files with oscillating, reciprocating 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, which specifies a type test for the measurement of vibrations at the handles of impact drills, supplements ISO 8662-1 which gives general specifications for the measurement of vibrations at the handles of hand-held portable power tools. It specifies the operation of the tool under the type test and other requirements for the performance of the type test.

Impact drills are used for the drilling of materials having a compressive strength of up to 50 N/mm^2. The concrete wall chosen for the type test shall have a compressive strength of at least 40 N/mm^2. Thus the method chosen is almost identical with a typical work situation. It specifies well-defined operating conditions and thus gives satisfactory repeatability; it is economical, as small quantities of concrete are consumed, and due to the low production of dust it has little harmful influence on the measurement site.

These machines operate on the principle of a rotary cam lift mechanism which generates impacts that are transmitted to the outgoing shaft and drill bit. Impact drills are normally driven by electricity.

For impact drills the magnitude of the impact energy is determined by the feed force.

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

Part 6:
Impact drills

1 Scope

This part of ISO 8662 specifies a laboratory method of measuring the vibrations occurring at the handles of hand-held power driven impact drills. It is a type test procedure for establishing the magnitude of vibrations at the handles of impact drills operating under a specified load.

It is intended that the results can be used to compare different power tools or different models of the same type of power tool.

2 Normative references

The following standards contain 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 679:1989, *Methods of testing cements — Determination of strength.*

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 Quantity to be measured

The quantity to be measured is the acceleration, in accordance with ISO 8662-1:1988, 3.1, presented as a weighted acceleration in accordance with ISO 8662-1:1988, 3.3.

NOTE 1 The absence of d.c.-shift should be proved by frequency analysis or other means.

4 Instrumentation

4.1 General

For specifications concerning instrumentation, see ISO 8662-1:1988, 4.1 to 4.6.

4.2 Transducer

For specification of the transducer see ISO 8662-1:1988, 4.1.

NOTE 2 On a handle made of plastic, when the plastic itself functions as a mechanical filter, the total mass of transducer plus its mounting should be less than 5 g.

4.3 Fastening of transducer

Fastening of transducer and mechanical filter (see figure 1) shall be in accordance with ISO 8662-1:1988, 4.2. For plastic handles, a mechanical filter may not be necessary (ISO 8662-1:1988, 4.3).

Small transducers may be glued to a flat surface using a suitable adhesive. If the handle has a soft resilient cover, this shall be removed (ISO 8662-1:1988, 4.3).

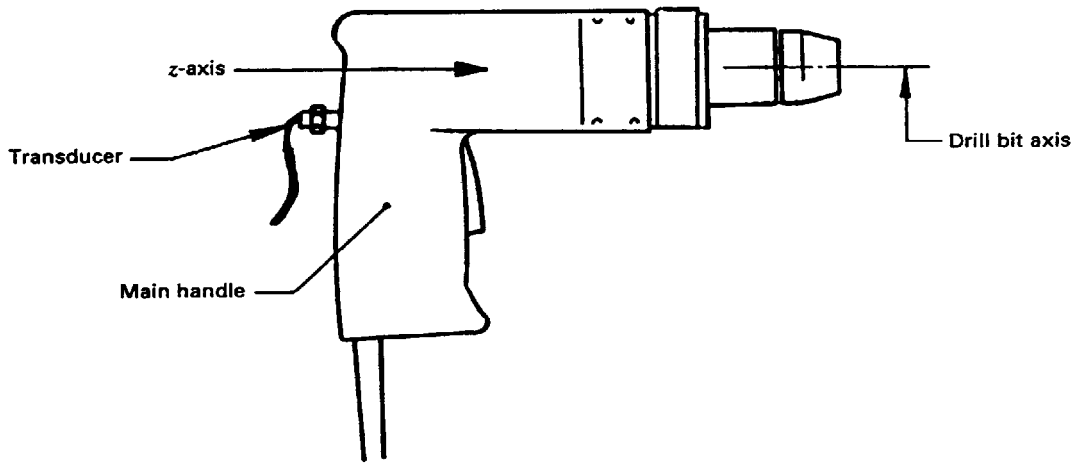

Figure 1 — Example of position and fastening of transducer and measurement direction

4.4 Auxiliary equipment

The supply voltage of electrically powered tools shall be measured using instruments reading out r.m.s. values.

The air or hydraulic pressure shall be measured using a manometer of precision class.

The horizontal feed force shall be measured with a suitable measuring device (see 6.3 and figure 2).

4.5 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 parallel with the drill bit axis, i.e. in the z-direction (see figure 1).

5.2 Measurement location

Measurements shall be made on the main handle, by which the operator normally holds the tool and on which he applies the feed force.

The transducer shall be placed as close as possible to the hand between the thumb and the index finger (see figure 1).

6 Determination of working procedure

6.1 General

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

During testing, the machine shall operate at rated power, i.e. rated voltage or rated pressure. It shall be used according to the manufacturer's specifications. The operation shall be stable and regular (see 6.3).

Performance data of the machine under test should be set so as to suit the characteristics of the drill bit used, as specified by the manufacturer (see 6.4).

For the purposes of the test, the workpiece shall be arranged so that the operator stands and operates the machine horizontally at right angles to the surface of the wall while performing the test (see figure 2).

6.2 Loading device

During measurement, the operator shall drill into a wall of non-reinforced concrete having a compressive strength of at least 40 N/mm^2 (after 28 days) and a maximum aggregate particle size of 4 mm. The strength of the wall shall be measured in accordance with ISO 679.

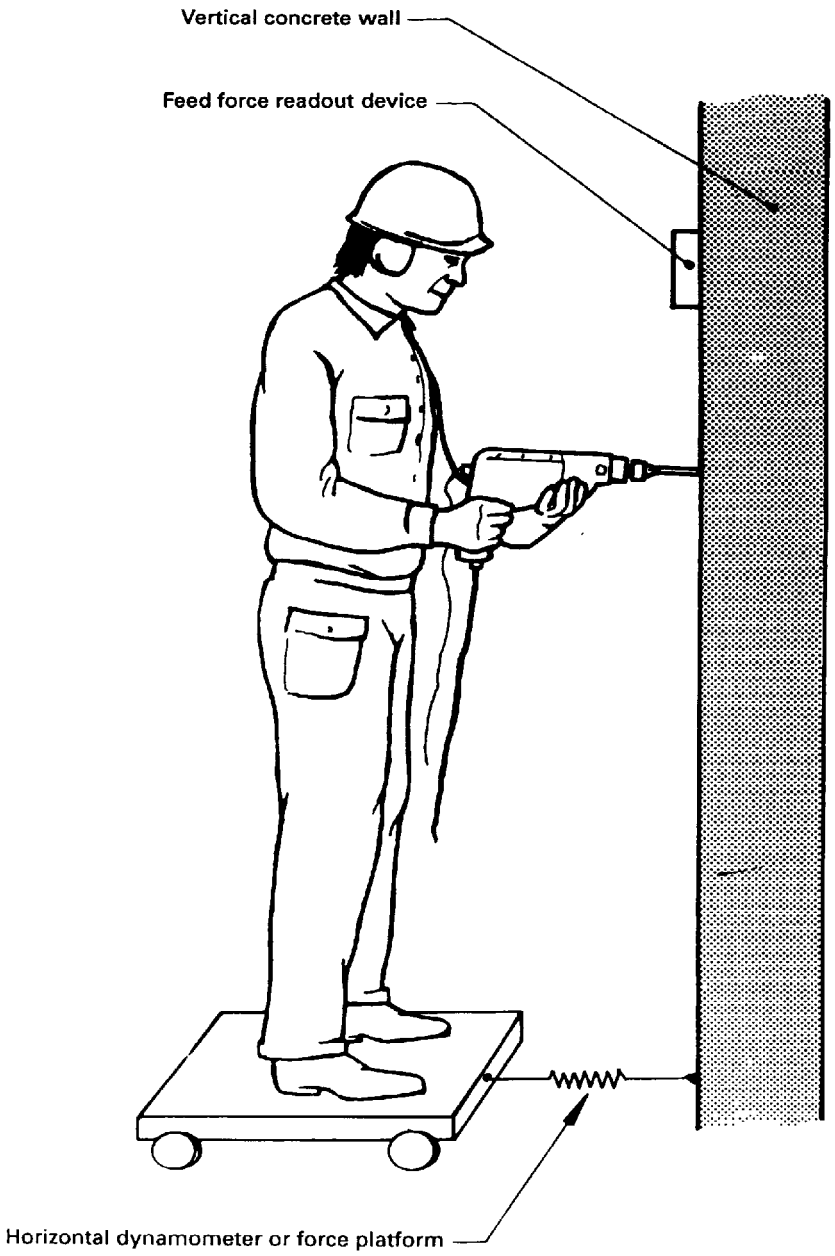

Figure 2 — Working position of operator

6.3 Feed force

The feed force shall ensure that the machine exhibits stable operation at its normal level of performance.

This is achieved by a feed force, F_A, which shall be maintained within the range 150 N to 180 N for all impact drills.

The feed force F_A must be controlled during the test and its value shall be displayed to the operator.

NOTE 3 Not only the feed force but also the grip force on the handle have a considerable influence on the vibration level, especially when the tool is very light weight. At present it is not possible to measure the grip force using simple means.

6.4 Drill bit

For the vibration test on impact drills, a new drill bit for concrete having a diameter of 8 mm and a working length of at least 80 mm shall be used.

7 Measurement procedure and validity of measurements

7.1 Power supply

The supply voltage of electrically powered machines shall be measured using instruments reading out r.m.s. values.

The air pressure of pneumatically powered machines shall be measured in accordance with ISO 2787 and maintained at the value specified by the manufacturer.

The blow frequency of the tool during measurement can be determined from the signal from the vibration transducer, using an electronic filter or other suitable means.

7.2 Test procedure

Three skilled operators shall each carry out one test series with the power tool to be tested. A test series shall consist of five test drillings.

The time necessary for drilling into the concrete wall can be established by experiment and shall be used during the test series. The time should be not less than 8 s.

The reading should begin when the drill bit has reached a depth of 10 mm and shall be of at least 8 s duration. The reading should stop after the bit has reached a depth which is 80 % of the usable drill bit length.

7.3 Validity of test

Measurements must be continued until a valid test series has been obtained, i.e. when the variation coefficient (see 7.4) of five consecutive weighted values is less than 0,15.

7.4 Variation coefficient

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

$$c_v = \frac{s_{n-1}}{\bar{x}}$$

The standard deviation is given by

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

and the mean value of the series by

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

where

n is the number of measurement values;

x_i is the ith value measured.

7.5 Expression of results

The result of the vibration measurement is the overall arithmetic mean value of acceleration calculated using the arithmetic mean values obtained by each of the three skilled operators.

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 diameter of the drill bit;

b) the length of the drill bit;

c) the supply voltage, air or hydraulic pressure or other data relating to the power supply;

d) the blow frequency and rotational speed of the drill;

e) the feed force;

f) the compressive strength of the concrete used in the test;

g) the result of the vibration measurement (see 7.5);

h) a sketch showing the position of the handles and the position of the accelerometers.

A model test report is shown in annex A.

Annex A
(informative)

Model test report for impact drills

The test has been carried out in accordance with ISO 8662-1:1988, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 1: General*, and ISO 8662-6:1994, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 6: Impact drills.*

General

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

Date: .....

Power tool tested

Type: ..... Manufacturer: .....

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

Mass, kg: .....

Inserted drill bit

Diameter, mm: ..... Length, mm: .....

Operating conditions

Blow frequency, Hz: ..... Pressure, bar, or voltage, V: .....

Feed force, N: ..... Time for test run, s: .....

Measuring equipment

Accelerometer — manufacturer, type: .....

Accelerometer — mass, g: .....

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

Mechanical filter — mass, 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

State the type of signal integration in the spectral analyser and the method of determining the weighted acceleration.

Additional specifications

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

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

NOTE — Examples of frequency analysis should be provided.

Results

The results shall be expressed as weighted values according to the following tables:

Individual weighted r.m.s. values — Operator A

Values in metres per second squared

Test run	Weighted value — Transducer position 1
1	
2	
3	
4	
5	
Arithmetic mean value:	
Standard deviation:	

Individual weighted r.m.s. values — Operateur B

Values in metres per second squared

Test run	Weighted value — Transducer position 1
1	
2	
3	
4	
5	
Arithmetic mean value:	
Standard deviation:	

Individual weighted r.m.s. values — Operator C

Values in metres per second squared

Test run	Weighted value — Transducer position 1
1	
2	
3	
4	
5	
Arithmetic mean value:	
Standard deviation:	

Overall arithmetic mean value: ..... m/s^2

ICS 13.160.00; 25.140.10

Descriptors: tools, power-operated tools, portable equipment, portable electric machine tools, percussive machines, drilling machines (tools), tests, vibration tests.

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