

Hand-held motor-operated electric tools — Safety —

Part 2-1: Particular requirements for drills and impact drills

BS EN
60745-2-1:2003

BS EN 60745-2-1:2003

National foreword

This British Standard is the official English language version of EN 60745-2-1:2003. It was derived by CENELEC from IEC 60745-2-1:2003. It supersedes BS EN 50144-2-1:2000 and BS EN 50260-2-1:2002 which will be withdrawn on 2005-12-01.

The CENELEC common modifications have been implemented at the appropriate places in the text and are indicated by a vertical line in the left margin of the text.

The UK participation in its preparation was entrusted by Technical Committee CPL/61, Safety of household and similar electrical appliances, to Subcommittee CPL/61/6, Portable motor operated tools, which has the responsibility to:

- aid enquirers to understand the text;
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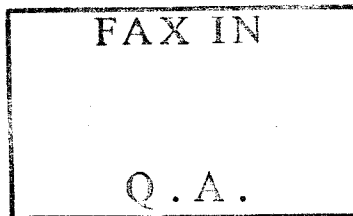
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English version

**Hand-held motor-operated electric tools -
Safety**
Part 2-1: Particular requirements for drills and impact drills
(IEC 60745-2-1:2003, modified)

Outils électroportatifs à moteurs -
Sécurité
Partie 2-1: Règles particulières
pour les perceuses
(CEI 60745-2-1:2003, modifiée)

Handgeführte motorbetriebene
Elektrowerkzeuge -
Sicherheit
Teil 2-1: Besondere Anforderungen
für Bohrmaschinen und
Schlagbohrmaschinen
(IEC 60745-2-1:2003, modifiziert)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of the International Standard IEC 60745-2-1:2003, prepared by SC 61F, Safety of hand-held motor-operated electric tools, of IEC/TC 61, Safety of household and similar electrical appliances, together with the common modifications prepared by the Technical Committee CENELEC TC 61F, Safety of hand-held and transportable motor-operated electric tools, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60745-2-1 on 2002-12-01.

This European Standard supersedes EN 50144-2-1:1999 and EN 50260-2-1:2002.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2004-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-12-01

In this standard the common modifications to the International Standard are indicated by a vertical line in the left margin of the text.

Other standards referred to in this European standard are listed in Clause 2. Clause 2 lists the valid edition of those documents at the time of issue of this EN.

This standard is divided into two parts:

- Part 1: General requirements which are common to most hand-held electric motor-operated tools (for the purpose of this standard referred to simply as tools) which could come within the scope of this standard;
- Part 2: Requirements for particular types of tools which either supplement or modify the requirements given in Part 1 to account for the particular hazards and characteristics of these specific tools.

This European Standard has been prepared under a mandate given to CEN and CENELEC by the European Commission and the European Free Trade Association and supports the essential health and safety requirements of the Machinery Directive.

Compliance with the clauses of Part 1 together with this Part 2 provides one means of conforming with the essential health and safety requirements of the Directive concerned.

CEN/TC 255 is producing standards for non-electric drills and tappers (EN 792-3) and for non-electric rotary percussive tools (EN 792-5).

Warning: Other requirements and other EC Directives can be applicable to the products falling within the scope of this standard.

This standard follows the overall requirements of EN 292-1 and EN 292-2.

This Part 2-1 is to be used in conjunction with EN 60745-1:2003. When this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly.

Subclauses and figures which are additional to those in Part 1 are numbered starting from 101.

Subclauses, tables and figures which are additional to those in IEC 60745-2-1 are prefixed "Z".

NOTE In this standard, the following print types are used:

- requirements: in roman type;
- test specifications: in italic type;
- notes: in smaller roman type.

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1 Scope

This clause of Part 1 is applicable, except as follows:

1.1 Addition:

This standard applies to drills and impact drills.

2 Normative references

This clause of Part 1 is applicable.

3 Definitions

This clause of Part 1 is applicable, except as follows:

Additional definitions:

3.101

drill

tool specifically designed to bore holes in various materials such as metal, plastics, wood, etc.

3.102

impact drill

drill specifically designed to bore holes in concrete, stone and other materials. It is similar, in appearance and construction, to a drill, but has a built-in percussion system which gives an axial percussion movement to rotating output spindle.

It may have a device for rendering the percussion system inoperative, so that it may be used as a conventional drill

4 General requirements

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable, except as follows:

5.5 Addition:

For drills which have both a mechanical means of setting different ranges of speed and an electronic means of setting the speed within a given range, the mechanical device is adjusted to the lowest range possible and the electronic device is adjusted to the highest setting within the given range.

6 Environmental requirements

This clause of Part 1 is applicable except as follows:

6.1.2.4 Modification:

Drills without an impact mechanism are suspended.

Impact drills are held by the operator for drilling vertically down in accordance with 6.1.2.5.

6.1.2.5 Modification:

Drills without impact mechanism are tested at no-load, all speed setting devices adjusted to the highest value.

For impact drills the speed setting shall be that recommended by the manufacturer for an 8 mm bit for drilling into concrete.

Impact drills are tested under load as shown in Figure Z101 and in accordance with the conditions shown in Tables Z101 and Z102.

Table Z101 — Concrete formulation (per cubic metre)

Cement	Water	Aggregate	
		1 450 kg	
		Particle size	Fraction (%)
450 kg	220 kg	0 to 0,25 mm	12 ± 3
		0 to 0,50 mm	50 ± 5
		0 to 1,00 mm	80 ± 5
		0 to 4,00 mm	100

Compressive strength after 28 days to be 40 N/mm².

Table Z102 — Test conditions for impact drills

Orientation	Drilling vertically down into a concrete block having the formulation specified in Table Z101 and having the minimum dimensions 500 mm x 500 mm and 200 mm in height and supported on resilient material. The concrete block, its support and the tool shall be so oriented that the geometric centre of the tool is 1 m above the reflecting plane. The centre of the concrete block shall be located under the top microphone.
Tool bit	8 mm drill bit for drilling in concrete with a usable length of approximately 100 mm
Feed force	150 N ± 30 N
Test cycle	Measurement starts when the drill bit has reached a depth of approximately 10 mm and stops when the depth has reached approximately 80 mm

6.2.2.4 Modification:

Drills and impact drills are tested under the conditions specified in 6.1.2.5.

7 Classification

This clause of Part 1 is applicable.

8 Marking and instructions

This clause of Part 1 is applicable, except as follows:

8.1 Addition:

Drills and impact drills shall be marked with the following:

- rated no-load speed in revolutions per minute.
- maximum capacity, in millimetres, of the chuck.

8.12.1 Addition:

The following additional warnings are given; if in English they shall be verbatim and if in any other official language they shall be equivalent.

- **Wear ear protectors with impact drills.** *Exposure to noise can cause hearing loss.*
- **Use auxiliary handles supplied with the tool.** *Loss of control can cause personal injury.*

9 Protection against access to live parts

This clause of Part 1 is applicable.

10 Starting

This clause of Part 1 is applicable.

11 Input and current

This clause of Part 1 is applicable.

12 Heating

This clause of Part 1 is applicable, except as follows:

12.2 Addition:

Tools are operated continuously with the impact mechanism, if any, disengaged, while the torque applied to the spindle is 80 % of the torque necessary to attain rated input or rated current.

12.3 Addition

The temperature-rise limit for the external enclosure does not apply to the enclosure of the hammer mechanism.

13 Leakage current

This clause of Part 1 is applicable.

14 Moisture resistance

This clause of Part 1 is applicable.

15 Electric strength

This clause of Part 1 is applicable.

16 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

17 Endurance

This clause of Part 1 is applicable, except as follows:

17.2 Replacement for impact drills:

Impact drills are operated intermittently with no load and, if the impact mechanism can be engaged and disengaged at will, the impact mechanism shall remain disengaged for 12 h at supply voltage equal to 1,1 times rated voltage and then for 12 h at a supply voltage equal to 0,9 times rated voltage. The speed is adjusted to the highest value of the highest range.

Each cycle of operation comprises an "on" period of 100 s and an "off" period of 20 s, the off periods being included in the specified operating time.

During the test, the tool is placed in three different positions, the operating time, at each voltage, being approximately 4 h for each position.

The tool may be switched on and off by means of a switch other than that incorporated in the tool.

During this test, replacement of the carbon brushes is allowed, and the tool is oiled and greased as in normal use.

The impact drills are then mounted vertically in a test apparatus as shown in Figure 101 and are operated at rated voltage or at the mean value of the rated voltage range, for four periods of 6 h each, the interval between these periods being at least 30 min; if the impact mechanism can be engaged and disengaged at will, the impact mechanism shall remain engaged.

During these tests, the impact drills are operated intermittently, each cycle comprising a period of operation of 30 s and a rest period of 90 s during which the tool remains switched off.

During the tests, an axial force, just enough to ensure steady operation of the impact mechanism, is applied to the impact drill through a resilient medium.

If the impact mechanism fails mechanically during the test without causing an accessible part to become live it may be replaced by a new one.

During these tests, overload protection devices shall not operate.

NOTE In general, external temperatures are to be monitored for the purpose of avoiding mechanical failure.

18 Abnormal operation

This clause of Part 1 is applicable.

19 Mechanical hazards

This clause of Part 1 is applicable, except as follows:

19.1 Addition:

Chuck keys shall be so designed that they drop easily out of position when released. This requirement does not exclude the provision of clips for holding the key in place when not in use; metal clips fixed to the flexible cable or cord are not allowed.

Compliance is checked by inspection and manual test

The key is inserted in the chuck and, without tightening, the tool is turned such that the key is facing down. The key shall fall out.

19.101 The force on the hand due to static stalling torque shall not be excessive.

Compliance is checked by the following test

Static stalling torque or slip torque of a clutch is measured on the locked output spindle of the tool in the cold condition (M_c).

The tool is connected to rated voltage. The mechanical gears are adjusted to the lowest speed. Electronic regulators are adjusted to their maximum speed setting. The tool switch is to be in the full "on" position. The mean value of the torque measured shall not exceed the relevant maximum value in Figure 102 and Figure 103.

20 Mechanical strength

This clause of Part 1 is applicable.

21 Construction

This clause of Part 1 is applicable, except as follows:

21.18 Addition

A switch lock-on device shall be located outside the grasping area, or so designed that it is not likely to be unintentionally locked on by the user's hand during intended left- or right-handed operation.

Compliance is checked by inspection or by a manual test.

A switch with a lock-on button in a recess within the grasping area shall not be actuated by a straight-edged utensil when the utensil is made to pass back and forth across the device in any direction. The straight-edged utensil may be of any convenient length sufficient to bridge the surface of the lock-on device and any surface adjacent to the lock-on device.

21.Z1 This clause of Part 1 is not applicable.

22 Internal wiring

This clause of Part 1 is applicable.

23 Components

This clause of Part 1 is applicable.

24 Supply connection and external flexible cords

This clause of Part 1 is applicable.

25 Terminals for external conductors

This clause of Part 1 is applicable.

26 Provision for earthing

This clause of Part 1 is applicable.

27 Screws and connections

This clause of Part 1 is applicable.

28 Creepage distances, clearances and distances through insulation

This clause of Part 1 is applicable.

29 Resistance to heat, fire and tracking

This clause of Part 1 is applicable.

30 Resistance to rusting

This clause of Part 1 is applicable.

31 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.

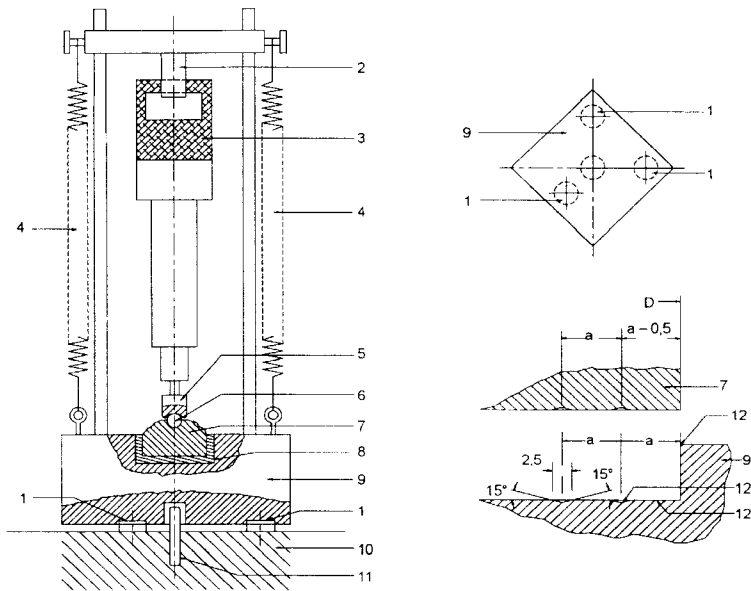


Figure 101 (continued)

Rated input of tool (W)	D Diameter of transfer plate mm	a Distance between centres of grooves mm	M ₁ Mass of steel base kg	M ₂ Mass of transfer plate kg	M ₃ Total mass of punch and shank kg
Up to and including 700	100	6,5	90	1,0	0,7
Over 700 up to and including 1 200	140	5,75	180	2,25	1,4
Over 1 200 up to and including 1 800	180	5,0	270	3,8	2,3
Over 1 800 up to and including 2 500	220	4,5	360	6,0	3,4

Figure 101 – Testing apparatus

Dimensions in millimetres

Key

- 1 Synthetic rubber disk or material having similar properties, shore hardness 70 deg. to 80 deg., thickness 10 mm, diameter 75 mm
- 2 Polyamide-lined yoke, adapted to suit the grip of the tool
- 3 Sample
- 4 Mechanical or pneumatic springs applying a force to the sample
- 5 Punch
- 6 Hardened steel ball with diameter 38 mm
- 7 Hardened steel transfer plate of mass M₂ and diameter D, grooved on underside as shown in detail
- 8 Synthetic rubber disk or material having similar properties, shore hardness 70 deg. to 80 deg., thickness 6 mm to 7 mm, fitting closely in cavity
- 9 Steel base at mass M₁, with circular cavity having a diameter 1 mm greater than that of the transfer plate, bottom of cavity grooved, as shown in detail
- 10 Concrete block supported by compacted ballast of earth
- 11 Steel peg to prevent any horizontal movement
- 12 Burnished surface and edge

NOTE When submitting a tool, the applicant may supply, if necessary, a suitable punch and shank, the total mass of which is less than that specified in the following table, for the steady operation of the impact mechanism.

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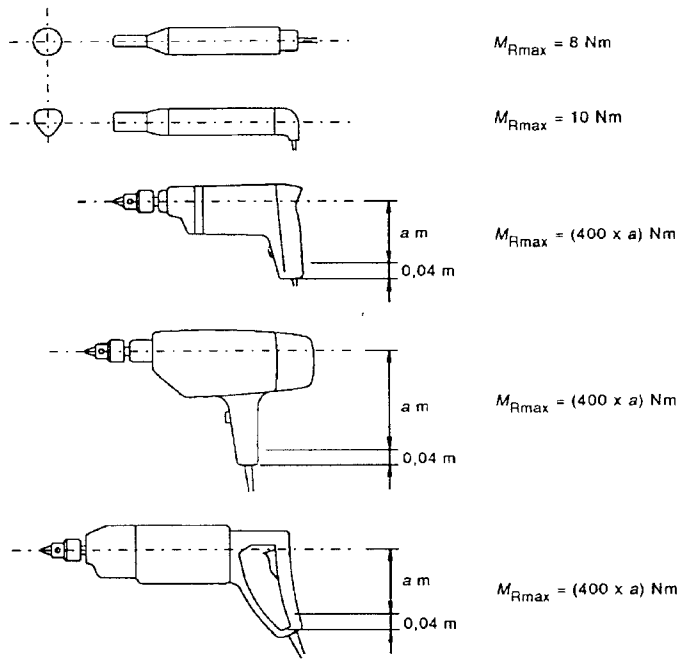


Figure 102 – Reaction torque of single-hand support

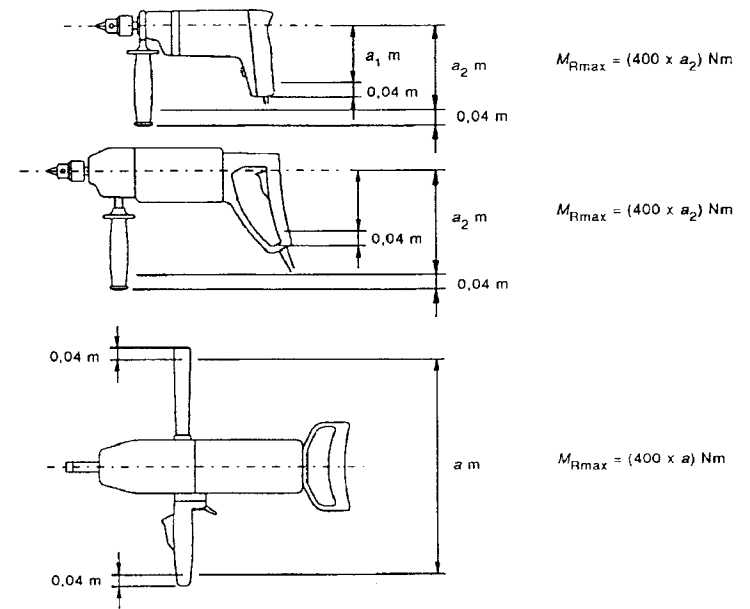


Figure 103 – Reaction torque of double-hand support

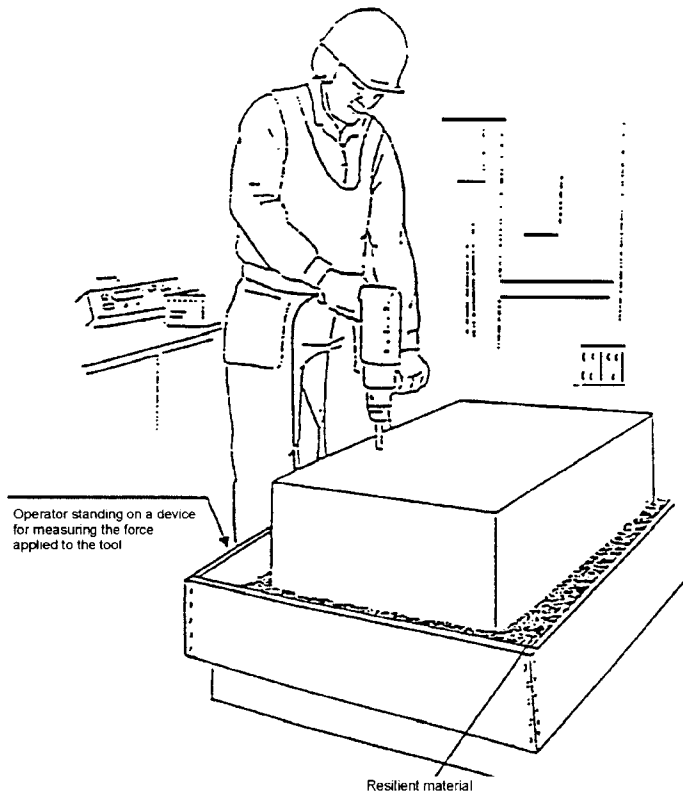


Figure Z101 — Application of load

Annexes

The annexes of Part 1 are applicable except as follows.

Annex K (normative)

Battery tools and battery packs

K.1.1 Addition:

All clauses of this Part 2 apply unless otherwise specified in this annex.

K.12.2 Replacement:

This subclause of Part 2 is not applicable.

K.17.2 Replacement:

This subclause of Part 2 is not applicable.

Annex L (normative)

Battery tools and battery packs provided with mains connection or non-isolated sources

L.1.1 Addition:

All clauses of this Part 2 apply unless otherwise specified in this annex.

Bibliography

The bibliography of Part 1 is applicable.

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