SLOVENSKI STANDARD
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SIST EN 60745-2-6:2003
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Električna ročna orodja - Varnost - 2-6. del: Posebne zahteve za kladiva (IEC 60745 -2-6:2003, spremenjen + A1:2006 + A2:2008)

Hand-held motor-operated electric tools - Safety - Part 2-6: Particular requirements for hammers (IEC 60745-2-6:2003, modified + A1:2006 + A2:2008)

Handgeführte motorbetriebene Elektrowerkzeuge - Sicherheit - Teil 2-6: Besondere Anforderungen für Hämmer (IEC 60745-2-6:2003, modifiziert + A1:2006 + A2:2008)

Outils électroportatifs à moteur - Sécurité - Partie 2-6: Règles particulières pour les marteaux (CEI 60745-2-6:2003, modifiée + A1:2006 + A2:2008)

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25.140.20 Električna orodja Electric tools

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EUROPEAN STANDARD

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English version

Hand-held motor-operated electric tools - Safety - Part 2-6: Particular requirements for hammers

(IEC 60745-2-6:2003, modified + A1:2006 + A2:2008)

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This European Standard was approved by CENELEC on 2010-02-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of the International Standard IEC 60745-2-6:2003, prepared by SC 61F (transformed into IEC TC 116, Safety of hand-held motor-operated electric tools) together with the common modifications prepared by the Technical Committee CENELEC TC 61F (transformed into TC 116), was submitted to the formal vote and was approved by CENELEC as EN 60745-2-6 on 2003-02-01.

A number of amendments to EN 60745-2-6 have since been voted on and published as amendments A1, A11, A2 and A12.

A further draft amendment (FprAD) including improvements to the vibration test code was submitted to the Unique Acceptance Procedure.

The combined texts were approved by CENELEC as a new edition of EN 60745-2-6 on 2010-02-01.

This European Standard supersedes EN 60745-2-6:2003 + A1:2006 + A11:2007 + A2:2009 + A12:2009.

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

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) 2011-02-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2013-02-01

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 2006/42/EC. See Annex ZZ.

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 rotary percussive drills (EN 792-5) and non-rotary percussive power tools (EN 792-4).

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 ISO 12100-1 and EN ISO 12100-2.

This Part 2-6 is to be used in conjunction with EN 60745-1:2009. 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.

Annexes, subclauses, tables and figures which are additional to those in IEC 60745-2-6 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.

Endorsement notice

The text of the International Standard IEC 60745-2-6:2003 + A1:2006 + A2:2008 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

2 Normative references

Replace the text by:

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

Additional normative references:

ENV 206:1990, *Concrete; performance, production, placing and compliance criteria*

3 Terms and definitions

Add:

3.Z101
concrete breakers and picks
heavy percussion hammers with a single impact energy greater than 20 J for demolition work and for breaking up concrete, rock and brickwork

3.Z102
chiselling hammers
light percussion hammers with a single impact energy less than or equal to 20 J for repair and installation work

6 Void

Replace by:

6 Environmental requirements

This clause of Part 1 is applicable except as follows:

6.1.2.2 Sound power level determination

Modification:

6.1.2.2.101 For concrete breakers and picks, the following applies:

The sound power level shall be measured according to EN ISO 3744, where the acoustic environment, instrumentation, quantities to be measured, quantities to be determined, and the measurement procedure are specified.

The sound power level shall be given as A-weighted sound power level in dB reference 1 pW. The A-weighted sound pressure levels, from which the sound power is to be determined, should be measured directly, and not calculated from frequency band data. Measurements shall be made in an essentially free field over a reflecting plane.

The sound power level shall be determined by using a hemispherical measurement surface according to Figure Z101. The location of the six microphone positions distributed on the surface of the hemisphere of radius *r* are listed in the form of Cartesian coordinates in Table Z101.

Table Z101 — Coordinates of the six microphone positions

Number of microphone	x/*r*	y/*r*	Mass of equipment < 10 kg Radius *r* = 2 m	Mass of equipment ≥ 10 kg Radius *r* = 4 m
			z	z
1	0,7	0,7	0,75 m	1,5 m
2	- 0,7	0,7	0,75 m	1,5 m
3	- 0,7	- 0,7	0,75 m	1,5 m
4	0,7	- 0,7	0,75 m	1,5 m
5	- 0,27	0,65	0,71 *r*	0,71 *r*
6	0,27	- 0,65	0,71 *r*	0,71 *r*

The A-weighted sound power level, L_{WA}, shall be calculated, in accordance with EN ISO 3744, Subclause 8.6, as follows:

$$L_{WA} = \overline{L_{pfA}} + 10\lg\left(\frac{S}{S_0}\right), \text{ in dB} \quad (1)$$

with $\overline{L_{pfA}}$ determined from

$$\overline{L_{pfA}} = 10\lg\left[\frac{1}{6}\sum_{i=1}^{6} 10^{0,1L'_{pA,i}}\right] - K_{1A} - K_{2A}$$

where

$\overline{L_{pfA}}$ is the A-weighted surface sound pressure level according to EN ISO 3744

$L'_{pA,i}$ A-weighted sound pressure level measured at the i-th microphone position, in decibels

K_{1A} Background noise correction, A-weighted

K_{2A} Environmental correction, A-weighted

S Area of the measurement surface, in m^2

S_0 = 1 m^2

Concrete breakers and picks shall be measured on a reflecting surface of concrete or non-porous asphalt. For open test sites with a hard, flat ground surface, such as asphalt or concrete, and with no sound-reflecting objects within a distance from the source equal to three times the greatest distance from the source centre to the lower measurement points, it is assumed that the environmental correction is less than or equal to 0,5 dB and therefore negligible.

For the hemispherical measurement surface, the area S of the measurement surface is calculated as follows:

$$S = 2\pi r^2, \text{ in } m^2. \quad (2)$$

where r is the radius of the hemisphere as given in Table Z101.

6.1.2.2.102 For chiselling hammers, 6.1.2.2 of Part 1 applies.

6.1.2.2.103 For rotary hammers, 6.1.2.2 of Part 1 applies.

6.1.2.4 Installation and mounting conditions of the power tools during noise tests

Modification:

6.1.2.4.101 Concrete breakers and picks are fixed in vertical position to the test equipment described in 6.1.2.5.101.

6.1.2.4.102 Chiselling hammers are held by the operator in vertical position using the test equipment described in 6.1.2.5.102.

6.1.2.4.103 Rotary hammers are held by the operator for drilling vertically down in accordance with 6.1.2.5.103.

6.1.2.5 Operating conditions

Modification:

6.1.2.5.101 Concrete breakers and picks

The hammer shall be coupled during the test run to a tool embedded in a cube-shaped concrete block placed in a concrete pit, sunk into the ground.

The block shall be in the shape of a cube 0,60 m ± 2 mm long at the edge and as regular as possible; it shall be made of reinforced concrete and thoroughly vibrated in layers of up to 0,20 m to avoid excessive sedimentation.

The quality of the concrete shall correspond to C 50/60 of ENV 206.

The cube shall be reinforced by 8 mm-diameter steel rods without ties, each rod being independent of the other; the design concept is illustrated in Figure Z102.

The support tool shall be sealed into the block and shall consist of a rammer of no less than 178 mm or no more than 220 mm diameter and a tool chuck component identical to that normally used with the appliance being tested. Its upper end protruding above the screening slab shall be sufficiently long to enable the practical test to be carried out, but, as indicated in Figure Z103, it shall not exceed 100 mm.

Suitable treatment shall be carried out to integrate the two components. The tool shall be fixed in the block so that the bottom of the rammer is 0,30 m from the upper face of the block (see Figure Z102).

The block shall remain mechanically sound, particularly at the point where the support tool and the concrete meet. Before and after each test, it shall be established that the tool sealed in the concrete block is integrated with it.

The cube shall be set in a pit cemented throughout, covered by a screening slab of at least 100 kg/m², as indicated in Figure Z103, so that the upper surface of the screening slab is flush with the ground. To avoid any parasitic noise, the block shall be insulated against the bottom and the sides of the pit by elastic blocks, the cut-off frequency of which shall not be more than half the striking rate of the appliance tested, expressed as strokes per second.

The opening in the screening slab through which the tool chuck component passes shall be as small as possible and sealed by a flexible sound-proof joint.

All speed setting devices shall be adjusted to the highest value.

The hammer is tested under load, connected to the support tool. The feed force applied to the hammer by an appropriate fixture in addition to its weight shall be just sufficient to ensure stable operation.

6.1.2.5.102 Chiselling hammers

All speed setting devices shall be adjusted to the highest value.

Chiselling hammers shall be tested under load applying the loading device shown in Figure Z104, which is mounted on a concrete block having the minimum dimensions specified in Table Z104.

The loading device shown in Figure Z104, which is made of steel, consists of a tube filled with hardened steel balls (ball bearings) on which a specially constructed test tool bit impacts. The parts of the fixture apart from the test tool shall be rigidly clamped to prevent additional vibration. The test tool bit rebound shall be restrained by means of a spring exerting just sufficient force to prevent “chattering”.

In order to minimise the noise from the loading device, the loading device shall be enclosed in an acoustically insulating box, see Figure Z105, which shall have an insulation effect of at least 10 dB in each octave band of interest. The upper end of the test tool protruding above the acoustically insulating box shall be sufficiently long to enable the practical test to be carried out, but, as indicated in Figure Z105, it shall not exceed 100 mm.

When using the loading device shown in Figure Z104, the force to be applied to the tool in addition to its weight shall be just sufficient to ensure stable operation.

6.1.2.5.103 Rotary hammers

For hammers with rotary action the speed setting shall be that recommended by the manufacturer for the drill bit size defined for the test for drilling in concrete.

Rotary hammers are tested under load as shown in Figure Z106 and in accordance with the conditions shown in Tables Z102, Z103 and Z104.

Table Z102 — Concrete formulation (per cubic metre)

Cement	Water	Aggregate [b]	
		1 844 kg	
		Particle size	Fraction %
330 kg [a]	183 l [a]	0 to 2 mm	38 ± 3
		0 to 8 mm	50 ± 5
		0 to 16 mm	80 ± 5
		0 to 32 mm	100

Compressive strength after 28 days to be 40 N/mm^2.

[a] The water/cement mass ratio shall be 0,55 ± 0,02 (the mass tolerance of cement and water is + 10 % to enable the concrete manufacturer to ensure compressive strength with local cement).

[b] Very hard aggregates as flint or granite and very soft aggregates as limestone shall not be used.

Table Z103 — Drill bit size

Tool mass kg	≤ 3,5	> 3,5 ≤ 5	> 5 ≤ 7	> 7 ≤ 10	> 10 ≤ 18	> 18
Diameter of drill bit mm	10	16	20	25	32	40
Usable length of drill bit mm	80		200		250	
Depth of hole mm	80		180		180	

Table Z104 — Noise test conditions for rotary hammers

Orientation	Drilling vertically down into a concrete block having the formulation specified in Table Z102 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	New drill bit as recommended by the manufacturer for drilling in concrete and of the size defined in Table Z103.
Feed force	The feed force applied to the tool in addition to its weight shall be sufficient to ensure stable operation with good performance.
Test cycle	Measurement starts, when the drill bit has reached a depth equal to its diameter, and stops, when the depth of hole according to Table Z103 has been reached and before the drill bit is removed from the hole.

NOTE 1 In general, stable operation with good performance is achieved by increasing the feed force by 30 N after the hammer has stopped bouncing and is operating smoothly.

NOTE 2 For consistency of results the drilled holes should be blind holes. If the drill bit breaks through, the depth of the hole may be reduced slightly to avoid this.

6.2.4.2 Location of measurement

Addition:

Figures Z107 and Z108 show the transducer positions for different types of hammers.

6.2.6.3 Operating conditions

Addition:

If rotary hammers have a chiselling (non rotary) function, they shall be tested in the chiselling and rotary hammer function according to 6.2.6.3.101 and 6.2.6.3.102.

During the test, an auxiliary handle (front handle) shall be mounted in a 90° angle to the machine (Figures Z107 and Z108 show the handle in 0° position).

6.2.6.3.101 Percussion hammers without rotary action (concrete breakers and picks, chiselling hammers)

For hammers without rotary action all speed setting devices shall be adjusted to the highest value.

Hammers without rotary action are tested under load in the loading device shown in Figure Z104 and described in 6.1.2.5.102 and in accordance with the conditions shown in Table Z105.

Table Z105 — Vibration test conditions for hammers without rotary action

Orientation	Operating vertically in the loading device which is mounted on a concrete block having the minimum dimensions specified in Table Z104. To avoid negative effects on the measurement results, the inserted tool shall be aligned in the middle of the bushing without contact to the bushing.
Tool bit	Test tool as shown in Figure Z104, item 1.
Feed force	The feed force applied to the tool in addition to its weight shall be sufficient to ensure stable operation with good performance. Excessive grip force shall be avoided. To allow correct operation, vibration reducing mechanisms shall not be overloaded.

NOTE In general, stable operation with good performance is achieved by increasing the feed force by 30 N after the hammer has stopped bouncing and is operating smoothly.

In addition, hammers without rotary action are tested under “no load”, by lifting the hammer up so that its weight is totally supported by the hands of the operator whilst the inserted tool is still located in the loading device and the hammer. During the measurement, the loading device shall not exert any force to the inserted tool which could influence the measurement.

6.2.6.3.102 Rotary hammers

For rotary hammers the speed setting shall be that recommended by the manufacturer for the drill bit size defined for the test for drilling in concrete.

Hammers with rotary action are tested under load as shown in Figure Z106 and in accordance with the conditions shown in Tables Z102, Z103 and Z106.

Table Z106 — Vibration test conditions for rotary hammers

Orientation	Drilling vertically down into a concrete block having the formulation specified in Table Z102 and having the minimum dimensions 500 mm x 500 mm and 200 mm in height and supported on resilient material.
Tool bit	New drill bit as recommended by the manufacturer for drilling in concrete and of the size defined in Table Z103.
Feed force	The feed force applied to the tool in addition to its weight shall be sufficient to ensure stable operation with good performance. Excessive grip force shall be avoided. To allow correct operation, vibration reducing mechanisms shall not be overloaded.
Test cycle	Measurement starts, when the drill bit has contact to the concrete block and stops, when the depth of the hole according to Table Z103 has been reached and before the drill bit is removed from the hole.

NOTE 1 In general, stable operation with good performance is achieved by increasing the feed force by 30 N after the hammer has stopped bouncing and is operating smoothly.

NOTE 2 For consistency of results the drilled holes should be blind holes. If the drill bit breaks through, the depth of the hole may be reduced slightly to avoid this.

6.2.7.1 Reported vibration value

Addition:

If more than one operating mode was measured, the result a_h for each operating mode applicable shall be reported.

$a_{h,HD}$ = mean vibration “hammer drilling” in accordance with 6.2.6.3.102

$a_{h,CH}$ = mean vibration “chiselling” on loading device in accordance with 6.2.6.3.101

$a_{h,NL}$ = mean vibration “no load” with lifted hammer on loading device in accordance with 6.2.6.3.101

$a_{h,CHeq} = [0,2\ (a_{h,NL})^2 + 0,8\ (a_{h,CH})^2\ ]^{0,5}$

= Equivalent chiselling value (representing time contents of 20 % with no load and 80 % with full load)

6.2.7.2 Declaration of the vibration total value

Addition:

The vibration total values of the handle with the highest emission and the uncertainty *K* shall be declared:

– for rotary hammers without chiselling (non rotary) function
the value of $a_{h,HD}$, with the work mode description “hammer drilling into concrete”;

– for rotary hammers with separate chiselling function
the value of $a_{h,HD}$, with the work mode description “hammer drilling into concrete” and
the value of $a_{h,Cheq}$; with the work mode description “chiselling”;

– for chiselling hammers and concrete breakers
the value of $a_{h,Cheq}$, with the work mode description “chiselling”.

8 Marking and instructions

Add:

8.12.2 a) *Addition:*

Z101) Information on the correct use of the dust collection system, if any

Z102) Advice to wear a dust mask

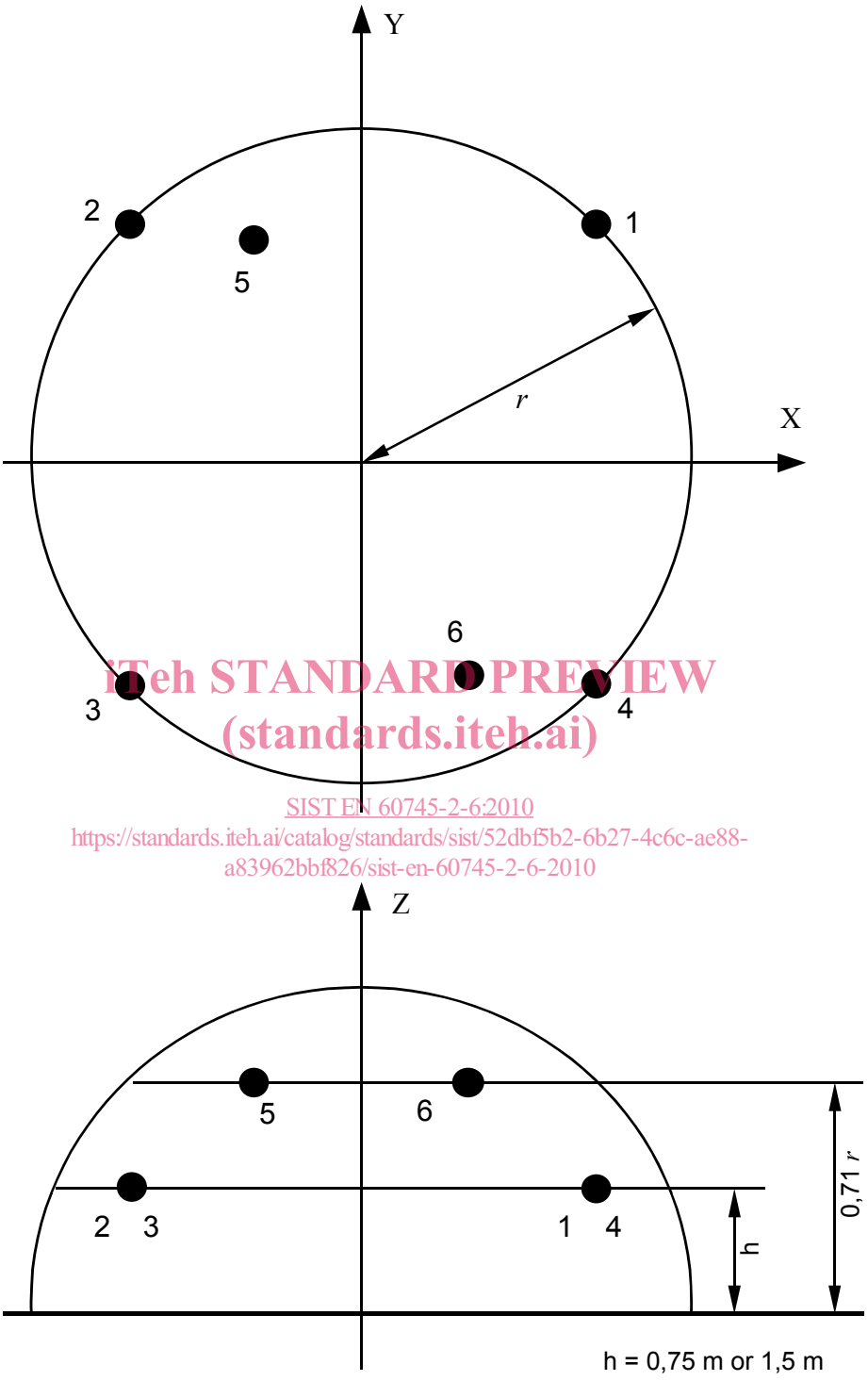

Figure Z101 – Positions of microphones for the hemispherical measurement surface