

EUROPEAN STANDARD

**EN 60745-2-6**

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2003

ICS 25.140.20

Supersedes EN 50144-2-6:2000 + A1:2001 & EN 50260-2-6:2002

English version

**Hand-held motor-operated electric tools –  
Safety**  
**Part 2-6: Particular requirements for hammers**  
(IEC 60745-2-6:2003, modified)

Outils électroportatifs à moteur –  
Sécurité  
Partie 2-6: Règles particulières  
pour les marteaux  
(CEI 60745-2-6:2003, modifiée)

Handgeführte motorbetriebene  
Elektrowerkzeuge –  
Sicherheit  
Teil 2-6: Besondere Anforderungen  
für Hämmer  
(IEC 60745-2-6:2003, modifiziert)

This European Standard was approved by CENELEC on 2003-02-01. 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

**CENELEC**

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

### Foreword

The text of the International Standard IEC 60745-2-6:2003, 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 formal vote and was approved by CENELEC as EN 60745-2-6 on 2003-02-01.

This European Standard supersedes EN 50144-2-6:2000 + A1:2001 and EN 50260-2-6:2002.

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) 2004-02-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-02-01

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 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 292-1 and EN 292-2.

This Part 2-6 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 60745-2-6 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 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 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 $\geq 10$ 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

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

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  $m^2$

$S_0 = 1 \text{ m}^2$

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  $0,60\text{ m} \pm 2\text{ mm}$  long at the edge and as regular as possible; it shall be made of reinforced concrete and thoroughly vibrated in layers of up to  $0,20\text{ m}$  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  $0,30\text{ m}$  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  $100\text{ kg/m}^2$ , 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	
		1844 kg	
330 kg	99 kg	Particle size	Fraction (%)
		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 <sup>2</sup> .			

**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	100		200		250	

**Table Z104 — 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	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 just sufficient to ensure stable operation
Test cycle	Measurement starts when the drill bit has reached a depth equal to its diameter and stops when the depth has reached 80 % of its usable length or 180 mm, whichever is the shorter

#### 6.2.2.4 Operating conditions

##### *Modification:*

##### 6.2.2.4.101 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, which is mounted on a concrete block having the minimum dimensions specified in Table Z104.

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.

##### 6.2.2.4.102 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 Z104.

**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



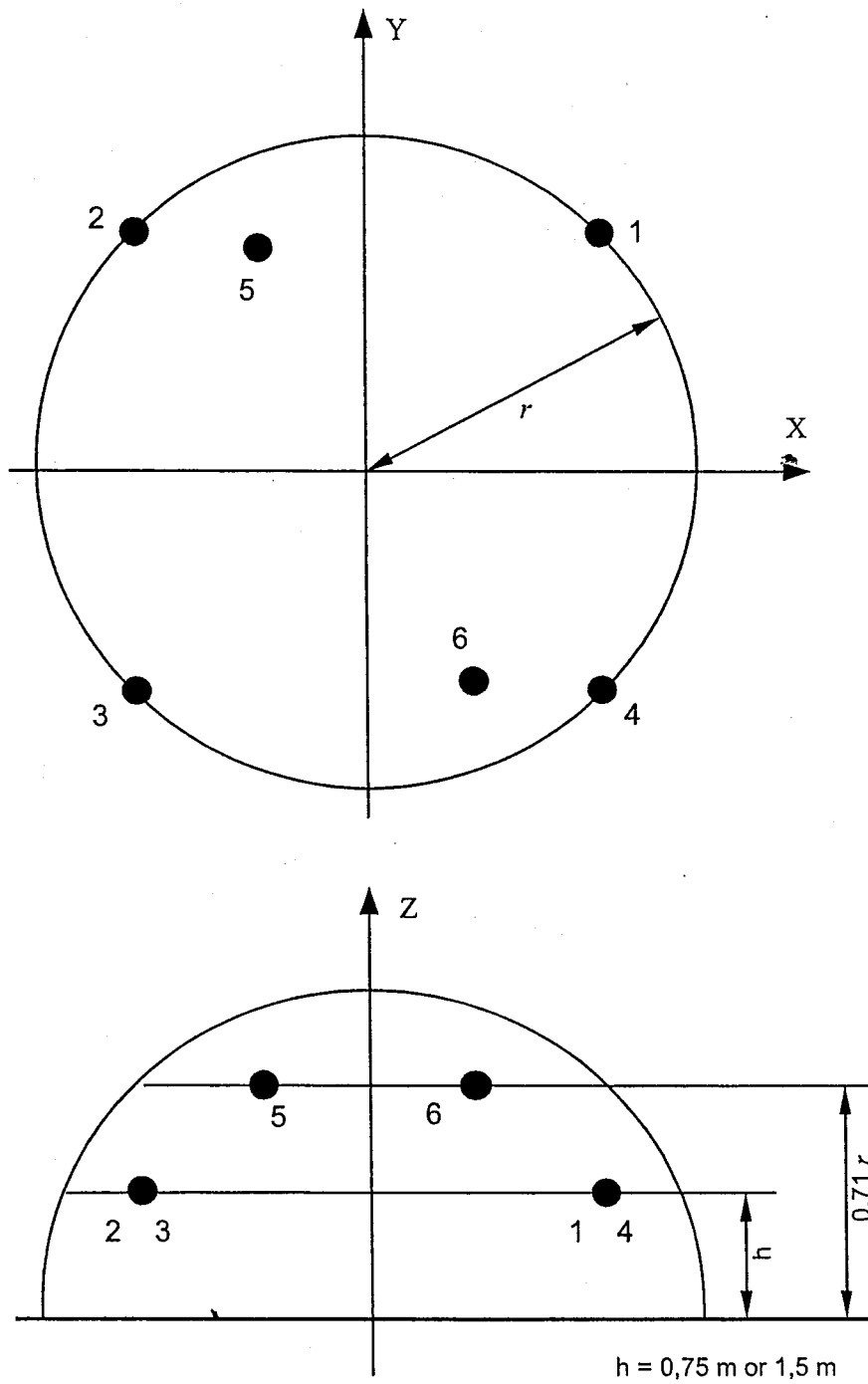


Figure Z101 – Positions of microphones for the hemispherical measurement surface

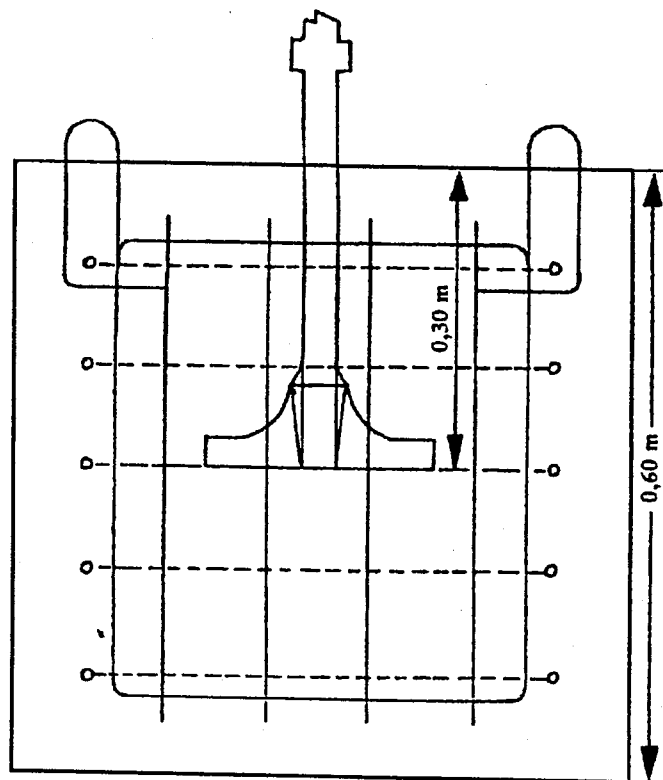
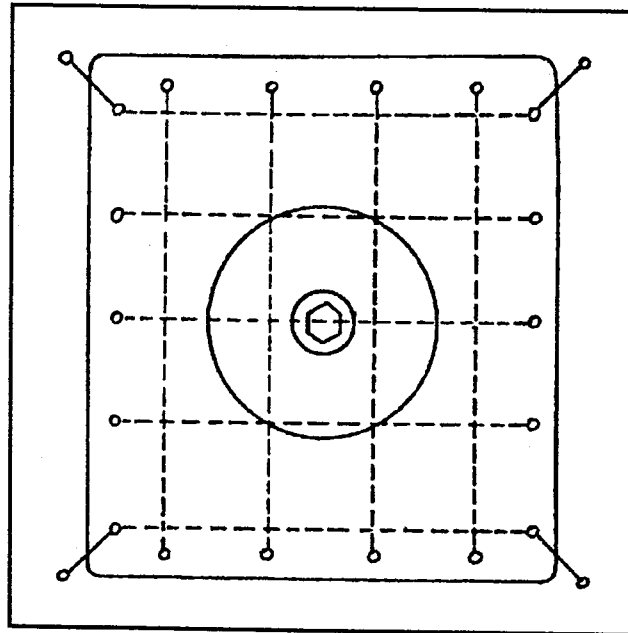
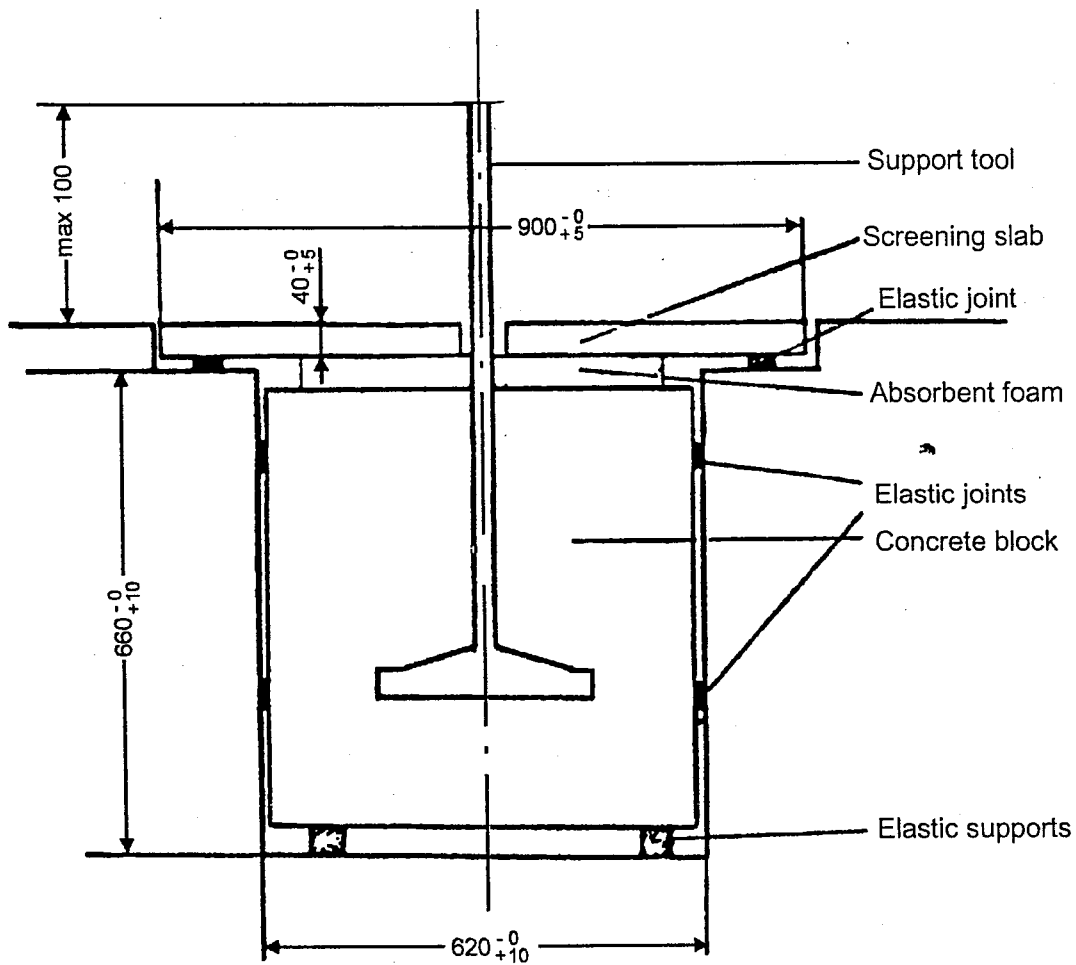
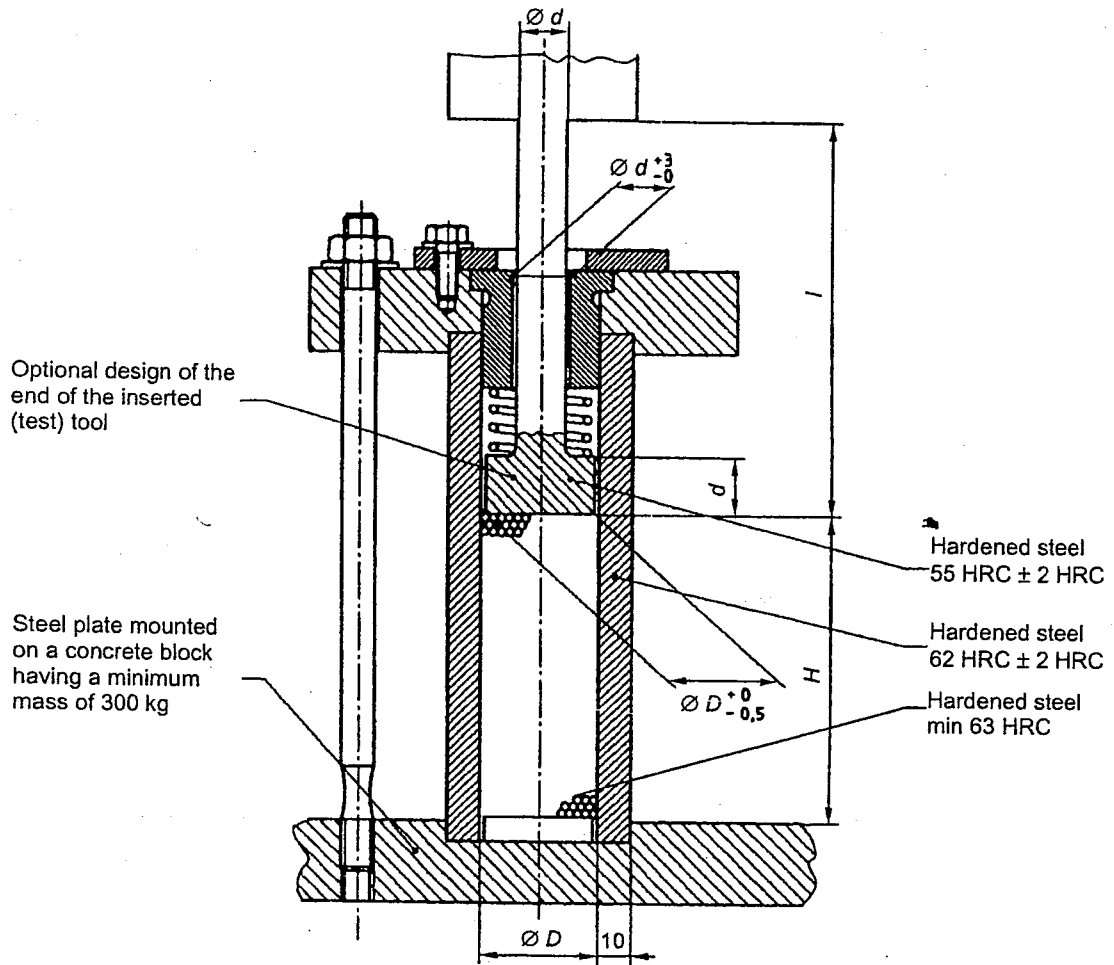


Figure Z102 – Test block



Dimensions in mm

Figure Z103 – Testing device



Dimensions in mm

*l* Length of the inserted (test) tool

Loading device parameters

Dimension <i>d</i> mm	Steel tube diameter <i>D</i> mm	Steel ball diameter mm	Ball column height <i>H</i> mm
≤ 23	40	4	100
> 23	60	4	150

Figure Z104 - Loading device for percussion hammers

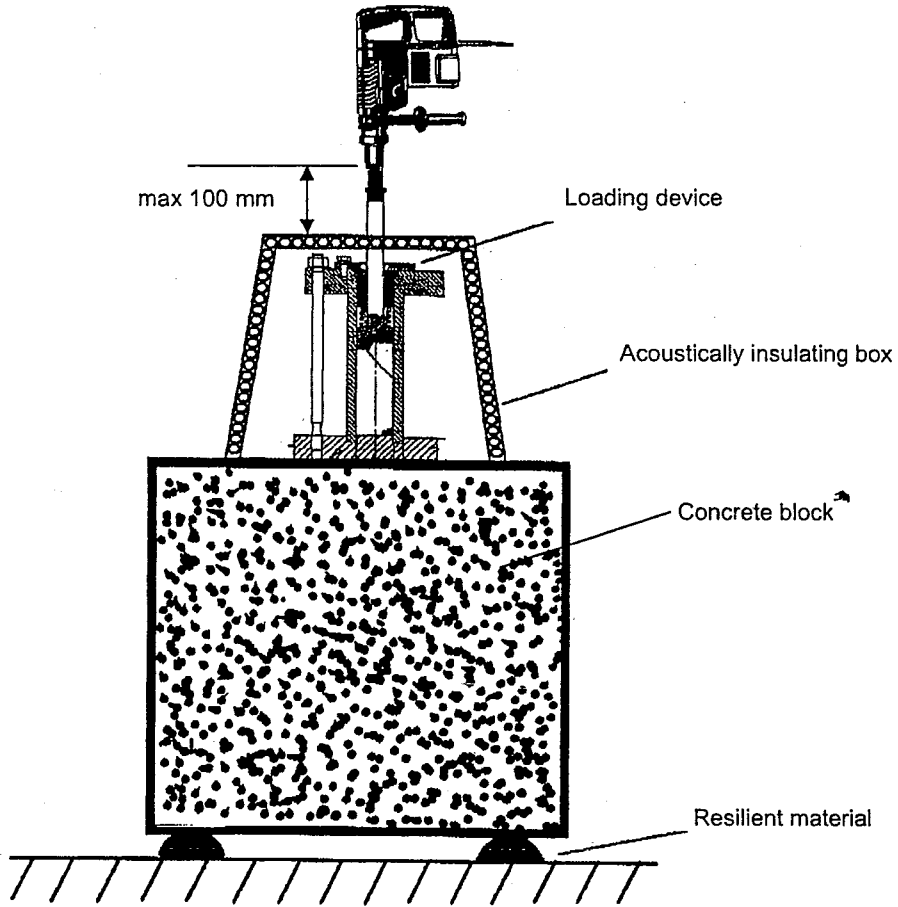


Figure Z105 - Noise measurement of chiselling hammers

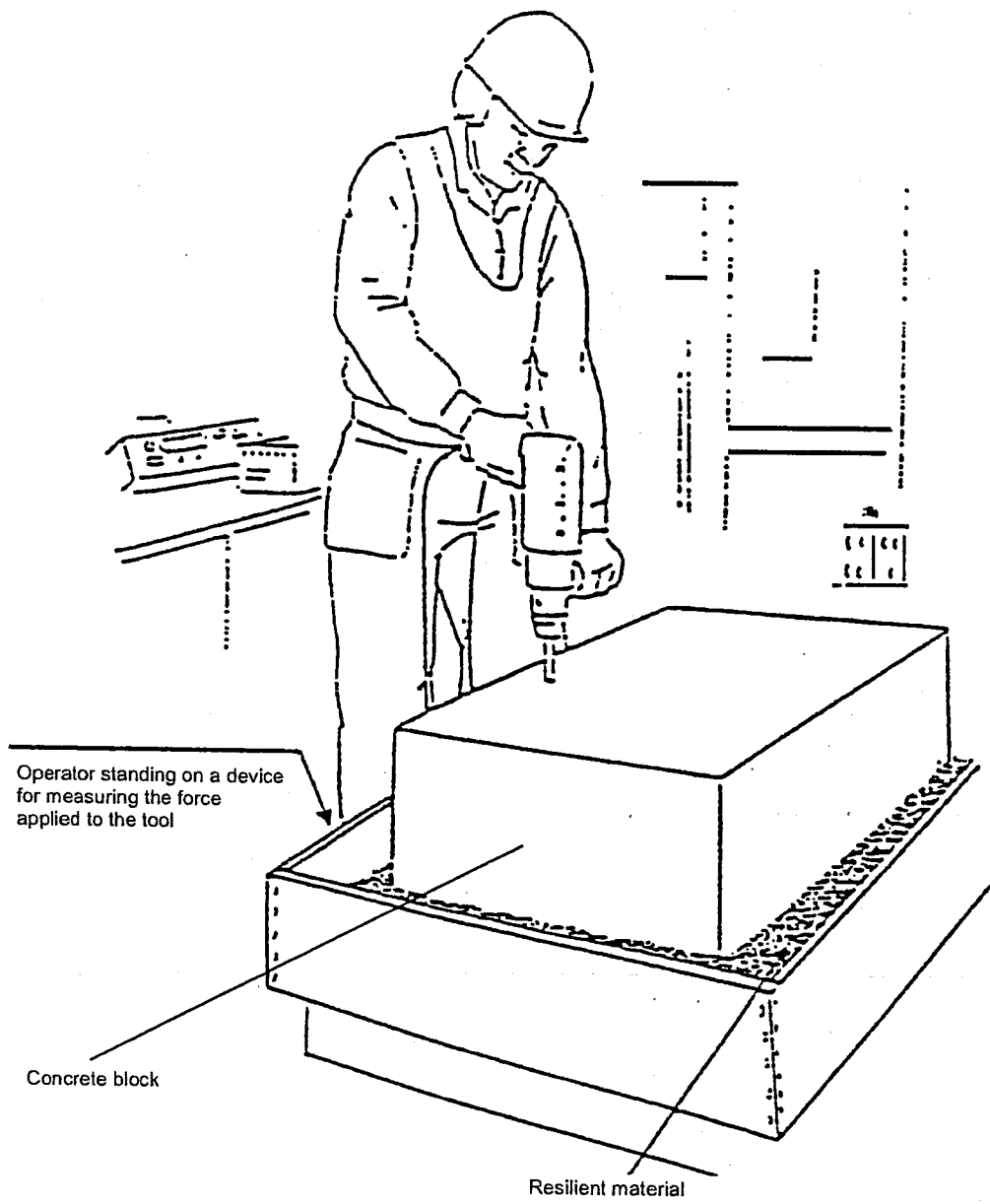


Figure Z106 — Application of load