INTERNATIONAL STANDARD

ISO 7492

Second edition
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Dental explorers

Sondes exploratrices dentaires

Reference number
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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 7492 was prepared by Technical Committee ISO/TC 106, *Dentistry*, Subcommittee SC 4, *Dental instruments*.

This second edition cancels and replaces the first edition (ISO 7492:1983), of which it constitutes a technical revision.

Annexes A to E of this International Standard are for information only.

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Dental explorers

1 Scope

This International Standard specifies the dimensions and performance requirements for dental explorers.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 1942-3:1989, *Dental vocabulary – Part 3: Dental instruments.*

ISO 6507-1:—[1)], *Metallic materials – Vickers hardness test – Part 1: Test method.*

ISO 7153-1:1991, *Instruments for surgery – Metallic materials – Part 1: Stainless steel.*

ISO 13402:1995, *Surgical and dental hand instruments – Determination of resistance against autoclaving, corrosion and thermal exposure.*

3 Definitions

For the purposes of this International Standard, the definition for the term "dental explorer" stated in ISO 1942–3 applies.

4 Material

4.1 Material of the working end

Working ends shall be made of austenitic or martensitic stainless steel in accordance with ISO 7153-1.

NOTE — Other materials may also be used, provided that the instruments made therefrom meet the requirements of clause 5.

1) To be published. (Revision of ISO 6507-1:1982, ISO 6507-2:1983, ISO 6507-3:1989, ISO 409-1:1982, ISO 409-2:1983 and ISO/DIS 409-3)

4.2 Material of the handle

The material of the handle, selected at the discretion of the manufacturer, shall meet the requirements of clause 5.

5 Requirements

5.1 Surface finish

5.1.1 All surfaces

All dental explorer surfaces shall be visibly free from pores, crevices, grinding marks, residual scale, acid, greases and residual grinding and polishing materials.

Tests shall be carried out in accordance with 7.1.

5.1.2 Satin finish

The satin finish shall be both uniform and smooth, and it shall reduce glare.

5.1.3 Mirror finish

The mirror finish shall be obtained by grinding to remove all surface imperfections and by polishing to remove grind marks, resulting in a highly reflective surface.

5.2 Vickers hardness and tensile strength of the working end

The Vickers hardness of the finished instrument when tested in accordance with ISO 6507-1, shall be:

Martensitic stainless steel	500 HV1 to 650 HV1
Cobalt-based alloys	min. 480 HV1
Austenitic stainless steel	min. 500 HV1 or min. 1 700 $MN \cdot mm^{-2}$ tensile strength

Annexes B and C describe methods for the measurement of Vickers hardness and tensile strength, respectively.

5.3 Resistance against corrosion

When the dental explorer is tested in accordance with 7.2.1 or 7.2.2 and 7.1, there shall be no visible signs of corrosion.

With the exception of serrated martensitic stainless steel handles, any blemish shall be considered as evidence of corrosion.

5.4 Resistance against thermal exposure

When the dental explorer is tested in accordance with 7.2.3, there shall be no alteration in physical appearance; the hardness value (or, in the case of austenitic stainless steel, tensile strength) shall remain within the specified limits.

Annexes B and C describe methods for the measurement of Vickers hardness and tensile strength, respectively.

5.5 Union of working end and handle

The union between the working end and the handle of the instrument, which has previously been subjected to the tests according to 7.2.1 and 7.2.2, shall not become loosened under tensile load when tested in accordance with 7.3.1 and under torque when tested in accordance with 7.3.2.

5.6 Marking

The instruments shall be marked in a manner chosen at the discretion of the manufacturer. Annex E provides details of a proposed method for instrument designation (see also table 2) and it is recommended that manufacturers mark their packaging and catalogues in the proposed manner.

6 Form and dimensions

The explorers shall have one of the forms A to H shown in figure 1 and the dimensions, measured in accordance with table 1, as shown in table 2. All linear dimensions shall be expressed in millimetres and all angular dimensions shall be expressed in degrees.

Annex A provides details of one method of measurement applicable to most types of dental instrument.

The maximum overall length, irrespective of the form of the instrument, shall be 178 mm.

Table 1 — Measurement of dental explorer dimensions (see figure 1)

Symbol	Meaning	Points of measurement
b_3	Blade length	distance from the extreme tip of the blade, parallel to the centreline of the blade, to the blade/shank interface
h_1	Blade height	distance from the datum point, at right angles to the centreline of the instrument, to the farthest extremity of the blade
h_2	Shank height	distance from the datum point, at right angles to the centreline of the instrument, to the farthest external surface of the first bend of the shank
r_1	Radius of blade	radius of curvature of the inside of the blade
α	Blade angle	angle between the centreline of the blade and the centreline of the instrument
β	Offset angle	angle between the centreline of the shank and a line, parallel to the centreline of the instrument, forming a tangent with the first bend of the instrument

7 Test methods

7.1 Visual inspection

Visually inspect, without magnification and at normal visual acuity, the surfaces to determine compliance with the requirements.

7.2 Tests for heat and corrosion resistance

Carry out the autoclave test (7.2.1) or the boiling water test (7.2.2) and the thermal test (7.2.3), in one continuous operation for five cycles. After completion of the tests, the instrument(s) shall be rubbed vigorously with a cloth to remove blemishes.

7.2.1 Autoclave test

The autoclave test shall be carried out as specified in ISO 13402.

7.2.2 Boiling water test

The boiling water test shall be carried out as specified in ISO 13402.

7.2.3 Thermal test

The thermal test shall be carried out as specified in ISO 13402.

7.3 Test for union of working end and handle

7.3.1 Under tensile load

Subject the union between the working end and handle to a tensile force of 600 N, applied in the direction parallel to the centreline of the handle, for a duration of 5 s.

Annex C describes a suitable test procedure.

7.3.2 Under torque

Subject the union between the working end and handle to a torque of 45 N·cm for a duration of 5 s.

Annex D describes a suitable test procedure.

Table 2 — Dental explorers – Dimensions

Linear dimensions in millimetres
Angular dimensions in degrees

Form (designation)	Dimensions					
	r_1	b_3 ± 0,5	α ± 5°	h_1 ± 0,5	h_2 ± 0,5	β ± 5°
A (= 010)						
011	4	–	85°	4,2	3,8	–
012	4	–	90°	4,2	3,8	–
B (= 020)						
021	6	–	85°	2,5	7,5	–
022	6	–	90°	1,5	9,0	–
C (= 030)						
031	2	–	85°	10,0	3,0	–
032	2,5	–	86°	8,2	4,1	–
033	2	–	80°	9,0	3,0	–
D (= 040)						
041	2	–	60°	9,0	3,0	–
042	2,5	–	62°	7,2	3,2	–
E (= 050)						
051	–	–	67°	6,0	–	–
052	–	–	80°	4,5	–	–
F (= 060)						
061	–	–	67°	11,5	–	–
062	–	–	80°	12,0	–	–
G (= 070)						
071	2	2	125°	5,0	4,0	38°
H (= 080)						
081	11	–	45°	11	–	–
082	11	–	35°	6	–	–
083	11	–	25°	4	–	–

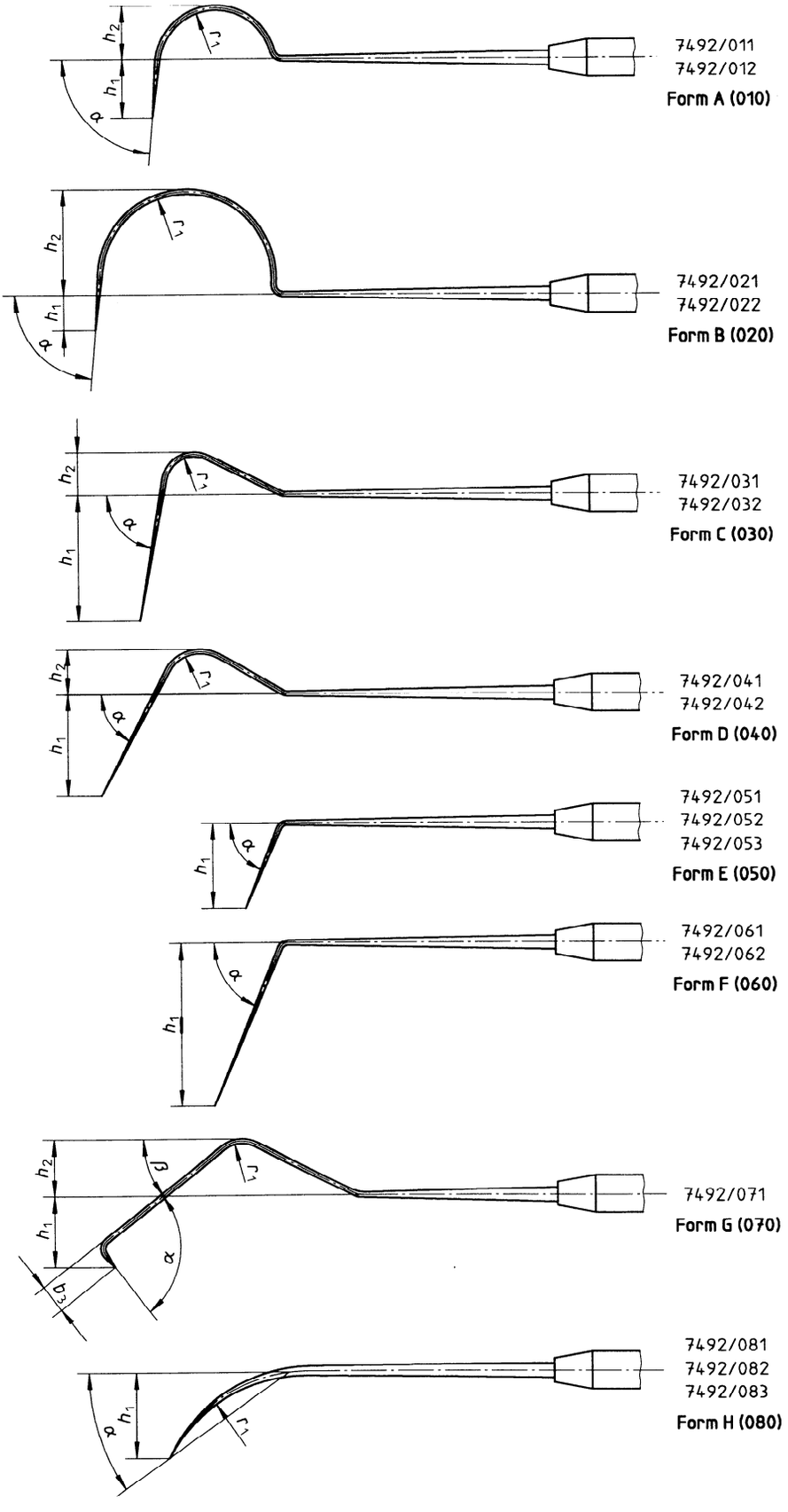


Figure 1 — Forms of dental explorer

Annex A
(informative)

Measurement of dimensions

A .1 General

This method of measurement is applicable to most types of dental hand instrument and is based on the use of an optical projector. Dimensions are measured parallel, and at right angles, to the centreline of the instrument and are constructed from a datum point at its working end. Although this is the preferred method, it is by no means the only technique available.

A.2 Apparatus

A.2.1 Optical projector (shadowgraph) fitted with 10 × magnifying lens and micrometer stage.

A.2.2 Glass specimen slide and plasticine, or

A.2.3 Mechanical holding device (e.g. light machine vice), or

A.2.4 V-block.

A.3 Procedure

A.3.1 Preparation for measurement

A.3.1.1 Support or hold the dental instrument using one of the devices in A.2.2, A.2.3 or A.2.4.

A.3.1.2 Place the supported instrument on the micrometer stage of the projector (A.2.1) and ensure that the following requirements are met:

a) the working end of the instrument projects beyond the holding device;

b) the instrument is securely held;

c) there is an unobstructed view of the working end.

A.3.1.3 Ensure that the dental instrument is parallel to the micrometer stage by focusing on, and traversing the length of, the handle. If the handle remains in focus over the traversed distance, then the instrument is ready for measurement.

If the handle does not remain in focus, repeat A.3.1.2 and A.3.1.3 until the handle remains in focus through the field of traverse.

A.3.1.4 Align the centreline of the dental instrument with the vertical or horizontal cross-wires on the projector screen.

A.3.2 Horizontal and vertical measurements

A.3.2.1 Refer to the illustration, table of dimensions and table of measurement points related to the instrument to be measured and, using the micrometer stage, bring the appropriate point of the projected image to either the vertical or horizontal cross-wire, whichever is appropriate to the datum measuring point of interest.

A.3.2.2 Zero the micrometer and move the micrometer stage to the final measurement position and record the measurement.

A.3.2.3 Realign the instrument (A.3.1.4) and repeat steps A.3.2.1 and A.3.2.2 for the remaining dimensions.

A.3.3 Angular measurements

A.3.3.1 Refer to the illustration, table of dimensions and table of measurement points related to the instrument to be measured and, using the micrometer stage, bring the appropriate point of the projected image to either the vertical or horizontal cross-wire, whichever is appropriate.

A.3.3.2 Rotate the bezel of the projector screen to the datum measuring point and note the angular reading.

A.3.3.3 Rotate the bezel to the final measurement position, subtract the initial angular reading from the final reading and record the measured angle.

Annex B
(informative)

Vickers hardness testing

B.1 General

The method described herein is applicable to most types of dental instrument and is based on applying a 1 kg load, via a 136° diamond indentor, to the working end of the instrument.

NOTE — It may be necessary to encapsulate the working ends of certain dental instruments in a plastic mounting medium in order to achieve this objective.

ISO 6507-1 shall be regarded as the reference test method.

B.2 Apparatus

B.2.1 Vickers hardness testing machine.

B.2.2 Weight of 1 kg.

B.2.3 Set of tables for converting ocular readings to Vickers hardness values.

B.2.4 Fine file.

B.2.5 Machine vice.

B.2.6 Silicon carbide abrasive papers, of grades 180, 320, 400 and 600.

B.3 Preparation

B.3.1 For larger, robust dental instruments

a) Prepare a flat area on the working end of the instrument using a fine file and wipe the surface clean.

b) Smooth the flat area with progressively finer grades of abrasive paper. Wipe the surface clean between each grade of paper and resume the smoothing process at 90° to the direction of the previous operation.

c) Finish with a grade 600 silicon carbide abrasive paper and wipe the surface clean.

B.3.2 For finer, more delicate dental instruments

a) Remove the working end from the handle and encapsulate in plastic mounting medium suitable for the preparation of metallographic samples.

b) Using a sucession of progressively finer grades of abrasive paper, flatten and smooth the surface. The mounted sample should be rinsed clean with water between each grade of paper and turned 90° from the direction of the previous operation prior to resumption of the smoothing process.

c) Finish with a grade 600 silicon carbide abrasive paper, rinse clean with water and dry.

B.4 Procedure

1) Place a machine vice on the horizontal (movable) platform of the hardness tester;

2) with the prepared smooth surface flat and level, grip the dental instrument in a machine vice and ensure that the working end is supported;

3) slowly raise the horizontal platform and align the diamond indentor with the smooth area on the working end of the instrument. A gap of approximately 3 mm should be left between the indentor and the smooth surface;

4) ensure that the instrument is axially aligned with the machine frame and firmly gripped;

5) select the 1 kg weight and place on the weight carrier of the hardness tester;

6) prime the hardness tester (e.g. by depressing the foot pedal or other priming device) and apply the test load by operating the release lever. The Vickers hardness tester automatically applies the load and, after 15 s, an alarm sounds to indicate completion of the cycle;

7) lower the platform, align the test sample with the microscope and focus on the indentation;

8) check that the ocular measuring device (attached to the microscope) reads zero when the knife-edges (visible in the eyepiece of the microscope) touch. If not, zero the ocular device;

9) measure the indentation by placing the fixed knife-edge at the corner of one diagonal and bringing the movable knife-edge to touch the opposite corner of the diagonal;

10) note the reading, repeat for the opposite diagonal and take an average of the two readings;

11) using the table for conversion of the ocular readings to hardness readings for a 1 kg load, note the hardness value;

12) conduct a further two tests and take an average of the three hardness readings.

Annex C (informative)

Tensile load test

C.1 General

This method of tensile testing is applicable to most types of dental instrument and is based on applying a tensile load, aligned with the major axis of the instrument, across the union of the working part and handle.

NOTE — It may be necessary to remove sections of the working end of instruments with offset angles in order to achieve this objective.

Although this is the preferred method, it is by no means the only technique available.

C.2 Apparatus

C.2.1 Tensile testing machine.

C.2.2 Range of load cells, e.g. 1 kN, 2 kN, etc.

C.2.3 Set of spring-loaded serrated wire-grips.

C.3 Procedure

1) Select the appropriate load cell for the test (e.g. as a minimum load of 600 N is required for dental explorers, a 1 kN load cell should be selected);

2) place the instrument tip in the jaws of the spring-loaded wire-grip attached to the fixed cross-head of the tensile tester;

3) ensure that the instrument is axially aligned with the machine frame and firmly gripped;

4) move the mobile cross-head towards the instrument handle, open the spring-loaded jaw and grip the instrument handle;

5) select a moderate cross-speed (e.g. 25 mm/min), zero the load-recording device and commence testing by applying a steadily increasing load until the minimum load is exceeded or the dental instrument fails (whichever occurs first).

Annex D (informative)

Torque test

D.1 General

This method of torque testing is applicable to most types of dental hand instrument and is based on applying a torque to the union between the handle and working end of an instrument.

NOTE — It may be necessary to remove sections of the working end of instruments with offset angles in order to achieve this objective.

Although this is the preferred method, it is by no means the only technique available.

D.2 Apparatus

D.2.1 Indelible marking pen.

D.2.2 Machine vice and a set of soft lead or rubber **jaws**.

D.2.3 Torque lever (figure D.1).

D.2.4 Spring balance.

D.2.5 Weight carrier.

D.2.6 Weights.

D.3 Procedure

1) Using an indelible marking pen, mark a line across the union of the working end and handle;

2) place the working end of the instrument, with the ink mark uppermost, in the machine vice (it may be necessary to employ soft jaws in the machine vice to obtain a firm grip);

3) place the torque lever in a horizontal position on the handle as close as possible to the union between the working end and handle, and secure with the grub screw;

4) couple the spring balance to the torque lever, attach the weight carrier and adjust the spring balance scale to zero;

5) using the following formula, calculate the force needed to apply the required torque:

$$F = \frac{I}{R}$$

where

F is the force, in newtons;

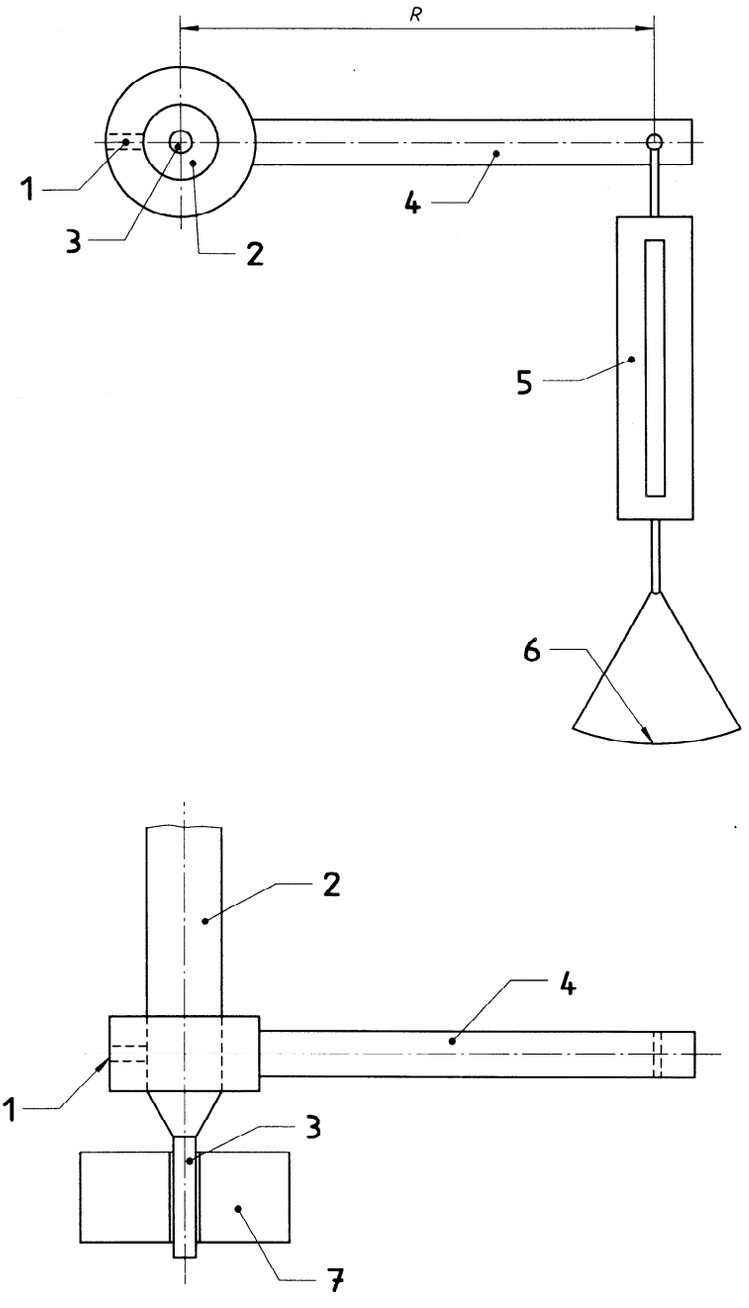
T is the torque, in newton metres;

R is the radius, in metres.

6) apply the force, by adding the calculated mass to the weight carrier, at radius R (see figure D.1) for 5 s;

NOTE – If the spring balance is calibrated in kilograms, the test mass may be calculated by dividing the force (expressed in newtons) by 9,81 $m \cdot s^2$ (the acceleration due to gravity).

7) examine the position of the lever and observe the ink mark for signs of displacement which indicates loosening of the union under torque load.



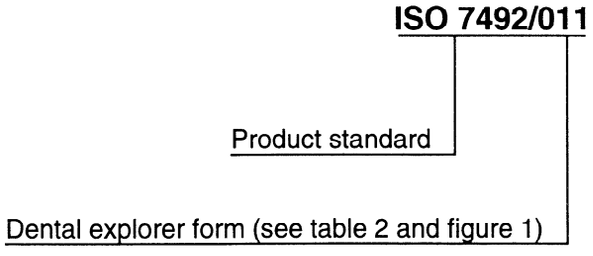
1) Grub screw
2) Handle
3) Working end
4) Torque lever
5) Spring balance
6) Weight carrier
7) Machine vice

Figure D.1 — Torque test

Annex E
(informative)

Designation and marking

The manufacturer's packaging and catalogue should be marked as illustrated by the designation in the following example:



ICS 11.060.20

Descriptors: dentistry, dental equipment, dental probes, specifications, dimensions, tests, marking.

Price based on 15 pages