INTERNATIONAL STANDARD

ISO 8325

Second edition
2004-09-15

Dentistry — Test methods for rotary instruments

Art dentaire — Méthodes d'essai pour instruments rotatifs

Reference number
ISO 8325:2004(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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

ISO 8325 was prepared by Technical Committee ISO/TC 106, *Dentistry*, Subcommittee SC 4, *Dental instruments*.

This second edition cancels and replaces the first edition (ISO 8325:1985), which has been technically revised.

Introduction

To check the conformity of dental rotary instruments against relevant product standards, it is indispensable to conduct tests on the basis of harmonised test methods in order to achieve comparable test results. In the respective product standards for dental rotary instruments, reference is made to the test methods specified in this International Standard.

Dentistry — Test methods for rotary instruments

1 Scope

This International Standard specifies methods for measuring the dimensional characteristics, neck strength and surface roughness of dental rotary instruments, such as burs, cutters, polishers, diamond and abrasive instruments.

This International Standard does not provide test methods for the characteristics of materials used for dental rotary instruments.

NOTE For testing of these characteristics, see the respective product standards.

This International Standard is not applicable to dental root-canal instruments (see ISO 3630-1).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1797-1, *Dental rotary instruments — Shanks — Part 1: Shanks made of metals*

ISO 1797-2, *Dental rotary instruments — Shanks — Part 2: Shanks made of plastics*

ISO 1942, *Dentistry — Vocabulary*

ISO 3274, *Geometrical Product Specification (GPS) — Surface texture: Profile method — Nominal characteristics of contact (stylus) instruments*

ISO 4288, *Geometrical Product Specification (GPS — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1942 apply.

4 Test methods

4.1 General

The test methods specified in this International Standard refer to the main dimensional characteristics of dental rotary instruments. They are demonstrated by describing the measurement procedures for the single characteristics of instruments.

In addition to the test methods specified below, other equivalent methods and test devices exist and may be used, provided they render similar results. In case of dispute, however, the test methods specified in this International Standard become reference.

For evaluation of test results, see the relevant product standard.

4.2 Atmospheric conditions

Tests shall be conducted at room temperature (20 °C to 25 °C).

4.3 Measurement instruments

A list of measurement instruments is provided as follows:

a) micrometer;

b) vernier calliper;

c) dial gauge;

d) comparator;

e) toolmaker's microscope, workshop microscope, measuring microscope;

f) shadowgraph (e.g. profile projector);

g) ring gauge;

h) pneumatic gauge;

i) goniometer;

j) laser scanner.

Other precision instruments may equally be applicable, and may be used at the discretion of the manufacturer. Measurement instruments with reasonable accuracy shall be chosen in respect to the characteristics of the instruments to be measured.

Lengths and diameters shall be measured and calculated in millimetres, angles in degrees.

5 Measuring of single characteristics of instruments

5.1 Shape of the working part

5.1.1 Measurement instrument

Any suitable instrument of those listed in 4.3 shall be used, having an accuracy of $\leqslant$ 0,01 mm.

The applied measuring force shall not exceed 1,5 N.

5.1.2 Measurement location

The measurement location shall cover the whole representative integral shape of the test piece.

5.1.3 Procedure

Determine the shape of the working part visually or by using an instrument specified in 5.1.1.

Conduct one measurement.

5.2 Diameter of the working part

5.2.1 Measurement instrument

Any suitable instrument of those listed in 4.3 shall be used, having an accuracy of $\leqslant$ 0,01 mm.

The applied measuring force shall not exceed 1,5 N.

In case of dispute, the reference method shall be that using a dial gauge.

5.2.2 Measurement location

The measurement point shall be as follows, unless specified otherwise in the respective product standard:

a) for cylindrical instruments: the middle of the working part;

b) for non-cylindrical instruments: the largest diameter of the working part.

5.2.3 Procedure

Measure the diameter of the working part using an instrument as specified in 5.2.1.

Conduct one measurement on the peripheral surface, i.e. on the top surface.

For diamond instruments, conduct three measurements at angles 120° apart on the circumference of the test piece. Lift the blade before rotating the test piece to the next measurement point. Record the three measuring results as d_1, d_2 and d_3.

5.2.4 Evaluation of test results for diamond instruments

For diamond instruments, calculate the average diameter by using the following formula:

$$d = \frac{d_1 + d_2 + d_3}{3} \quad (1)$$

where

d_1 is the diameter given by measurement 1;

d_2 is the diameter given by measurement 2;

d_3 is the diameter given by measurement 3.

5.3 Neck diameter

5.3.1 Measurement instrument

Any suitable instrument of those listed in 4.3 shall be used, having an accuracy of 0,01 mm.

If mechanical instruments are used, they shall be equipped with knife-edged tungsten carbide blades of $\leqslant$ 0,3 mm thickness.

The applied measurement force shall not exceed 1,5 N.

5.3.2 Measurement location

The measurement point shall be the smallest diameter just behind the working part, or just behind the collar, where applicable.

5.3.3 Procedure

Measure the neck diameter using an instrument as specified in 5.3.1.

Conduct one measurement.

5.4 Dimensions of the shank and the mandrel

The dimensions of the shank and the mandrel shall be determined in accordance with ISO 1797-1 and ISO 1797-2.

ISO 13295 should also be consulted.

The applied measuring force shall not exceed 1,5 N.

5.5 Length of the working part

5.5.1 Measurement instrument

Any suitable instrument of those listed in 4.3 shall be used, having an accuracy of $\leqslant$ 0,01 mm.

The applied measurement force shall not exceed 1,5 N.

5.5.2 Measurement location

The measurement points shall be the points at the ends of the shortest length of the working part, including, where applicable, the coated neck.

5.5.3 Procedure

Measure the length of the working part using an instrument as specified in 5.5.1.

Conduct one measurement.

5.6 Overall length

5.6.1 Measurement instrument

Any suitable instrument of those listed in 4.3 shall be used, having an accuracy of $\leqslant$ 0,01 mm.

The applied measurement force shall not exceed 1,5 N.

5.6.2 Measurement location

The points for measurement shall be the two ends of the instrument, including tip and shank end.

5.6.3 Procedure

Measure the overall length using an instrument as specified in 5.6.1.

Conduct one measurement.

5.7 Angle of the taper of the working part

5.7.1 Measurement instrument

Any suitable instrument of those listed in 4.3 shall be used, having an accuracy of $\leqslant 2'$ [equivalent to (1/30)°].

The applied measurement force shall not exceed 1,5 N.

5.7.2 Measurement location

The measurement shall be made on the enveloped area of the working part for applying test facilities.

The points of measurement shall be at least two representative points on the surface of the working part of the test piece which are as far apart from each other as possible.

5.7.3 Procedure

Determine the included angle with reference to the baseline (axis) of the test facilities with an instrument as specified in 5.7.1.

Measure the relevant diameters and the length of the taper and, if necessary, calculate the angle of the taper.

Conduct one measurement.

5.8 Run-out of the working part

5.8.1 Holding device and measuring instrument

5.8.1.1 Holding device

The holding device for measuring run-out shall be one of the following:

a) split V-block with adjustable distances l_1 and l_2 (see Figure 1) for instruments with shanks in accordance with ISO 1797-1;

b) equivalent device, for example a precision chuck, for instruments with shanks in accordance with ISO 1797-2;

c) equivalent device for mandrels.

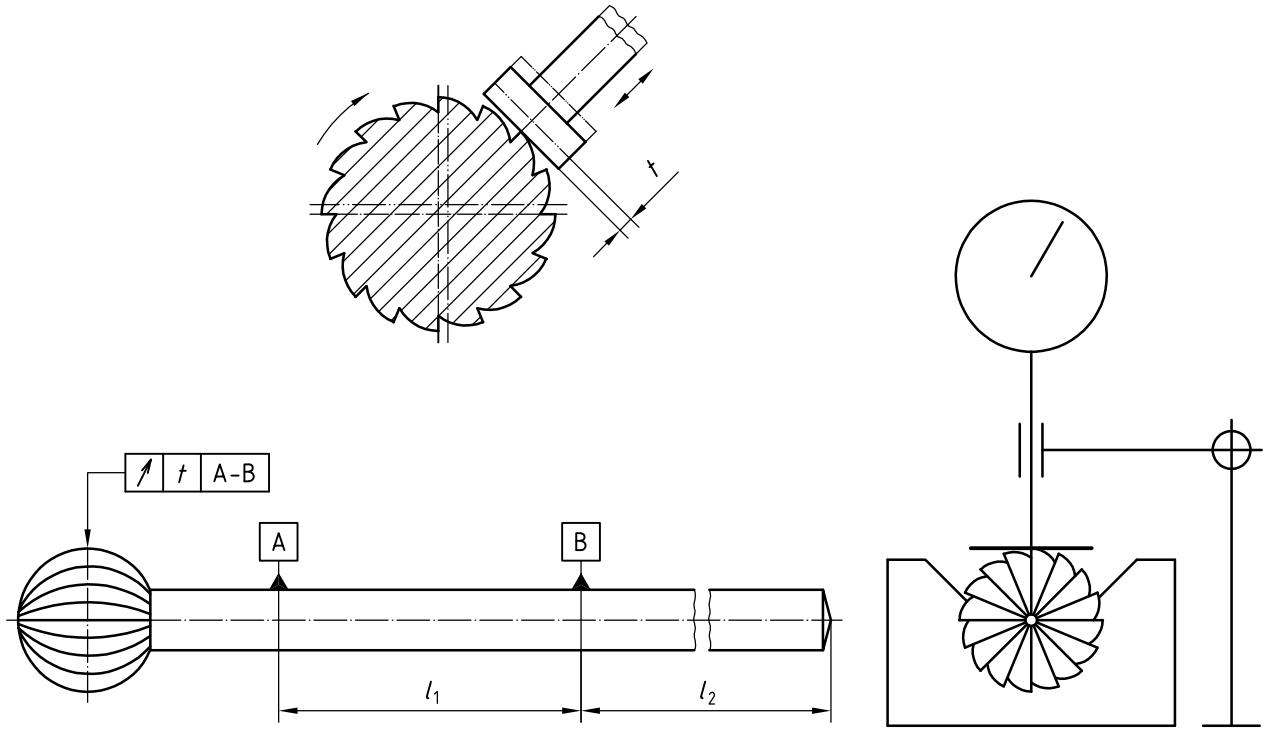

Figure 1 — V-block measuring device

Lengths l_1 and l_2, which depend on the type of shank and the fitting length of the test piece, shall be in accordance with Table 1.

Table 1 — Dimensions l_1 and l_2

Dimensions in millimetres

Shank type ISO 1797 [a]	Fitting length ISO 1797[a]	l_1	l_2
1	9	5	3
1	11 and 12	7	3
2	15	10	3
2	30	9	20
3	9	5	2
3	11 and 12	7	2
4	15	10	3
4	30	9	20

[a] ISO 1797-1 or ISO 1797-2, as appropriate.

5.8.1.2 Measuring instrument

Any suitable instrument of those listed in 4.3 shall be used, having an accuracy of $\leqslant$ 0,01 mm.

The applied measuring force shall not exceed 0,3 N.

5.8.2 Measurement location

The measurement point, specified in the relevant product standards, is on the top surface of the test piece.

If no specification is given, the measurement point shall be the middle of the working part for cylindrical and conical instruments, or the largest diameter of the working part for instruments with other shapes.

5.8.3 Procedure

Set the lengths l_1 and l_2 of the holding device (5.8.1.1) according to the type of shank (Table 1) to be tested. Place the test piece in the holding device and turn it slowly through 360°. Measure the run-out on the top surface of the test piece using an instrument as specified in 5.8.1.2.

Record the highest (t_2) and the lowest (t_3) readings. Calculate the difference of both readings as the total indicated run-out (t_1), using the formula:

$$t_1 = t_2 - t_3 \tag{2}$$

where

t_2 is the highest reading of the run-out;

t_3 is the lowest reading of the run-out.

5.9 Neck strength

5.9.1 Test load device and measuring instrument

5.9.1.1 Test load device

A device shall be used which permits a load, F, to be applied to the free end of the test piece with its long axis held in a chuck at an angle of 22,5° to the horizontal. The chuck should enable test pieces of different lengths to be inserted to a depth as described in 5.9.3.

5.9.1.2 Measuring instrument

Any suitable instrument of those listed in 4.3 shall be used, having an accuracy of $\leqslant$ 0,01 mm.

The applied measurement force shall not exceed 0,3 N.

5.9.2 Test load

The load F to be applied shall be that given in the relevant product standard, as calculated from the following equation:

$$F = \frac{98 \times {d_2}^3}{d_1 + d_2 + l} \tag{3}$$

where

F is the test load, expressed as a force in newtons;

d_1 is the nominal diameter of the working part, in millimetres;

d_2 is the maximum neck diameter, in millimetres;

l is the minimum length of the working part, in millimetres.

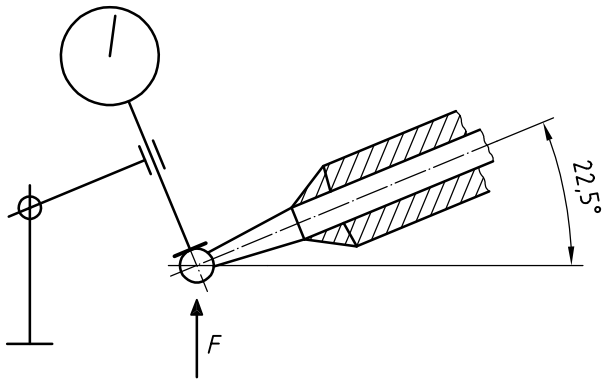

Figure 2 — Test piece at 22,5° to horizontal

5.9.3 Procedure

Place the test piece in the chuck so that it is gripped up to the junction of neck and shank. Rotate the test piece and record the maximum run-out (t_4). Set the test piece with the maximum run-out vertically upward. Apply the test load F vertically upward, as shown in Figure 2, or as specified in the relevant product standard.

Apply the test load F for a period of 5 s. If the test piece breaks, it has failed the test. If the test piece does not break, measure the run-out (t_5) again.

5.9.4 Permanent set

Calculate the permanent set, t_6, by using the formula:

$$t_6 = t_5 - t_4 \tag{4}$$

where

t_4 is the maximum run-out before application of the test load;

t_5 is the maximum run-out after application of the test load.

5.10 Surface roughness

Determine the surface roughness in accordance with ISO 3274 and ISO 4288.

Bibliography

[1] ISO 463, *Geometrical Product Specifications (GPS) — Dimensional measuring equipment — Design and metrological characteristics of mechanical dial gauges*

[2] ISO 3599, *Vernier callipers reading to 0,1 and 0,05 mm*

[3] ISO 3611, *Micrometer callipers for external measurement*

[4] ISO 3630-1, *Dental root-canal instruments — Part 1: Files, reamers, barbed broaches, rasps, paste carriers, explorers and cotton broaches*

[5] ISO 6906, *Vernier callipers reading to 0,02 mm*

[6] ISO 13295, *Dental rotary instruments — Mandrels*

ICS 11.060.20

Price based on 9 pages