SLOVENSKI STANDARD
SIST EN ISO 4545-2:2006

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Kovinski materiali – Preskus trdote po Knoopu – 2. del: Preverjanje in umerjanje naprav za preskušanje (ISO 4545-2:2005)

Metallic materials - Knoop hardness test - Part 2: Verification and calibration of testing machines (ISO 4545-2:2005)

Metallische Werkstoffe - Härteprüfung nach Knoop - Teil 2: Prüfung und Kalibrierung der Prüfmaschinen (ISO 4545-2:2005)

Matériaux métalliques - Essai de dureté Knoop - Partie 2: Vérification et étalonnage des machines d'essai (ISO 4545-2:2005)

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77.040.10 Mehansko preskušanje kovin Mechanical testing of metals

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Metallic materials - Knoop hardness test - Part 2: Verification and calibration of testing machines (ISO 4545-2:2005)

Matériaux métalliques - Essai de dureté Knoop - Partie 2: Vérification et étalonnage des machines d'essai (ISO 4545-2:2005)

Metallische Werkstoffe - Härteprüfung nach Knoop - Teil 2: Prüfung und Kalibrierung der Prüfmaschinen (ISO 4545-2:2005)

This European Standard was approved by CEN on 28 October 2005.

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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 CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN ISO 4545-2:2005) has been prepared by Technical Committee ISO/TC 164 "Mechanical testing of metals" in collaboration with Technical Committee ECISS/TC 1 "Steel - Mechanical testing", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2006, and conflicting national standards shall be withdrawn at the latest by May 2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of ISO 4545-2:2005 has been approved by CEN as EN ISO 4545-2:2005 without any modifications.

INTERNATIONAL STANDARD

ISO 4545-2

First edition
2005-11-15

Metallic materials — Knoop hardness test —

Part 2: Verification and calibration of testing machines

Matériaux métalliques — Essai de dureté Knoop —
Partie 2: Vérification et étalonnage des machines d'essai

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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.

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 4545-2 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 3, *Hardness testing*.

ISO 4545-2 cancels and replaces ISO 4546:1993, which has been technically revised.

ISO 4545 consists of the following parts, under the general title *Metallic materials — Knoop hardness test*:

— *Part 1: Test method*

— *Part 2: Verification and calibration of testing machines*

— *Part 3: Calibration of reference blocks*

— *Part 4: Table of hardness values*

Metallic materials — Knoop hardness test —

Part 2: Verification and calibration of testing machines

1 Scope

This part of ISO 4545 specifies the method of verification of testing machines for determining Knoop hardness for metallic materials in accordance with ISO 4545-1-1. It covers test forces from 0,098 07 N to 19,614 N. The method is recommended only for indentations with diagonals $\geqslant$ 0,020 mm.

It specifies a direct verification method for checking the main functions of the machine, and an indirect verification method suitable for the overall checking of the machine. The indirect verification method may be used on its own for periodic routine checking of the machine in service.

If a testing machine is also to be used for other methods of hardness testing, it should be verified independently for each method.

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 376:2004, *Metallic materials — Calibration of force-proving instuments used for the verification of uniaxial testing machines*

ISO 4545-1:2005, *Metallic materials — Knoop hardness test — Part 1: Test method*

ISO 4545-3, *Metallic materials — Knoop hardness test — Part 3: Calibration of reference blocks*

3 General conditions

Before a Knoop hardness testing machine is verified, it shall be checked to ensure that it is properly set up in accordance with the manufacturer's instructions.

Especially, it should be checked that:

a) the mount holding the indenter is capable of moving freely without any friction or excess side play;

b) the indenter is firmly mounted in the mount;

c) the test force can be applied and removed without shock or vibration and in such a manner that the readings are not influenced;

d) the measuring system is integral with the machine:

— the change in mode from the application and removal of the test force to the measuring mode does not influence the readings,

— illumination does not affect the readings,

— the centre of the indentation is near the centre of the field of view.

4 Direct verification

4.1 General

4.1.1 Direct verification should be carried out at a temperature of (23 ± 5) °C. If the verification is carried out at a temperature outside this range, it shall be noted in the verification report.

4.1.2 The instruments used for verification and calibration shall be traceable to national standards.

4.1.3 Direct verification involves:

a) calibration of the test force;

b) verification of the indenter;

c) calibration of the measuring system;

d) verification of the testing cycle.

4.2 Calibration of the test force

4.2.1 Each test force used (see Table 2 in ISO 4545-1:2005), within the working range of the testing machine, shall be measured.

4.2.2 The test force shall be measured by one of the following two methods:

— by means of an elastic proving device in accordance with ISO 376:2004, class 1, or

— by balancing against a force, accurate to ± 0,2 %, applied by means of calibrated masses or another method with the same accuracy.

4.2.3 Three readings shall be taken for each test force. Immediately before each reading is taken, the indenter shall be moved in the same direction as during the test. All readings shall be within the tolerances defined in Table 1.

Table 1 — Test-force tolerances

Test force, F N	**Tolerance** %
0,098 07 ⩽ F < 1,961	± 1,5
1,961 ⩽ F ⩽ 19,614	± 1,0

4.3 Verification of the indenter

4.3.1 The four faces of the diamond pyramid shall be polished and free from surface defects.

4.3.2 Verification of the shape of the indenter can be made by direct measurement or optical measurement. The device used for the verification shall be accurate to within ± 0,07°.

4.3.3 The angle α between the opposite edges at the vertex of the diamond pyramid shall be (172,5 ± 0,1)° (see Figure 1).

4.3.4 The angle β between the opposite edges at the vertex of the diamond pyramid shall be (130 ± 1,0)° (see Figure 1).

4.3.5 The indenter constant c (see ISO 4545-1:2005, Table 1) shall be within 1,0 % of the ideal value 0,070 28, (0,069 58 $\leqslant c \leqslant$ 0,070 98).

NOTE To achieve the tolerances for the indenter constant c, the values of angle α and/or angle β may be kept to closer tolerances than given above.

4.3.6 The angle between the axis of the diamond pyramid and the axis of the indenter holder (normal to the seating surface) shall be within ± 0,5°.

4.3.7 The four faces shall meet at a common point. The maximum permissible length of the line of conjunction between opposite faces shall be less than 1,0 µm (see Figure 2).

NOTE For indents less than 0,020 mm, the maximum permissible length of the line of conjunction should be proportionally less. The line of conjunction may be determined by measuring an indentation.

4.4 Calibration of the measuring system

4.4.1 The system for measuring the long diagonal of the indentation shall be calibrated at each magnification to be used against an accurately ruled line scale (object micrometer) or system of equivalent accuracy. The errors of the line scale shall be known within an uncertainty of 0,1 µm or 0,05 %, whichever is greater.

4.4.2 The measuring system shall be verified by measurements made on a stage micrometer at a minimum of five intervals over each working range.

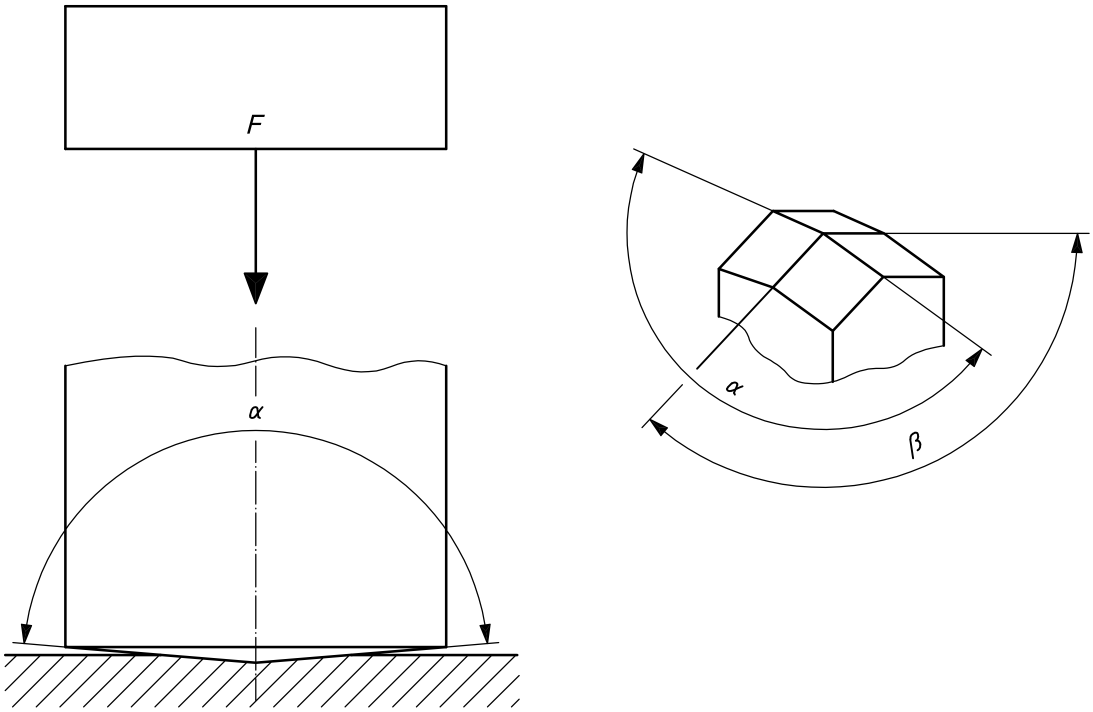

Figure 1 — Principle of the test and indenter geometry