SLOVENSKI STANDARD
SIST ISO 6507-3:1995

01-november-1995

Kovinska gradiva - Preskus trdote - Preskus trdote po Vickersu - 3. del: Manj kot HV 0,2

Metallic materials -- Hardness test -- Vickers test -- Part 3: Less than HV 0,2

Matériaux métalliques -- Essai de dureté -- Essai Vickers -- Partie 3: Inférieure à HV 0,2

Ta slovenski standard je istoveten z: **ISO 6507-3:1989**

ICS:

77.040.10 Mehansko preskušanje kovin Mechanical testing of metals

SIST ISO 6507-3:1995 **en**

INTERNATIONAL STANDARD

ISO 6507-3

First edition
1989-11-01

Metallic materials — Hardness test — Vickers test —

Part 3 : Less than HV 0,2

Matériaux métalliques — Essai de dureté — Essai Vickers —

Partie 3 : Inférieure à HV 0,2

Reference number
ISO 6507-3 : 1989 (E)

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 approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6507-3 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals.*

ISO 6507 consists of the following parts, under the general title *Metallic materials — Hardness test — Vickers test*:

- *Part 1:* HV 5 *to* HV 100
- *Part 2:* HV 0,2 *to less than* HV 5
- *Part 3: Less than* HV 0,2

Annex A forms an integral part of this part of ISO 6507. Annex B is for information only.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Printed in Switzerland

Introduction

Three types of Vickers hardness test exist, characterized by different ranges of test forces as indicated in the following table.

Designation	Hardness symbol	Test force, F (N)	Test method
Vickers hardness test	HV 5 to HV 100	49,03 to 980,7	ISO 6507-1
Low load Vickers hardness test	HV 0,2 to < HV 5	1,961 to < 49,03	ISO 6507-2
Vickers micro-hardness test	< HV 0,2	< 1,961	ISO 6507-3

In general, decreasing the test force increases the scatter of results of the measurements. This is particularly true for low load and micro Vickers hardness tests where the principal limitation will arise in the measurement of the diagonals of the indentation. In industrial tests, carried out in accordance with this part of ISO 6507, the accuracy of determination of the mean diagonal is unlikely to be better than ± 0,001 mm. The corresponding uncertainty in the hardness value would be, for example, very roughly 20 % HV for a diagonal length of 0,010 mm.

Metallic materials — Hardness test — Vickers test —

Part 3:
Less than HV 0,2

1 Scope

This part of ISO 6507 specifies a method of determining a Vickers hardness of less than HV 0,2 (test force less than 1,961 N) for metallic materials.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6507. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6507 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6507-1 : 1982, *Metallic materials — Hardness test — Vickers test — Part 1:* HV 5 *to* HV 100.

ISO 6507-2 : 1983, *Metallic materials — Hardness test — Vickers test — Part 2:* HV 0,2 *to less than* HV 5.

3 Symbols and their meanings

3.1 See table 1 and figures 1 and 2.

Table 1

Symbol	Meaning
α	Angle between the opposite faces at the vertex of the pyramidal indenter (136°)
F	Test force, in newtons
d	Arithmetic mean, in millimetres, of the two diagonals d_1 and d_2
HV	Vickers hardness $= \text{Constant} \times \frac{\text{Test force}}{\text{Surface area of indentation}}$ $= 0{,}102 \times \frac{2F \cdot \sin\frac{136°}{2}}{d^2} \approx 0{,}189\,1 \times \frac{F}{d^2}$
NOTE — Constant $= \frac{1}{g_n} = \frac{1}{9{,}806\,65} \approx 0{,}102$	

3.2 The Vickers hardness is denoted by the symbol HV preceded by the hardness value and followed by:

a) a number representing the test force (see table 2);

b) the duration of loading, in seconds, if different from the time specified in 7.4.

Examples:

640 HV 0,1 = Vickers hardness of 640 determined with a test force of 0,980 7 N applied for 10 s to 15 s

640 HV 0,1/20 = Vickers hardness of 640 determined with a test force of 0,980 7 N applied for 20 s

4 Principle

Forcing a diamond indenter in the form of a right pyramid with a square base and with a specified angle between opposite faces at the vertex into the surface of a test piece and measuring the diagonals of the indentation left in the surface after removal of the test force, F (see figure 1).

The Vickers hardness is porportional to the number obtained by dividing the test force by the area of the sloping faces of the indentation, which is assumed to be a right pyramid with a square base and having at the vertex the same angle as the indenter.

5 Apparatus

5.1 Testing machine, capable of applying a predetermined force or forces less than 1,961 N.

5.2 Indenter, comprising a diamond in the shape of a right pyramid with a square base.

6 Test piece

6.1 The test shall be carried out on a polished surface which is smooth and even, free from oxide scale and foreign matter and, in particular, completely free from lubricants.

6.2 Due to the small depth of Vickers micro-hardness indentations, special precautions must be taken during preparation. Preparation shall be carried out in such a way that any alteration of the surface hardness, due to heat or cold-working, for example, is minimized.

6.3 The thickness of the test piece or of the layer under test shall be at least 1,5 times the diagonal of the indentation (see annex A).

No deformation shall be visible at the back of the test piece after the test.

6.4 For test pieces of small cross-section or of irregular shape, it may be necessary to provide some form of additional support, for example mounting in plastics material.

7 Procedure

7.1 The test is normally carried out at a temperature of 23 °C ± 5 °C. If the test is carried out at a temperature outside this range, it shall be noted in the test report.

7.2 The test forces shown in table 2 are recommended.

Table 2

Hardness symbol	Nominal value of the test force, F (N)
HV 0,01	$98,07 \times 10^{-3}$
HV 0,02	0,196 1
HV 0,025	0,245 2
HV 0,05	0,490 3
HV 0,1	0,980 7

7.3 The test piece shall be placed on a rigid support. The contact surfaces shall be clean and free from foreign matter (scale, oil, dirt, etc.). It is important that the test piece lies firmly on the support so that displacement cannot occur during the test.

7.4 Bring the indenter into contact with the test surface and apply the test force in the direction perpendicular to the surface, without shock or vibration, until the applied force attains the specified value. The time from the initial application of the force until the full test force is reached shall not exceed 10 s. The approach speed of the indenter shall not exceed 200 µm/s. The duration of the test force shall be 10 s to 15 s. For some materials, a longer time for maintaining the force may be specified; this time shall be applied with a tolerance of ± 2 s.

7.5 Throughout the test, the apparatus shall be protected from shock or vibration.

7.6 The distance between the centre of any indentation and the edge of the test piece shall be at least 2,5 times the mean diagonal of the indentation in the case of steel, copper and copper alloys and at least three times the mean diagonal of the indentation in the case of light metals, lead and tin and their alloys.

The distance between the centres of two adjacent indentations shall be at least three times the mean diagonal of the indentation in the case of steel, copper and copper alloys, and at least six times the mean diagonal in the case of light metals, lead and tin and their alloys. If two adjacent indentations differ in size, the spacing shall be based on the mean diagonal of the larger indentation.

7.7 Measure the lengths of the two diagonals. The arithmetical mean of the two readings shall be taken for the calculation of the Vickers hardness.

8 Test report

The test report shall include the following information:

a) a reference to this part of ISO 6507;

b) all details necessary for the identification of the test sample;

c) the result obtained;

d) all operations not specified in this part of ISO 6507, or regarded as optional;

e) details of any occurrence which may have affected the result.

NOTES

1 There is no general process for accurately converting Vickers hardness into other scales of hardness or into tensile strength. Such conversions therefore should be avoided, unless a reliable basis for conversion can be obtained by comparison tests.

2 A strict comparison of hardness values is only possible at identical test forces.

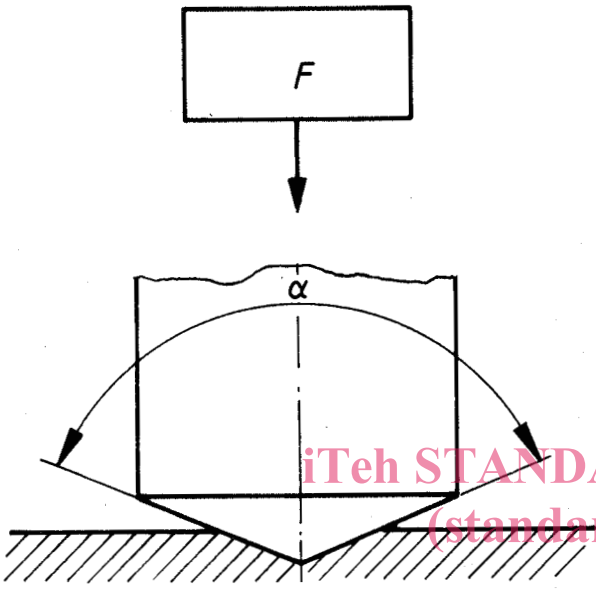

Figure 1 — Indenter (pyramidal diamond)

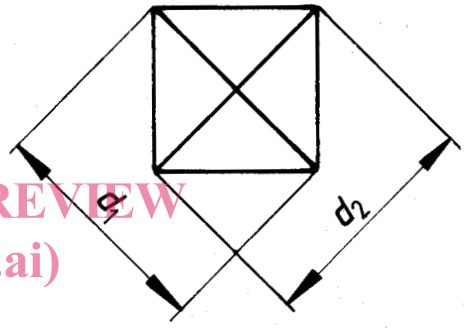

Figure 2 — Vickers indentation