



SLOVENSKI STANDARD
SIST EN ISO 4545-4:2006

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Metallische Werkstoffe - Härteprüfung nach Knoop - Teil 4: Tabelle zur Bestimmung der Härtewerte (ISO 4545-4:2005)

Metallische Werkstoffe - Härteprüfung nach Knoop - Teil 4: Tabelle zur Bestimmung der Härtewerte (ISO 4545-4:2005)

Matériaux métalliques - Essai de dureté Knoop - Partie 4: Tableau des valeurs de dureté (ISO 4545-4:2005)

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Ta slovenski standard je istoveten z: EN ISO 4545-4:2005

ICS:

77.040.10 Mehansko preskušanje kovin Mechanical testing of metals

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN ISO 4545-4

November 2005

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English Version

Metallic materials - Knoop hardness test - Part 4: Table of hardness values (ISO 4545-4:2005)

Matériaux métalliques - Essai de dureté Knoop - Partie 4:
Tableau des valeurs de dureté (ISO 4545-4:2005)

Metallische Werkstoffe - Härteprüfung nach Knoop - Teil 4:
Tabelle zur Bestimmung der Härtewerte (ISO 4545-4:2005)

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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EN ISO 4545-4:2005 (E)**Foreword**

This document (EN ISO 4545-4:2005) 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of an identical text or by endorsement, at the latest by May 2006, and conflicting national standards shall be withdrawn at the latest by May 2006.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.

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The text of ISO 4545-4:2005 has been approved by CEN as EN ISO 4545-4:2005 without any modifications.

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INTERNATIONAL STANDARD

ISO
4545-4

First edition
2005-11-15

Metallic materials — Knoop hardness test —

Part 4: Table of hardness values

*Matériaux métalliques — Essai de dureté Knoop —
Partie 4: Tableau des valeurs de dureté*
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Foreword

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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 4545-4 was prepared by Technical Committee ISO/TC 164, *Mechanical hardness testing*, Subcommittee SC 3, *Hardness testing*.

ISO 4545-4 cancels and replaces ISO 10250:1994, 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* [SIST EN ISO 4545-4:2006](https://standards.iteh.ai/catalog/standards/sist/32ebfa11-b632-4d47-b155-0bf031d26188/sist-en-iso-4545-4-2006)
- *Part 2: Verification and calibration of testing machines*
- *Part 3: Calibration of reference blocks*
- *Part 4: Table of hardness values*

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Metallic materials — Knoop hardness test —

Part 4: Table of hardness values

1 Scope

This part of ISO 4545 gives a table for the calculation of Knoop hardness values for use in tests made on flat surfaces carried out in accordance with ISO 4545-1.

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

ISO 4545-2, *Metallic materials — Knoop hardness test — Part 2: Verification and calibration of testing machines*

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3 Calculation

The Knoop hardness values in Table 1 have been calculated from the formula

$$\begin{aligned} \text{HK} &= \text{Gravitational constant} \times \frac{\text{Test force}}{\text{Projected area of indentation}} \\ &= 0,102 \times \frac{F}{cd^2} = 0,102 \times \frac{F}{0,070\,28d^2} = 1,451 \times \frac{F}{d^2} \end{aligned} \quad (1)$$

where

HK is the Knoop hardness;

F is the test force, in newtons;

d is the length in millimetres, of the long diagonal of the indentation;

c is an indenter constant which equals $\left[\frac{\tan \frac{\beta}{2}}{2 \tan \frac{\alpha}{2}} \right]$, ideally $c = 0,070\,28$;

where α and β are the angles between the opposite edges at the vertex of the diamond pyramid, as defined in ISO 4545-2.

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NOTE Gravitational constant = $\frac{1}{g_n} = \frac{1}{9,806\ 65} \approx 0,102$

where g_n is the acceleration due to gravity.

Table 1 covers a range of indentation diagonals d between 0,020 mm and 0,200 0 mm.

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Table 1

Indentation diagonal <i>d</i> mm	Test force								
	N								
	0,098 07	0,196 1	0,245 2	0,490 3	0,980 7	1,961 2	2,942 0	4,903	9,807
	Knoop hardness								
	HK 0,01	HK 0,02	HK 0,025	HK 0,05	HK 0,1	HK 0,2	HK 0,3	HK 0,5	HK 1
0,020 0	355,8	711,3	889,5	1 779	—	—	—	—	—
0,020 2	348,7	697,2	872,0	1 743	—	—	—	—	—
0,020 4	341,9	683,6	855,0	1 709	—	—	—	—	—
0,020 6	335,3	670,4	838,4	1 676	—	—	—	—	—
0,020 8	328,9	657,6	822,4	1 644	—	—	—	—	—
0,021 0	322,7	645,1	806,8	1 613	—	—	—	—	—
0,021 2	316,6	633,0	791,7	1 583	—	—	—	—	—
0,021 4	310,7	621,2	776,9	1 553	—	—	—	—	—
0,021 6	305,0	609,8	762,6	1 525	—	—	—	—	—
0,021 8	299,4	598,6	748,7	1 497	2 994	—	—	—	—
0,022 0	294,0	587,8	735,1	1 470	2 940	—	—	—	—
0,022 2	288,7	577,3	721,9	1 443	2 887	—	—	—	—
0,022 4	283,6	567,0	709,1	1 418	2 836	—	—	—	—
0,022 6	278,6	557,0	696,6	1 393	2 786	—	—	—	—
0,022 8	273,7	547,3	684,4	1 368	2 737	—	—	—	—
0,023 0	269,0	537,8	672,6	1 345	2 690	—	—	—	—
0,023 2	264,4	528,6	661,0	1 322	2 644	—	—	—	—
0,023 4	259,9	519,6	649,8	1 299	2 599	—	—	—	—
0,023 6	255,5	510,8	638,8	1 277	2 555	—	—	—	—
0,023 8	251,2	502,3	628,1	1 256	2 512	—	—	—	—
0,024 0	247,0	493,9	617,7	1 235	2 470	—	—	—	—
0,024 2	243,0	485,8	607,5	1 215	2 430	—	—	—	—
0,024 4	239,0	477,9	597,6	1 195	2 390	—	—	—	—
0,024 6	235,1	470,1	587,9	1 176	2 351	—	—	—	—
0,024 8	231,4	462,6	578,5	1 157	2 314	—	—	—	—
0,025 0	227,7	455,2	569,3	1 138	2 277	—	—	—	—
0,025 2	224,1	448,0	560,3	1 120	2 241	—	—	—	—
0,025 4	220,6	441,0	551,5	1 103	2 206	—	—	—	—
0,025 6	217,1	434,1	542,9	1 086	2 171	—	—	—	—
0,025 8	213,8	427,4	534,5	1 069	2 138	—	—	—	—
0,026 0	210,5	420,9	526,3	1 052	2 105	—	—	—	—
0,026 2	207,3	414,5	518,3	1 036	2 073	—	—	—	—
0,026 4	204,2	408,2	510,5	1 021	2 042	—	—	—	—
0,026 6	201,1	402,1	502,9	1 005	2 011	—	—	—	—
0,026 8	198,1	396,1	495,4	990,5	1 981	—	—	—	—
0,027 0	195,2	390,3	488,1	975,9	1 952	—	—	—	—
0,027 2	192,3	384,5	480,9	961,6	1 923	—	—	—	—
0,027 4	189,5	378,9	473,9	947,6	1 895	—	—	—	—
0,027 6	186,8	373,5	467,1	933,9	1 868	—	—	—	—
0,027 8	184,1	368,1	460,4	920,5	1 841	—	—	—	—
0,028 0	181,5	362,9	453,8	907,4	1 815	—	—	—	—
0,028 2	178,9	357,8	447,4	894,6	1 789	—	—	—	—
0,028 4	176,4	352,7	441,1	882,0	1 764	—	—	—	—
0,028 6	174,0	347,8	435,0	869,7	1 740	—	—	—	—
0,028 8	171,6	343,0	429,0	857,7	1 716	—	—	—	—

Table 1 (continued)

Indentation diagonal <i>d</i> mm	Test force N								
	0,098 07	0,196 1	0,245 2	0,490 3	0,980 7	1,961 2	2,942 0	4,903	9,807
	Knoop hardness								
	HK 0,01	HK 0,02	HK 0,025	HK 0,05	HK 0,1	HK 0,2	HK 0,3	HK 0,5	HK 1
0,029 0	169,2	338,3	423,1	845,9	1 692	—	—	—	—
0,029 2	166,9	333,7	417,3	834,3	1 669	—	—	—	—
0,029 4	164,6	329,1	411,6	823,0	1 646	—	—	—	—
0,029 6	162,4	324,7	406,1	812,0	1 624	—	—	—	—
0,029 8	160,2	320,4	400,7	801,1	1 602	—	—	—	—
0,030 0	158,1	316,1	395,3	790,4	1 581	—	—	—	—
0,030 2	156,0	311,9	390,1	780,0	1 560	—	—	—	—
0,030 4	154,0	307,8	385,0	769,8	1 540	—	—	—	—
0,030 6	152,0	303,8	380,0	759,8	1 520	—	—	—	—
0,030 8	150,0	299,9	375,1	749,9	1 500	2 999	—	—	—
0,031 0	148,1	296,0	370,2	740,3	1 481	2 960	—	—	—
0,031 2	146,2	292,3	365,5	730,8	1 462	2 923	—	—	—
0,031 4	144,3	288,6	360,9	721,5	1 443	2 886	—	—	—
0,031 6	142,5	284,9	356,3	712,4	1 425	2 849	—	—	—
0,031 8	140,7	281,3	351,8	703,5	1 407	2 813	—	—	—
0,032 0	139,0	277,8	347,5	694,7	1 390	2 778	—	—	—
0,032 2	137,2	274,4	343,2	686,1	1 372	2 744	—	—	—
0,032 4	135,6	271,0	338,9	677,7	1 356	2 710	—	—	—
0,032 6	133,9	267,7	334,8	669,4	1 339	2 677	—	—	—
0,032 8	132,3	264,4	330,7	661,3	1 323	2 644	—	—	—
0,033 0	130,7	261,2	326,7	653,3	1 307	2 612	—	—	—
0,033 2	129,1	258,1	322,8	645,4	1 291	2 581	—	—	—
0,033 4	127,6	255,0	318,9	637,7	1 276	2 550	—	—	—
0,033 6	126,0	252,0	315,2	630,1	1 260	2 520	—	—	—
0,033 8	124,6	249,0	311,4	622,7	1 246	2 490	—	—	—
0,034 0	123,1	246,1	307,8	615,4	1 231	2 461	—	—	—
0,034 2	121,7	243,2	304,2	608,2	1 217	2 432	—	—	—
0,034 4	120,3	240,4	300,7	601,2	1 203	2 404	—	—	—
0,034 6	118,9	237,6	297,2	594,2	1 189	2 376	—	—	—
0,034 8	117,5	234,9	293,8	587,4	1 175	2 349	—	—	—
0,035 0	116,2	232,2	290,4	580,7	1 162	2 322	—	—	—
0,035 2	114,8	229,6	287,2	574,2	1 148	2 296	—	—	—
0,035 4	113,6	227,0	283,9	567,7	1 136	2 270	—	—	—
0,035 6	112,3	224,5	280,7	561,3	1 123	2 245	—	—	—
0,035 8	111,0	222,0	277,6	555,1	1 110	2 220	—	—	—
0,036 0	109,8	219,5	274,5	548,9	1 098	2 195	—	—	—
0,036 2	108,6	217,1	271,5	542,9	1 086	2 171	—	—	—
0,036 4	107,4	214,7	268,5	536,9	1 074	2 147	—	—	—
0,036 6	106,2	212,4	265,6	531,1	1 062	2 124	—	—	—
0,036 8	105,1	210,1	262,7	525,3	1 051	2 101	—	—	—
0,037 0	103,9	207,8	259,9	519,6	1 039	2 078	—	—	—
0,037 2	102,8	205,6	257,1	514,1	1 028	2 056	—	—	—
0,037 4	101,7	203,4	254,4	508,6	1 017	2 034	—	—	—
0,037 6	100,7	201,2	251,7	503,2	1 007	2 012	—	—	—
0,037 8	99,59	199,1	249,0	497,9	995,9	1 991	2 988	—	—