



# SLOVENSKI STANDARD

## SIST EN 10003-3:1996

01-junij-1996

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**Kovinski materiali - Preskus trdote po Brinellu - 3. del: Kalibracija standardiziranih primerjalnih ploščic za preverjanje merilnikov trdote po Brinellu**

Metallic materials - Brinell hardness test - Part 3: Calibration of standardized blocks to be used for Brinell hardness testing machines

Metallische Werkstoffe - Härteprüfung nach Brinell - Teil 3: Kalibrierung von Härtevergleichsplatten für die Prüfung von Härteprüfmaschinen nach Brinell

Matériaux métalliques - Essai de dureté Brinell - Partie 3: Etalonnage des blocs de référence de dureté à utiliser avec les machines de dureté Brinell

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**Ta slovenski standard je istoveten z: EN 10003-3:1994**

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**ICS:**

77.040.10 Mehansko preskušanje kovin Mechanical testing of metals

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EUROPEAN STANDARD

EN 10003-3

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EUROPÄISCHE NORM

October 1994

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Descriptors: metallurgical products, mechanical tests, hardness tests, Brinell hardness, hardness testers, calibration, standard measures

English version

**Metallic materials - Brinell hardness test - Part 3:  
Calibration of standardized blocks to be used for  
Brinell hardness testing machines**

Matériaux métalliques - Essai de dureté Brinell  
- Partie 3: Etalonnage des blocs de référence  
de dureté à utiliser avec les machines de  
dureté Brinell

Metallische Werkstoffe - Härteprüfung nach  
Brinell - Teil 3: Kalibrierung von  
Härtevergleichsplatten für die Prüfung von  
Härteprüfmaschinen nach Brinell

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist 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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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This European Standard has been prepared by the Technical Committee ECISS/TC 1A "Mechanical and physical tests", 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 April 1995, and conflicting national standards shall be withdrawn at the latest by April 1995.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

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### 0 Introduction

The Standard EN 10003 is valid to metallic materials and comprises the following parts :

- Part 1 : **Metallic materials - Brinell hardness test - Part 1 : Test method**
- Part 2 : **Metallic materials - Brinell hardness test - Part 2 : Verification of Brinell hardness testing machines**
- Part 3 : **Metallic materials - Brinell hardness test - Part 3 : Calibration of standardized blocks to be used for Brinell hardness testing machines.**

## 1 Scope

This European Standard specifies a method for the calibration of standardized blocks to be used in Brinell hardness testing machines, for the indirect verification of these machines, as described in accordance with EN 10003-2.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10002-3 Metallic materials - Tensile test - Part 3 : Calibration of force proving instruments used for the verification of uniaxial testing machines

EN 10003-1 Metallic materials - Brinell hardness test - Part 1 : Test method

EN 10003-2 Metallic materials - Brinell hardness test - Part 2 : Verification of Brinell hardness testing machines

ISO 468 Surface roughness - Parameters, their values and general rules for specifying surfaces.

## 3 Manufacture of blocks

3.1 The block shall be specially prepared and the attention of the manufacturer is drawn to the need to use a manufacturing process which will give the necessary homogeneity, stability of structure and uniformity of surface hardness.

3.2 Each metal block to be standardized shall be of a thickness not less than :

- 16 mm for 10 mm balls
- 12 mm for 5 mm balls
- 6 mm for smaller balls.

3.3 The standardized blocks shall be free of magnetism. It is recommended that the manufacturer shall ensure that the blocks, if of steel, have been demagnetized at the end of the manufacturing process.

3.4 The flatness of the two surfaces and the parallelism of the standardized block shall be in accordance with table 1.

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Table 1

Diameter of ball mm	Maximum deviation in flatness of the surfaces mm	Maximum error in parallelism mm/50 mm	Surface roughness, maximum $R_a$ 1) $\mu\text{m}$	
			Test surface	Bottom surface
10	0,040	0,050	0,3	0,8
5	0,020	0,040	0,2	0,8
< 5	0,005	0,010	0,1	0,8

1) sampling length :  $l = 0,80$  mm (see ISO 468)

3.5 The test surface shall be free from scratches which interfere with the measurement of the indentations (see table 1).

3.6 To permit checking that no material is subsequently removed from the standardized block, its thickness at the time of standardization shall be marked on it to the nearest 0,1 mm, or an identifying mark shall be made on the test surface (see clause 8).

#### 4 Standardizing machine

4.1 In addition to fulfilling the general requirements specified in EN 10003-2, clause 3, the standardizing machine shall also meet the requirements in 4.2.1 to 4.2.3 of this European Standard.

4.2 The machine shall be verified directly. Direct verification involves :

- verification of the test force
- verification of the indenter
- verification of the measuring device.

The instruments used for verification shall have a certified traceability using the international system of units (SI).

4.2.1 Each test force shall be correct to within  $\pm 0,1$  % of the nominal test force as defined in EN 10003-1.

The force has to be measured with force proving instrument of class 0,5 according to EN 10002-3.

4.2.2 The indenters shall be verified, and shall meet the requirements given in 4.2 of EN 10003-2, clause 4.2, except that the tolerances on the diameter of the balls shall meet the requirements given in table 2.

Table 2

Dimensions in millimetres	
Ball diameter	Tolerance
10	± 0,003
5	± 0,002
2,5	± 0,001
2	± 0,001
1	± 0,001

4.2.3 The scale of the measuring microscope shall be graduated to read to 0,002 mm for indentations made with 10 and 5 mm balls and 0,001 mm for indentations made with balls of less than 5 mm diameter.

The scale of the measuring microscope shall be verified by measurements made on a stage micrometer at a minimum of five intervals over each working range. The accuracy of the measuring device in relation to the diameters of indentation shall be as given in table 3.

Table 3

Dimensions in millimetres	
Diameter of indentation	Accuracy
< 1	± 0,0005
de 1 à 2,499	± 0,0010
≥ 2,5	± 0,0020

## 5 Standardizing procedure

The standardized blocks shall be calibrated in a standardizing machine as described in clause 4, at a temperature of  $(23 \pm 5) ^\circ\text{C}$ , using the general procedure described in EN 10003-1.

The time from the initial application of force until the full test force is reached shall not be less than 6 s nor greater than 8 s. The duration of the test force shall be 10 to 15 s.

The mechanism which controls the application of the force shall ensure that the speed of approach of the ball immediately before it touches the block is not more than 1 mm/s.

## 6 Number of indentations

On each standardized block five indentations shall be made uniformly distributed over the entire test surface.

## 7 Uniformity of hardness

7.1 Let  $d_1, d_2 \dots d_5$  be the values of the mean measured diameters, arranged in increasing order of magnitude.

The non-uniformity of the block under the particular conditions of standardization is characterized by :

$$d_5 - d_1$$



and expressed in percent of  $\bar{d}$ ,

where

$$\bar{d} = \frac{d_1 + d_2 + \dots + d_5}{5}$$

7.2 The block is sufficiently uniform in hardness for standardization purposes if the uniformity satisfies the conditions given in table 4.

Table 4

$\bar{d}$ in mm	Maximum permissible non-uniformity of $\bar{d}$ %
< 0,5	2,0
from 0,5 to 1	1,5
> 1	1,0

## 8 Marking

8.1 Each standardized block shall be marked with the following :

a) arithmetic mean of the hardness values found in the standardizing test, for example :  
348 HBS (HBW) 5/750

b) name or mark of the supplier

c) serial number

d) name or mark of the standardizing authority

e) thickness of the block or an identifying mark on the test surface

f) year of calibration.

8.2 Any mark put on the side of the block shall be upright when the test surface is the upper face.

8.3 Each delivered standardized block shall be accompanied with a document giving at least the following information :

a) the reference to this standard

b) the identity of the block

c) the year of manufacture

d) the arithmetic mean of the hardness values or the value characterizing the non-uniformity of the block.