SLOVENSKI STANDARD
SIST EN 10109-1:1996

01-januar-1996

Kovinski materiali - Preskus trdote - 1. del: Preskus po Rockwellu (skale A, B, C, D, E, F, G, H, K) in preskus površinske trdote po Rockwellu (skale 15N, 30N, 45N, 15T, 30T in 45T)

Metallic materials - Hardness test - Part 1: Rockwell test (scales A,B,C,D,E,F,G,H,K) and Rockwell superficial test (scales 15N,30N,45N,15T,30T and 45T)

Metallische Werkstoffe - Härteprüfung - Teil 1: Rockwell-Verfahren (Skalen A,B,C,D,E,F,G,H,K) und Verfahren N und T (Skalen 15N,30N,45N,15T,30T,45T)

Matériaux métalliques - Essai de dureté - Partie 1: Essai Rockwell (échelles A,B,C,D,E,F,G,H,K) et essai superficiel Rockwell (échelles 15N,30N,45N,15T,30T,45T)

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English version

Metallic materials - Hardness test - Part 1: Rockwell test (scales A,B,C,D,E,F,G,H,K) and Rockwell superficial test (scales 15N,30N,45N,15T,30T, and 45T)

Matériaux métalliques - Essai de dureté - Partie 1: Essai Rockwell (échelles A,B,C,D,E,F,G,H,K) et essai superficiel Rockwell (échelles 15N,30N,45N,15T,30T et 45T)

Metallische Werkstoffe - Härteprüfung - Teil 1: Rockwell-Verfahren (Skalen A,B,C,D,E,F,G,H,K) und Verfahren N und T (Skalen 15N,30N,45N,15T,30T, und 45T)

This European Standard was approved by CEN on 1994-10-19. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

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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 replaces:

EURONORM 4	Rockwell hardness test (scales A, B, C, F)
EURONORM 109	Conventional Rockwell hardness test - Rockwell scales HRN and HRT - Rockwell scales HRBm and HR30Tm for thin products.

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.

0 Introduction

The standard EN 10109 is valid to metallic materials and comprises the following parts :

Part 1 : Metallic materials - Hardness test - Part 1 : Rockwell test (scales A, B, C, D, E, F, G, H, K) and Rockwell superficial test (scales 15N, 30N, 45N, 15T, 30T and 45T)

Part 2 : Metallic materials - Hardness test - Part 2 : Verification of Rockwell hardness testing machines (scales A, B, C, D, E, F, G, H, K, N, T)

Part 3 : Metallic materials - Hardness test - Part 3 : Calibration of standardized blocks to be used for Rockwell hardness testing machines (scales A, B, C, D, E, F, G, H, K, N, T).

1 Scope

This European Standard specifies the method for Rockwell and Rockwell superficial hardness tests (scales and field of application according to table 1) for metallic materials.

For specific materials and/or products, particular International Standards exist (see clause 2).

NOTE : For certain materials, the fields of application may be narrower than those indicated.

The normative annexes A to C give respectively the minimum thickness of the test piece and the corrections to be added to Rockwell hardness values obtained on convex cylindrical surfaces and on spherical test surfaces of various diameters.

The normative annex D describes the conventional HR30Tm test for thin products.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions for 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 10109-2 Metallic materials - Hardness test - Part 2 : Verification of Rockwell hardness testing machines (scales A, B, C, D, E, F, G, H, K, N, T)

EN 24498-1 Sintered metals materials, excluding hardmetals - Determination of apparent hardness - Part 1 : Materials of essentially uniform section hardness.

ISO 3738-1 Hardmetals - Rockwell hardness test (scale A) - Part 1 : Test method

3 Principle

Forcing an indenter (diamond cone or steel ball) into the surface of a test piece in two steps under specified conditions (see clause 7). Measuring the permanent depth of indentation under preliminary test force after removal of additional test force.

From the value of h, a number known as the Rockwell hardness is calculated (see table 2) following the formula :

Rockwell hardness : $N - \frac{h}{S}$

4 Symbols and designations

See tables 1 and 2 and figure 1.

Table 1

Rockwell hardness scale	Hardness symbol	Type of indenter	Preliminary test force F_o	Additional test force F_1	Total test force F	Field of application (Rockwell hardness test)
A	HRA	Diamond cone	98,07 N	490,3 N	588,4 N	20 to 88 HRA
B	HRB	Steel ball 1,587 5 mm	98,07 N	882,6 N	980,7 N	20 to 100 HRB
C	HRC	Diamond cone	98,07 N	1,373 kN	1,471 kN	20 to 70 HRC
D	HRD	Diamond cone	98,07 N	882,6 N	980,7 N	40 to 77 HRD
E	HRE	Steel ball 3,175 mm	98,07 N	882,6 N	980,7 N	70 to 100 HRE
F	HRF	Steel ball 1,587 5 mm	98,07 N	490,3 N	588,4 N	60 to 100 HRF
G	HRG	Steel ball 1,587 5 mm	98,07 N	1,373 kN	1,471 kN	30 to 94 HRG
H	HRH	Steel ball 3,175 mm	98,07 N	490,3 N	588,4 N	80 to 100 HRH
K	HRK	Steel ball 3,175 mm	98,07 N	1,373 kN	1,471 kN	40 to 100 HRK
15N	HR15N	Diamond cone	29,42 N	117,7 N	147,1 N	70 to 94 HR15N
30N	HR30N	Diamond cone	29,42 N	264,8 N	294,2 N	42 to 86 HR30N
45N	HR45N	Diamond cone	29,42 N	411,9 N	441,3 N	20 to 77 HR45N
15T	HR15T	Steel ball 1,587 5 mm	29,42 N	117,7 N	147,1 N	67 to 93 HR15T
30T	HR30T	Steel ball 1,587 5 mm	29,42 N	264,8 N	294,2 N	29 to 82 HR30T
45T	HR45T	Steel ball 1,587 5 mm	29,42 N	411,9 N	411,3 N	1 to 72 HR45T

Table 2

Symbol	Designation	Unit
F_o	Preliminary test force	N
F_1	Additional test force	N
F	Total test force	N
S	Scale unit	mm
N	Number specific to the scale	
h	Permanent depth of indentation under preliminary test force after removal of additional test force (permanent indentation depth)	mm
HRA HRC HRD	Rockwell hardness = $100 - \frac{h}{0{,}002}$	
HRB HRE HRF HRG HRH HRK	Rockwell hardness = $130 - \frac{h}{0{,}002}$	
HRN HRT	Rockwell hardness = $100 - \frac{h}{0{,}001}$	

4.1 The Rockwell superficial hardness for the scales A, B, C, D, E, F, G, H and K is denoted by the symbol HR preceded by the hardness value and completed by a letter indicating the scale.

EXAMPLE : 59 HRC = Rockwell hardness of 59, measured on the C scale.

4.2 The Rockwell superficial hardness for the scales N and T is denoted by the symbol HR preceded by the hardness value and followed by a number (representing the total test force) and a letter together indicating the scale.

EXAMPLE : 70 HR30N = Rockwell superficial hardness of 70 measured on the 30 N scale with a total test force of 294,2N.

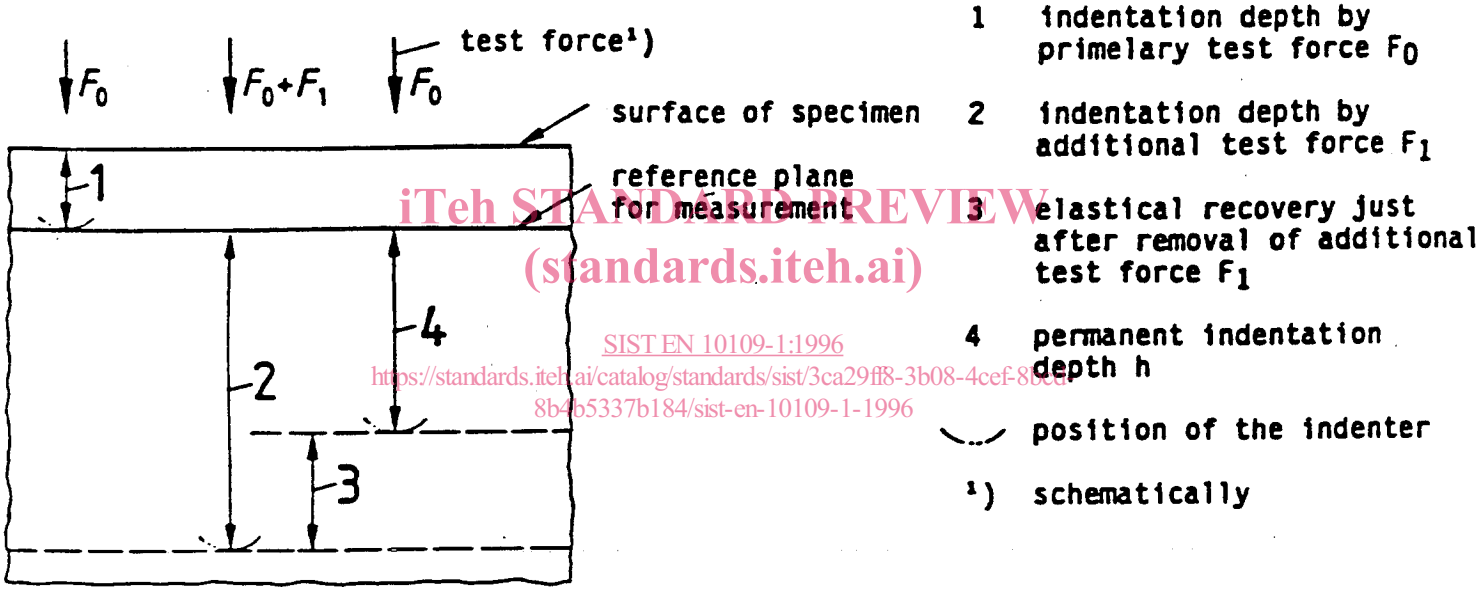

Figure 1 : Rockwell principle diagram