

DIN EN ISO 6508-1



ICS 77.040.10

Supersedes
DIN EN ISO 6508-1:2015-06

**Metallic materials –
Rockwell hardness test –
Part 1: Test method (ISO 6508-1:2016);
English version EN ISO 6508-1:2016,
English translation of DIN EN ISO 6508-1:2016-12**

Metallische Werkstoffe –
Härteprüfung nach Rockwell –
Teil 1: Prüfverfahren (ISO 6508-1:2016);
Englische Fassung EN ISO 6508-1:2016,
Englische Übersetzung von DIN EN ISO 6508-1:2016-12

Matériaux métalliques –
Essai de dureté Rockwell –
Partie 1: Méthode d'essai (ISO 6508-1:2016);
Version anglaise EN ISO 6508-1:2016,
Traduction anglaise de DIN EN ISO 6508-1:2016-12

Document comprises 42 pages

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original shall be considered authoritative.

A comma is used as the decimal marker.

National foreword

This document (EN ISO 6508-1:2016) has been prepared by Technical Committee ISO/TC 164 “Mechanical testing of metals”, Subcommittee SC 3 “Hardness testing” (Secretariat: DIN, Germany) in collaboration with Technical Committee ECISS/TC 101 “Test methods for steel (other than chemical analysis)” (Secretariat: AFNOR, France) in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

The responsible German body involved in its preparation was *DIN-Normenausschuss Materialprüfung* (DIN Standards Committee Materials Testing), Working Committee NA 062-01-41 AA *Härteprüfung für Metalle*.

DIN EN ISO 6508 consists of the following parts, under the general title *Metallic materials — Rockwell hardness test*:

- *Part 1: Test methods*
- *Part 2: Verification and calibration of testing machines and indenters*
- *Part 3: Calibration of reference blocks*

The DIN Standards corresponding to the International Standards referred to in this document are as follows:

ISO 3738-1	DIN EN ISO 3738-1
ISO 4498	DIN EN ISO 4498
ISO 6508-2	DIN EN ISO 6508-2
ISO 6508-3	DIN EN ISO 6508-3
ISO 18265	DIN EN ISO 18265

Amendments

This standard differs from DIN EN ISO 6508-1:2015-06 as follows:

- a) the scope has been revised for clarification;
- b) the standard has been editorially revised.

Previous editions

DIN DVM A 103: 1933-02
DIN 50103: 1942xx-03
DIN 50103-1: 1972-12, 1984-03
DIN 50103-2: 1972-12, 1973-10, 1984-03
DIN 50103-3: 1985-02
DIN EN 10109-1: 1995-01
DIN EN ISO 6508-1 1999-10, 2006-03, 2015-06
DIN EN ISO 6508-1 Corrigendum 1: 2000-05

National Annex NA (informative)

Uncertainty of the measured hardness values

NA.1 General

In this part of ISO 6508, Annex G gives an example of assessing the uncertainty of measured hardness values.

This national Annex gives an alternative, simplified method for calculating uncertainty. This method makes use of the uncertainty of the hardness testing machine, calculated as in Part 2 of this standards series and stated in the calibration certificate for the machine. Thus, a simpler method is made available to the user.

The metrological chain needed for defining and disseminating hardness scales is shown in Figure I.1 of DIN EN ISO 6508-1.

NA.2 Indirect calibration of the hardness testing machine by the user

Indirect calibration by means of hardness reference blocks (referred to below as CRM (certified reference material)) serves to check the overall functioning of the hardness testing machine, and to determine its repeatability and deviation from the real hardness value.

The uncertainty of the results of indirect calibration is calculated using the following equation:

$$u_{\text{HTM}} = \sqrt{u_{\text{CRM}}^2 + u_{\text{H}}^2 + u_{\text{ms}}^2} \quad (\text{NA.1})$$

Where

u_{CRM} is an uncertainty contribution due to the calibration uncertainty of the certified value of CRM (Certified Reference Material) from the calibration certificate for $k = 1$;

u_{H} is an uncertainty contribution due to the lack of repeatability of the hardness testing machine;

u_{ms} is an uncertainty contribution due to the resolution of the hardness testing machine
($u_{\text{ms}} = \frac{\delta_{\text{ms}}}{2 \cdot \sqrt{3}}$).

EXAMPLE

Certified hardness of CRM

$$H_{\text{CRM}} = (45,5 \pm 0,5) \text{ HRC}$$

Uncertainty of CRM

$$u_{\text{CRM}} = \pm 0,25 \text{ HRC}$$

Resolution of the hardness testing machine

$$\delta_{\text{ms}} = 0,1 \text{ }\mu\text{m}$$

Table NA.1 — Results of indirect calibration

No.	Calculated hardness value <i>H</i> , HRC
1	46,4 _{max}
2	46,1
3	45,3 _{min}
4	45,7
5	45,8
Mean value $\bar{H}$	45,9
Standard deviation s_H	0,42

$$u_H = \frac{t \cdot s_H}{\sqrt{n}} \quad (\text{NA.2})$$

For $t = 1,14$, $n = 5$ and $s_H = 0,42$ HRC:

$$u_H = 0,21 \text{ HRC}$$

NA.3 Uncertainty budget

Table NA.2 — Uncertainty budget

Quantity X_i	Estimated value x_i	Standard uncertainty $u(x_i)$	Distribution type	Sensitivity coefficient ^a c	Uncertainty contribution $u_i(H)$
u_{CRM}	45,4 HRC	0,25 HRC	Normal	1,0	0,25 HRC
u_H	45,9 HRC	0,21 HRC	Normal	1,0	0,21 HRC
u_{ms}	0,000 1 mm	0,000 03 mm	Rectangular	1,0	0,03 HRC
Combined uncertainty of measurement, u_{HTM}					0,33 HRC
Expanded uncertainty of measurement, U_{HTM} ($k = 2$)					0,66 HRC
^a For Rockwell scale HRC: $\delta H = -\delta h / 0,002$					(NA.3)

NA.4 Uncertainty of hardness test results

The uncertainty of hardness test results is given by the following equation:

$$u = \sqrt{u_{\text{HTM}}^2 + u_x^2} \quad (\text{NA.4})$$

where

u_{HTM} is the uncertainty of the hardness testing machine;

u_x is the standard deviation due to inhomogeneity of the hardness distribution in the test piece.

Table NA.3 — Determining inhomogeneity of the test piece

No.	Calculated hardness value H , HRC
1	45,2 _{min}
2	45,3
3	45,8 _{max}
4	45,6
5	45,4
Mean value $\bar{H}$	45,46
Standard deviation, s_x	0,24

The measurement uncertainty of the test piece is

$$u_x = \frac{t \cdot s_x}{\sqrt{n}} \quad (\text{NA.5})$$

For $t = 1,14$, $n = 5$ and $s_x = 0,24$:

$$u_x = 0,12 \text{ HRC}$$

Table NA.4 — Measurement uncertainty of test piece

Hardness of CRM	Inhomogeneity of test piece	Uncertainty of hardness testing machine	Expanded uncertainty of test piece
H , HRC	u_x , HRC	u_{HTM} , HRC	U , HRC
45,46	0,12	0,33	0,70

National Annex NB
(informative)

Bibliography

DIN EN ISO 3738-1, *Hard metals — Rockwell hardness test (scale A) — Part 1: Test methods*

DIN EN ISO 4498, *Sintered metal materials, excluding hardmetals — Determination of apparent hardness and microhardness*

DIN EN ISO 6508-2, *Metallic materials — Rockwell hardness test — Part 2: Verification and calibration of testing machines and indenters*

DIN EN ISO 6508-3, *Metallic materials — Rockwell hardness test — Part 3: Calibration of reference test blocks*

DIN EN ISO 18265, *Metallic materials — Conversion of hardness values*