



# SLOVENSKI STANDARD SIST EN ISO 16859-1:2016

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**Kovinski materiali - Preskus trdote po Leebu - 1. del: Preskusna metoda (ISO 16859-1:2015)**

Metallic materials - Leeb hardness test - Part 1: Test method (ISO 16859-1:2015)

Metallische Werkstoffe - Härteprüfung nach Leeb - Teil 1: Prüfverfahren (ISO 16859-1:2015)

Matériaux métalliques - Essai de dureté Leeb - Partie 1: Méthode d'essai (ISO 16859-1:2015)

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN ISO 16859-1**

October 2015

ICS 77.040.10

English Version

## Metallic materials - Leeb hardness test - Part 1: Test method (ISO 16859-1:2015)

Matériaux métalliques - Essai de dureté Leeb - Partie 1  
: Méthode d'essai (ISO 16859-1:2015)

Metallische Werkstoffe - Härteprüfung nach Leeb - Teil  
1: Prüfverfahren (ISO 16859-1:2015)

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## European foreword

This document (EN ISO 16859-1:2015) has been prepared by Technical Committee ISO/TC 164 “Mechanical testing of metals” in collaboration with Technical Committee ECISS/TC 101 “Test methods for steel (other than chemical analysis)” 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of an identical text or by endorsement, at the latest by April 2016, and conflicting national standards shall be withdrawn at the latest by April 2016.

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**Metallic materials — Leeb hardness  
test —**

**Part 1:  
Test method**

*Matériaux métalliques — Essai de dureté Leeb —*

*Partie 1: Méthode d'essai*  
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## ISO 16859-1:2015(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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary Information](#)

The committee responsible for this document is ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 3, *Hardness testing*.

ISO 16859 consists of the following parts, under the general title *Metallic materials — Leeb hardness test*:

- *Part 1: Test method*
- *Part 2: Verification and calibration of the testing devices*
- *Part 3: Calibration of reference test blocks*

# Metallic materials — Leeb hardness test —

## Part 1: Test method

### 1 Scope

This part of ISO 16859 covers the determination of a dynamic hardness of metallic materials using seven different Leeb scales (HLD, HLS, HLE, HLDL, HLD+15, HLC, HLG).

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16859-2, *Metallic materials — Leeb hardness test — Part 2: Verification and calibration of the testing devices*

ISO 16859-3, *Metallic materials — Leeb hardness test — Part 3: Calibration of reference test blocks*

### 3 Principle

When testing hardness according to Leeb, a moving impact body collides at normal incidence with a surface and rebounds. The velocity of the impact body is measured before ( $v_A$ ) and after impact ( $v_R$ ). The energy amount absorbed by the test piece respectively dissipated in the test measures the dynamic Leeb hardness of the test piece. It is assumed that the impact body does not permanently deform.

The ratio of the impact and rebound velocity values gives the coefficient of restitution for the impact configuration and energy used. This coefficient represents the proportion of initial kinetic energy returned to the impact body within the contact time of the impact.

The hardness number according to Leeb, HL, is calculated as given in Formula (1)

$$HL = \frac{v_R}{v_A} \cdot 1\,000 \quad (1)$$

where

$v_R$  is rebound velocity;

$v_A$  is impact velocity.

By definition, the Leeb hardness is a ratio and thus becomes a quantity without dimensions.

### 4 Symbols, abbreviated terms, and designations

4.1 For most common Leeb scale and type of impact devices, see [Table 1](#).

NOTE Other parameter values can be used based on the specific agreement between the parties.

## ISO 16859-1:2015(E)

Table 1 — Symbols, dimensions, designations, and parameters of Leeb scales according to type of impact devices

Symbol	Unit	Designation	Parameters of types of impact devices						
			Da	S	E	DL	D+15	C	G
$E_A$	mJ	Kinetic impact energy <sup>b</sup>	11,5	11,4	11,5	11,95	11,2	3,0	90,0
$v_A$	m/s	Impact velocity	2,05	2,05	2,05	1,82	1,7	1,4	3,0
$v_R$	m/s	Rebound velocity	0,615 - 1,824 5	0,82 - 1,886	0,615 - 1,886	1,1092 - 1,729	0,561 - 1,513	0,49 - 1,344	0,9 - 2,25
	mm	Maximum distance of ball indenter from test piece surface at velocity measurement	2,00	2,00	2,00	2,00	2,00	2,00	3,00
$M$	g	Mass of impact body incl. ball indenter	5,45	5,40	5,45	7,25	7,75	3,1	20,0
$R$	mm	Spherical radius of indenter ball	1,5	1,5	1,5	1,39	1,5	1,5	2,5
		Material of indenter	WC-Co <sup>c</sup>	C <sup>d</sup>	PCD <sup>e</sup>	WC-Co <sup>c</sup>	WC-Co <sup>c</sup>	WC-Co <sup>c</sup>	WC-Co <sup>c</sup>
HL		Leeb hardness	HLD	HLS	HLE	HLDL	HLD+15	HLC	HLG
		Field of application	300 HLD - 890 HLD	400 HLS - 920 HLS	300 HLE - 920 HLE	560 HLDL - 950 HLDL	330 HLD+15 - 890 HLD+15	350 HLC - 960 HLC	300 HLG - 750 HLG
a	Alternative common designation "DC".								
b	Impact vertically down, in direction of gravity, rounded.								
c	Tungsten-carbide cobalt.								
d	Ceramics.								
e	Polycrystalline diamond.								

4.2 The Leeb hardness number is followed by the symbol "HL" with one or more subsequent characters representing the type of impact device.

EXAMPLE 570 HLD

Leeb hardness, HL, is measured using impact device type D in direction of gravity. Measurements using a different impact device type will deliver a different hardness number, as the result from Formula (1) depends on the parameters of each impact device type.

For testing in other directions, the measured hardness number will be biased. In such cases, a correction shall be applied in accordance with Annex A. If the test is not conducted in direction of gravity, the testing direction and correction shall be recorded, and the adjusted hardness number shall be given as the Leeb hardness result.