International Standard

ISO 14577-3

Third edition
2026-05

# Metallic materials — Instrumented indentation test for hardness and materials parameters —

## Part 3: Calibration of reference blocks

*Matériaux métalliques — Essai de pénétration instrumenté pour la détermination de la dureté et de paramètres des matériaux —*

*Partie 3: Étalonnage des blocs de référence*

Reference number
ISO 14577-3:2026(en)

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Published in Switzerland

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# 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 document 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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 3, *Hardness testing,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 459/SC 1, *Test methods for steel (other than chemical analysis,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 14577-3:2015), which has been technically revised.

The main changes are as follows:

— Specification of the shape of the reference block.

— Modifications in the procedure for the verification of the indenter.

— Testing cycle requirements.

— Changing the conditions for the verification of the uniformity of the reference blocks.

— Annex A was added.

A list of all parts in the ISO 14577 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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# Introduction

Hardness has typically been defined as the resistance of a material to permanent penetration by another harder material. The results obtained when performing Rockwell, Vickers, and Brinell tests are determined after the test force has been removed. Therefore, the effect of elastic deformation under the indenter has been ignored.

ISO 14577 (all parts) has been prepared to enable the user to evaluate the indentation of materials by considering both the force and displacement during plastic and elastic deformation. By monitoring the complete cycle of increasing and removal of the test force, hardness values equivalent to traditional hardness values can be determined. More significantly, additional properties of the material such as its indentation modulus and elasto-plastic hardness can also be determined. All these values can be calculated without the requirement to measure the indent optically. Furthermore, by a variety of techniques, the instrumented indentation test allows to record hardness and modulus depth profiles within a, probably complex, indentation cycle.

ISO 14577 (all parts) has been written to allow a wide variety of post test data analysis.

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# Metallic materials — Instrumented indentation test for hardness and materials parameters —

# Part 3: Calibration of reference blocks

## 1 Scope

This document specifies a method for the calibration of reference blocks to use for the indirect verification of testing machines for the instrumented indentation test as specified in ISO 14577-2.

Reference materials, where it is necessary to prepare a surface before the test in a manner that removes surface layers are excluded from this standard.

## 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 376, *Metallic materials — Calibration of force-proving instruments used for the verification of uniaxial testing machines*

ISO 14577-1, *Metallic materials — Instrumented indentation test for hardness and materials parameters — Part 1: Test method*

ISO 14577-2, *Metallic materials — Instrumented indentation test for hardness and materials parameters — Part 2: Verification and calibration of testing machines*

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

## 4 Manufacture of reference blocks

**4.1** The block shall be specially prepared and the attention of the manufacturer drawn to the requirement to use a manufacturing process that gives the necessary homogeneity, uniformity, and stability of structure. When the reference block is used for certifying hardness then it shall have a constant hardness over the range of indentation sizes for which it is certified.

NOTE Variation in hardness with variation in indentation size occurs when the microstructural length scale of the material is within an order of magnitude of the indentation size. Microstructural length scale is in this circumstance the combined frequency of all length scales in the material, for example grain size, precipitate spacing, layer thickness et cetera.

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