International Standard

ISO 14577-2

Third edition
2026-06

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

Part 2: Verification and calibration of testing machines

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

Partie 2: Vérification et étalonnage des machines d'essai

Reference number
ISO 14577-2:2026(en)

© ISO 2026



COPYRIGHT PROTECTED DOCUMENT

© ISO 2026

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 General conditions ... **1**
4.1 Requirements ... 1
4.2 Preparation ... 2
4.3 Functional installation ... 2
4.4 Indenter ... 2
4.5 Application of the test force ... 2
5 Direct verification and calibration ... **2**
5.1 General ... 2
5.2 Calibration of the test force ... 3
5.3 Calibration of the displacement measuring device ... 3
5.4 Verification and calibration of the machine compliance ... 4
5.4.1 General ... 4
5.4.2 Procedure ... 4
5.5 Calibration and verification of the indenter ... 5
5.5.1 General ... 5
5.5.2 Vickers indenter ... 6
5.5.3 Berkovich, modified Berkovich, and corner cube indenters ... 8
5.5.4 Ball indenters ... 8
5.5.5 Spheroconical indenters ... 9
5.6 Verification of the indenter area function ... 10
5.6.1 General ... 10
5.6.2 Procedure ... 10
5.7 Verification of the testing cycle ... 11
6 Indirect verification ... **11**
6.1 General ... 11
6.2 Procedure ... 12
7 Intervals between calibrations and verifications ... **14**
7.1 Direct verification and calibration ... 14
7.2 Indirect verification ... 14
7.3 Routine checking ... 14
8 Verification report/Calibration certificate ... **14**
Annex A (informative) **Example of an indenter holder** ... **15**
Annex B (normative) **Procedures for determination of indenter area function** ... **16**
Annex C (informative) **Examples for the documentation of the results of indirect verification** ... **18**
Annex D (normative) **Machine compliance calibration procedure** ... **21**
Bibliography ... **25**

© ISO 2026 – All rights reserved

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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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

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/SC1 *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 14577-2:2015), which has been technically revised.

The main changes are as follows:

— New procedure for indirect verification.

— New method 6 for machine compliance calibration.

— Replacement of tungsten carbide balls by balls in general.

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.

© ISO 2026 – All rights reserved

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)[2] 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 need 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.

Part 2 of ISO 14577 specifies the methods of verification and calibration of instrumented indentation testing machines.

© ISO 2026 – All rights reserved

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

Part 2: Verification and calibration of testing machines

1 Scope

This document specifies the method of verification and calibration of testing machines for carrying out the instrumented indentation test in accordance with ISO 14577-1.

It specifies a direct verification method for verifying and calibrating the main functions of the testing machine and an indirect verification method suitable for the determination of the repeatability of the testing machine.

The methods in ISO 14577 are applicable to all systems that comply with the requirements of this part of ISO 14577.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. 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 14577-3, *Metallic materials — Instrumented indentation test for hardness and materials parameters — Part 3: Calibration of reference blocks*

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 General conditions

4.1 Requirements

There is the requirement that an indirect verification method be used in addition to the direct method and for the periodic routine checking of the testing machine in service.

© ISO 2026 – All rights reserved