

This is a preview of "ISO 14577-1:2015". [Click here to purchase the full version from the ANSI store.](#)

Second edition  
2015-07-15

---

---

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

## Part 1: Test method

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

*Partie 1: Méthode d'essai*



Reference number  
ISO 14577-1:2015(E)

© ISO 2015

This is a preview of "ISO 14577-1:2015". [Click here to purchase the full version from the ANSI store.](#)



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, 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  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

This is a preview of "ISO 14577-1:2015". Click here to purchase the full version from the ANSI store.

## Contents

	Page
Foreword .....	iv
Introduction .....	v
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Symbols and designations</b> .....	<b>2</b>
<b>4 Principle</b> .....	<b>4</b>
<b>5 Testing machine</b> .....	<b>4</b>
<b>6 Test piece</b> .....	<b>5</b>
<b>7 Procedure</b> .....	<b>5</b>
<b>8 Uncertainty of the results</b> .....	<b>8</b>
<b>9 Test report</b> .....	<b>9</b>
<b>Annex A (normative) Materials parameters determined from the force/indentation depth data set</b> .....	<b>11</b>
<b>Annex B (informative) Types of control use for the indentation process</b> .....	<b>24</b>
<b>Annex C (normative) Machine compliance and indenter area function</b> .....	<b>25</b>
<b>Annex D (informative) Notes on diamond indenters</b> .....	<b>27</b>
<b>Annex E (normative) Influence of the test piece surface roughness on the accuracy of the results</b> .....	<b>28</b>
<b>Annex F (informative) Correlation of indentation hardness <math>H_{IT}</math> to Vickers hardness</b> .....	<b>29</b>
<b>Annex G (normative) Drift and creep rate determination</b> .....	<b>31</b>
<b>Annex H (informative) Estimation of uncertainty of the calculated values of hardness and materials parameters</b> .....	<b>33</b>
<b>Annex I (normative) Calculation of radial displacement correction</b> .....	<b>43</b>
<b>Bibliography</b> .....	<b>45</b>

## 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)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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*.

This second edition cancels and replaces the first edition (ISO 14577-1:2002), which has been technically revised.

ISO 14577 consists of the following parts, under the general title *Metallic materials — Instrumented indentation test for hardness and materials parameters*:

- *Part 1: Test method*
- *Part 2: Verification and calibration of testing machines*
- *Part 3: Calibration of reference blocks*
- *Part 4: Test method for metallic and non-metallic coatings*

This is a preview of "ISO 14577-1:2015". [Click here to purchase the full version from the ANSI store.](#)

## 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 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.