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Metallic materials — Conversion of hardness values (ISO 18265:2013, IDT)



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Australian Pipelines and Gas Association
Bureau of Steel Manufacturers of Australia
Materials Australia
National Association of Testing Authorities Australia
University of Technology Sydney
Weld Australia

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This page explains the meaning of the language and structure of this Standard.

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Requirements

To conform to a Standard, all requirements in the Standard need to be met.

A requirement is any statement in the Standard which uses the word "shall".

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The following words are commonly used in Standards, but statements using them do not have to be followed to conform to the Standard:

(a) "should" means that something is recommended.

(b) "may" means that something is permitted.

(c) "can" means that something is possible.

Structure of Standards

A Standard always has the following parts:

(i) The Preface states who developed the Standard, what the Standard is aiming to do, and how it relates to other documents.

(ii) The Scope states what the Standard is about, what it covers and what it does not cover.

(iii) The Normative references clause lists other documents that are referenced in the Standard as part of requirements.

(iv) The Terms and definitions clause defines important terms to help with understanding the Standard.

A Standard may also include other parts, such as the following:

(1) A normative appendix sets additional requirements that need to be conformed to.

(2) An informative appendix provides additional information or guidance. They usually do not contain requirements. If an informative appendix does contain requirements, the Standard will explain when those requirements apply.

(3) A Bibliography lists documents referenced in the Standard but not as part of requirements.

Many Standards include notes. Notes provide recommendations and/or guidance only. They never contain requirements.

Preface

This Standard was prepared by the Standards Australia Committee MT-006, Mechanical Testing Of Metals to supersede AS 5016:2004, *Metallic materials — Conversion of hardness values*.

The objective of this document is to specify the principles of the conversion of hardness values to equivalent values in other hardness scales and to estimates of tensile strength. It gives general information on the use of the conversion tables.

This document is identical to, and has been reproduced from, ISO 18265:2013, *Metallic materials — Conversion of hardness values.*

As this document has been reproduced from an international document, the following apply:

(a) In the source text “this International Standard” is to be read as “this document”.

(b) A comma is to be read as a full point when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

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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 documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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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 18265:2003) which has been technically revised.

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Introduction

The hardness conversion values given in Table A.1 were obtained in interlaboratory tests by the *Verein Deutscher Eisenhüttenleute* (VDEh) (German Iron and Steel Institute) using verified and calibrated hardness testing machines. Statistically reliable information cannot be given on the uncertainty of these values because the test conditions were not reproducible, and the number of results used to calculate the mean hardness values is not known. The conversion values in this table are in accordance with the information presented in IC No. 3 (1980) and IC No. 4 (1982) of the European Coal and Steel Community, as well as in ISO 4964:1984 and ISO/TR 10108:1989.

Annexes C, D and E contain – in a revised format – the extensive results on the conversion of hardness values presented in TGL 43212/02 to 43212/04, standards published by the former East German standards body, the *Amt für Standardisierung, Meßwesen und Warenprüfung* (ASMW). The values presented in Annex B had also been determined by the ASMW, but were published in a report of the *Physikalisch-Technische Bundesanstalt* (PTB),[1] the German national institute for science and technology, not in a TGL standard.

The converted hardness values in the above-mentioned TGL standards were obtained in statistically reliable hardness and tensile tests. The hardness tests were performed using ASMW normal testing machines on plane-parallel, polished specimens of various materials in different heat treatment conditions. Tensile strength was tested on machines whose force measuring and extension measuring systems had been calibrated immediately before testing. The tensile test method used is equivalent to that specified in ISO 6892-1, and the calibration procedures conform with those specified in ISO 7500-1 and ISO 9513.

Annex G contains the results on the conversion of hardness values of two tool steels with the assistance of the *Verein Deutscher Eisenhüttenleute* (VDEh) which were obtained in the year 2007.

Users of this International Standard should take note of Clause 2, especially the concluding warning.

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1 Scope

This International Standard specifies the principles of the conversion of hardness values to equivalent values in other hardness scales and to estimates of tensile strength. It gives general information on the use of the conversion tables.

The conversion tables in Annexes A to G apply to

— unalloyed and low alloy steels and cast steel,

— steels for quenching and tempering,

— steels for cold working,

— high speed steels,

— tool steels,

— hardmetals, and

— non-ferrous metals and alloys.

NOTE 1 The conversion tables in Annexes B to G are based on empirical results which were evaluated by means of regression analysis. Such analysis was not possible in the case of the values given in Annex A because a sufficient number of results was not available.

NOTE 2 Annex H gives information about the effects of changes of the test procedure in the standards specifying the hardness tests.

Converted values obtained using this International Standard are only directly applicable to the exact material tested. For all other materials, they provide an indicator only. In all cases, the converted values are not intended as replacements for values obtained by the correct standard method. In particular, tensile strength estimates are the least reliable converted values in this International Standard.

Sections of this International Standard are reprinted, with permission of ASTM International, from ASTM E140 *Standard Hardness Conversion Tables for Metals Relationship among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Harness, Knoop Hardness, and Scleroscope Hardness*.

2 Principles of conversion

Hardness testing is a form of materials testing that provides information on the mechanical properties of a material with limited destruction of the specimen and within a relatively short period of time. In practice, it is often desirable to use hardness results to draw conclusions on the tensile strength of the same material if tensile testing is too involved or the piece to be examined is not to be destroyed.

Since the means of loading in hardness testing is considerably different from that in tensile testing, it is not possible to derive a reliable functional relationship between these two characteristic values on the basis of a model. Nevertheless, hardness values and tensile strength values are positively correlated, and so it is possible to draw up empirical relationships for limited applications.

Often it is necessary to check a given hardness value against a value gained by a different test method. This is especially the case if only a certain method can be used due to the particular specimen or coating thickness, the size of the object to be tested, surface quality, or the availability of hardness testing machines.

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