
Steels — Determination of the depth of decarburization

Aciers — Détermination de la profondeur de décarburation

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 3887:2017

<https://standards.iteh.ai/catalog/standards/iso/02f52b3b-10f6-43b3-bf05-77b3b5916690/iso-3887-2017>



iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 3887:2017

<https://standards.iteh.ai/catalog/standards/iso/02f52b3b-10f6-43b3-bf05-77b3b5916690/iso-3887-2017>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, 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

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Sampling	2
5 Measuring methods	2
5.1 General.....	2
5.2 Metallographic method.....	3
5.2.1 General.....	3
5.2.2 Selection and preparation of the sample.....	3
5.2.3 Measurement.....	3
5.3 Methods for measuring the micro-indentation hardness.....	5
5.3.1 General.....	5
5.3.2 Selection and preparation of the sample.....	7
5.3.3 Measurement.....	7
5.4 Methods of determination of the carbon content.....	9
5.4.1 General.....	9
5.4.2 Chemical analysis.....	9
5.4.3 Spectrographic analysis.....	9
5.4.4 Interpretation of the results (chemical and spectrographic methods).....	9
5.4.5 Electron probe microanalysis (EPMA).....	9
5.4.6 Glow discharge optical emission spectrometry (GDOES).....	10
6 Test report	10
Annex A (informative) Examples of typical decarburization microstructure	12

[ISO 3887:2017](https://standards.iteh.ai/catalog/standards/iso/02f52b3b-10f6-43b3-bf05-77b3b5916690/iso-3887-2017)

<https://standards.iteh.ai/catalog/standards/iso/02f52b3b-10f6-43b3-bf05-77b3b5916690/iso-3887-2017>

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).

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).

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 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 7, *Methods of testing (other than mechanical tests and chemical analysis)*.

This third edition cancels and replaces the second edition (ISO 3887:2003), which has been technically revised. The following changes have been made:

- the scope has been expanded from “non-alloy and low-alloy steels” to “steel products”;
- the definitions of “partial decarburization” and “complete decarburization” have been modified;
- the term “depth of ferrite decarburization” has been deleted;
- the terms “depth profile of carbon content” and “depth profile of hardness” have been added;
- more measurement details for the micro-indentation hardness method have been added;
- two new methods of measuring the carbon depth profile, by GDOES and EPMA, have been added;
- examples of typical decarburization microstructures have been added.

Steels — Determination of the depth of decarburization

1 Scope

This document defines the decarburization and specifies three methods of measuring the depth of decarburization of steel products.

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 4545-1, *Metallic materials — Knoop hardness test — Part 1: Test method*

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

ISO 9556, *Steel and iron — Determination of total carbon content — Infrared absorption method after combustion in an induction furnace*

ISO 14594, *Microbeam analysis — Electron probe microanalysis — Guidelines for the determination of experimental parameters for wavelength dispersive spectroscopy*

ISO 14707, *Surface chemical analysis — Glow discharge optical emission spectrometry (GD-OES) — Introduction to use*

ISO 15349-2, *Unalloyed steel — Determination of low carbon content — Part 2: Infrared absorption method after combustion in an induction furnace (with preheating)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

decarburization

reduction of carbon content from the surface zone of the steel

Note 1 to entry: A distinction is made between

- a) partial decarburization, d_3 , measured as the distance from the point at which the carbon content exceeds the solubility limit in ferrite, becoming visible as e.g. pearlite, to the point at which there is no more visible difference to the core carbon concentration, and
- b) complete decarburization, also called ferrite decarburization, d_1 , measured as the distance between the surface of the product and the point up to which the carbon content is below the solubility limit of carbon in ferrite so that only ferrite is present.

Note 2 to entry: The depth of complete decarburization as described in b) is determined by examination of the microstructure.

3.2

depth of functional decarburization

d_2

distance between the surface of the product and the point at which the carbon content or hardness is at the level where the performance of the product would be unaffected by a reduction in carbon content (i.e. at the minimum level specified in the product standard)

3.3

depth of total decarburization

d_4

distance between the surface of the product and the point at which the carbon content is that of the unaffected core, the sum of the partial and the complete decarburization $d_3 + d_1$ being designated by the letters DD

EXAMPLE DD = 0,08 mm.

Note 1 to entry: Expressed in millimetres.

3.4

depth profile of carbon content

curve indicating the relationship between the perpendicular distance from the surface of steel material and the carbon content

3.5

depth profile of hardness

curve indicating the relationship between the perpendicular distance from the surface of steel material and the hardness

4 Sampling

Samples should be taken at locations that are representative of the bulk specimen. The location and number of samples taken depend on the nature of the material to be tested and are defined by agreement between the parties concerned.

Specimens for the metallographic methods or micro-indentation hardness tests or electron probe microanalysis should be cut from the bulk specimen perpendicular to the longitudinal axis of the product so that measurements are made on a transverse plane. This procedure permits the determination of the variation of decarburization around the periphery of the specimen. Unless otherwise specified, the corner parts which can generate abnormal decarburization shall not be included. For specimens up to about 2,5 cm diameter, the entire cross-section is polished and examined. For larger cross-sections, one or more specimens shall be prepared to assess variations in surface decarburization. The sampling scheme for large sections should be determined by agreement between the parties concerned.

Specimens for chemical analytical methods shall be of sufficient length so that the weight of incremental turnings is adequate for chemical analysis or the size of milled surfaces is large enough for sparking yet small enough to fit in the specimen holder.

5 Measuring methods

5.1 General

The choice of the method and its accuracy depend on the degree of decarburization, the microstructure, the carbon content of the product examined and the shape of the component.

The usual methods employed on finished products are as follows:

- metallographic method (see 5.2);