

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS G 0558 : 2020

(JISF)

**Steels — Determination of depth of
decarburization**

ICS 77.040.99 ; 77.080.20

Reference number : JIS G 0558 : 2020 (E)

PROTECTED BY COPYRIGHT

Date of Establishment: 1966-01-01

Date of Revision: 2020-12-21

Date of Public Notice in Official Gazette: 2020-12-21

Investigated by: Japanese Industrial Standards Committee

Standards Board for ISO area

Technical Committee on Metal and Inorganic Materials

JIS G 0558 : 2020, First English edition published in 2021-04

Translated and published by: Japanese Standards Association
Mita MT Building, 3-13-12, Mita, Minato-ku, Tokyo, 108-0073 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2021

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED BY COPYRIGHT

Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Classification of measuring methods	4
5 Test pieces	5
6 Measuring method	5
6.1 Measuring method by microscope	5
6.2 Measuring method by hardness test	7
6.3 Measuring method by carbon content	9
7 Marking method and marking symbols	12
8 Test report	14
Annex A (informative) Examples of typical decarburization microstructure	15
Annex JA (informative) Comparison table between JIS and corresponding International Standard	17

Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by The Japan Iron and Steel Federation (JISF) with a draft being attached, based on the provision of Article 12, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act. This edition replaces the previous edition (**JIS G 0558:2007**), which has been technically revised.

This **JIS** document is protected by the Copyright Act.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, published patent application or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, published patent application or utility model rights.

Steels — Determination of depth of decarburization

Introduction

This Japanese Industrial Standard has been prepared based on **ISO 3887** : 2017, Edition 3, with some modifications of the technical contents.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanations is given in Annex JA.

1 Scope

This Standard specifies the method for determining the depth of decarburization of steel materials.

NOTE The International Standards corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 3887 : 2017 *Steels — Determination of the depth of decarburization* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standards and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS G 0201 *Glossary of terms used in iron and steel (Heat treatment)*

JIS G 0202 *Glossary of terms used in iron and steel (Testing)*

JIS G 1211-3 *Iron and steel — Determination of carbon — Part 3 : Infrared absorption method after combustion*

JIS G 1211-4 *Iron and steel — Determination of carbon content — Part 4 : Infrared absorption method after combustion in a furnace with preheating or peak separating*

JIS G 1253 *Iron and steel — Method for spark discharge atomic emission spectrometric analysis*

JIS K 0144 *Surface chemical analysis — Glow discharge optical emission spectrometry (GD-OES) — Introduction to use*

NOTE Corresponding International Standard : **ISO 14707** *Surface chemical analysis — Glow discharge optical emission spectrometry (GD-OES) —*

Introduction to use

JIS K 0189 *Microbeam analysis — Electron probe microanalysis — Determination of experimental parameters for wavelength dispersive X-ray spectroscopy*

NOTE Corresponding International Standard : ISO 14594 *Microbeam analysis — Electron probe microanalysis — Guidelines for the determination of experimental parameters for wavelength dispersive spectroscopy*

JIS Z 2244-1 *Vickers hardness test — Part 1 : Test method*

JIS Z 2251 *Knoop hardness test — Part 1 : Test method*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in JIS G 0201 and JIS G 0202, and the following apply.

3.1

decarburization

loss of carbon from the surface layer as a result of hot working or heat treatment of steel

NOTE The decarburization is either the partial decarburization, d_3 , or the complete decarburization, d_1 , measured as the distance between the surface of the product and the point at which carbon is detectable (see Figure 1).

3.2

depth of total decarburization, d_4

distance between the surface of the steel material and the position where the difference of chemical or physical characteristics between the decarburization and the core material is no longer recognized

The chemical characteristic as referred to here is determined by microstructure or carbon content and the physical characteristic, by hardness (see Figure 1).

3.3

depth of ferrite decarburization

in the surface layer of steel material, the depth from the surface of the layer consisting only of ferrite as a result of decarburization

The depth of ferrite decarburization said here is determined by microstructure.

3.4

depth of decarburization specified by residual carbon ratio

distance from the surface of steel material to the position where a certain residual carbon ratio (the ratio of residual carbon content to the carbon content of core material) is obtained

The depth of decarburization of residual carbon ratio mentioned here is determined by microstructure.

3.5

depth of functional decarburization, d_2

distance from the surface of steel material to the position where the hardness permissible in practical use can be obtained

An example of hardness permissible in practical use is the minimum hardness specified in the material standard.

NOTE In the corresponding International Standard, the depth of functional decarburization is the distance between the surface of the steel material 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, exemplified as d_2 in Figure 1.

3.6

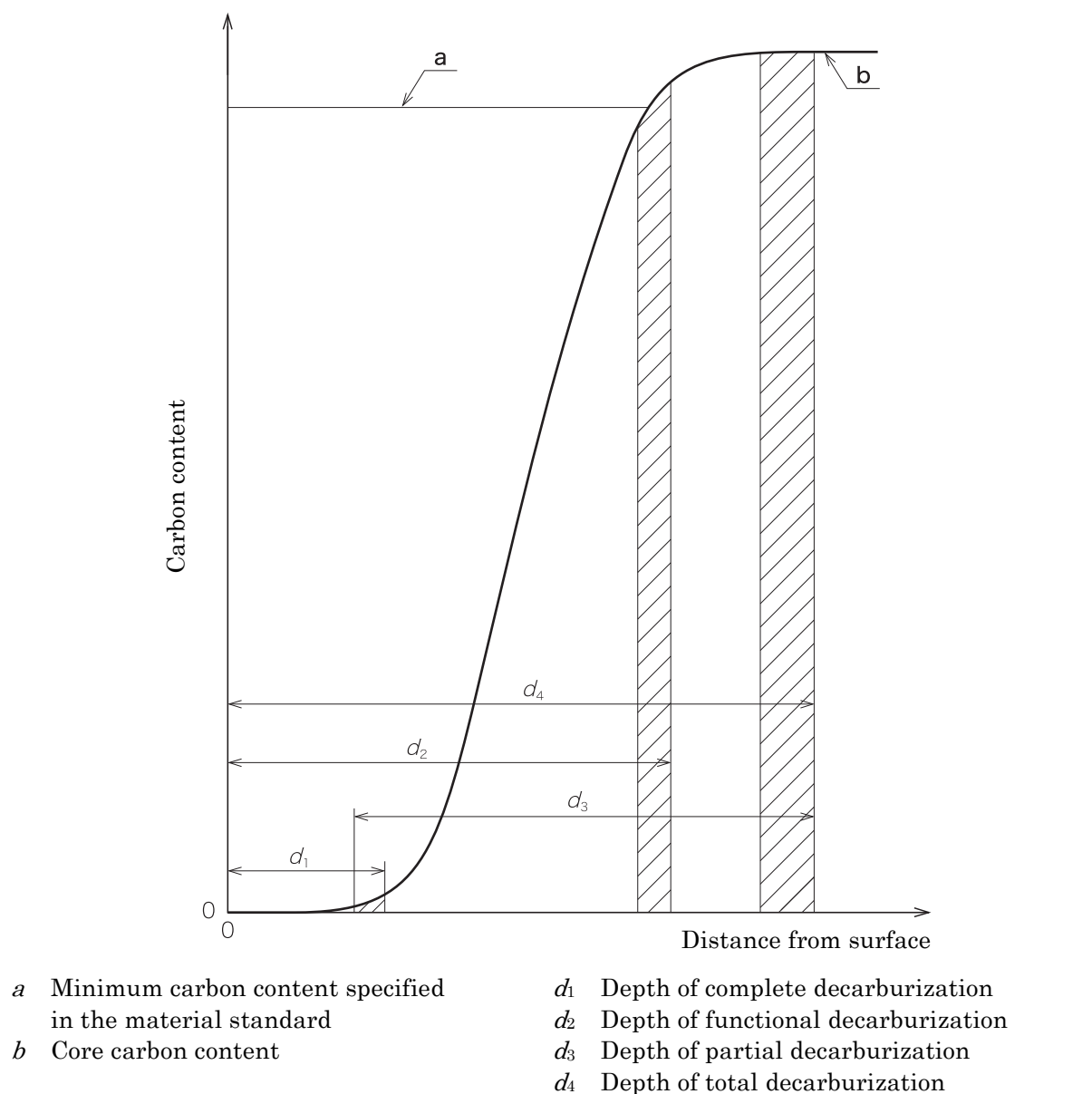
depth profile of hardness

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

3.7

depth profile of carbon content

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



NOTE The diagonally shaded areas in Figure 1 indicate that there can be a fluctuation in evaluation at the actual measurement.

Figure 1 Representation of different decarburized depths of a typical decarburized steel

4 Classification of measuring methods

The measuring method of depth of decarburization of steel, unless otherwise specified in the material standard or unless otherwise agreed between the purchaser and the supplier, shall be selected by the person who will perform the test, according to the degree of decarburization, microstructure, carbon content of the steel material, the shape of the steel material and the measuring precision required. The usual methods employed are as follows.

a) **Measuring method by microscope** This method is for measuring the depth of de-