

This is a preview of "BS EN ISO 643:2020". [Click here to purchase the full version from the ANSI store.](#)



BSI Standards Publication

Steels — Micrographic determination of the apparent grain size

This is a preview of "BS EN ISO 643:2020". [Click here to purchase the full version from the ANSI store.](#)

National foreword

This British Standard is the UK implementation of EN ISO 643:2020. It is identical to ISO 643:2019. It supersedes BS EN ISO 643:2012, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/101/7, Methods of physical and metallographic testing.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 539 13719 4

ICS 77.040.99

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2020.

Amendments/corrigenda issued since publication

Date	Text affected
30 April 2020	Implementation of ISO corrected text 19 March 2020: Formula B.9 corrected
31 May 2020	Endorsement pages added

This is a preview of "BS EN ISO 643:2020". [Click here to purchase the full version from the ANSI store.](#)

EUROPÄISCHE NORM

January 2020

ICS 77.040.99

Supersedes EN ISO 643:2012

English Version

Steels - Micrographic determination of the apparent grain size (ISO 643:2019)

Aciers - Détermination micrographique de la grosseur de grain apparente (ISO 643:2019)

Stahl - Mikrophotographische Bestimmung der erkennbaren Korngröße (ISO 643:2019)

This European Standard was approved by CEN on 26 October 2018.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

This is a preview of "BS EN ISO 643:2020". [Click here to purchase the full version from the ANSI store.](#)

European foreword

This document (EN ISO 643:2020) has been prepared by Technical Committee ISO/TC 17 "Steel" in collaboration with Technical Committee CEN/TC 459/SC 1 "Test methods for steel (other than chemical analysis)" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2020, and conflicting national standards shall be withdrawn at the latest by July 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 643:2012.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 643:2019 has been approved by CEN as EN ISO 643:2020 without any modification.

This is a preview of "BS EN ISO 643:2020". [Click here to purchase the full version from the ANSI store.](#)

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
3.1 Grains.....	1
3.2 General.....	2
4 Symbols	2
5 Principle	3
6 Selection and preparation of the specimen	4
6.1 Test location.....	4
6.2 Revealing ferritic grain boundaries.....	5
6.3 Revealing austenitic and prior-austenitic grain boundaries.....	5
6.3.1 General.....	5
6.3.2 “Bechet-Beaujard” method by etching with aqueous saturated picric acid solution.....	5
6.3.3 “Kohn” method by controlled oxidation.....	6
6.3.4 “McQuaid-Ehn” method by carburization at 925 °C.....	7
6.3.5 Proeutectoid ferrite method.....	8
6.3.6 Bainite or gradient-quench method.....	9
6.3.7 Sensitization of austenitic stainless and manganese steels.....	9
6.3.8 Other methods for revealing prior-austenitic grain boundaries.....	9
7 Characterization of grain size	10
7.1 Characterization by an index.....	10
7.1.1 Formulae.....	10
7.1.2 Assessment by comparison with standard grain size charts.....	10
7.1.3 Planimetric method.....	11
7.1.4 Estimation of the index.....	11
7.2 Characterization by the intercept method.....	11
7.2.1 Linear intercept segment method.....	11
7.2.2 Circular intercept segment method.....	12
7.2.3 Assessment of results.....	13
8 Test report	14
Annex A (informative) Summary of methods for revealing ferritic, austenitic or prior-austenitic grain boundaries in steels	15
Annex B (normative) Evaluation method	16
Bibliography	21

This is a preview of "BS EN ISO 643:2020". [Click here to purchase the full version from the ANSI store.](#)

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 fourth edition cancels and replaces the third edition (ISO 643:2012), which has been technically revised. The main changes compared to the previous edition are as follows:

- [7.1.2](#) has been modified;
- the original [Annex B](#) has been deleted and the original Annex C has been renumbered as [Annex B](#).

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.

This corrected version of ISO 643:2019 incorporates the following corrections:

- minus sign replaced with plus sign between the values in [Formula B.9](#).

This is a preview of "BS EN ISO 643:2020". [Click here to purchase the full version from the ANSI store.](#)

Steels — Micrographic determination of the apparent grain size

1 Scope

This document specifies a micrographic method of determining apparent ferritic or austenitic grain size in steels. It describes the methods of revealing grain boundaries and of estimating the mean grain size of specimens with unimodal size distribution. Although grains are three-dimensional in shape, the metallographic sectioning plane can cut through a grain at any point from a grain corner, to the maximum diameter of the grain, thus producing a range of apparent grain sizes on the two-dimensional plane, even in a sample with a perfectly consistent grain size.

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.

ASTM E112, *Standard Test Methods for Determining Average Grain Size*

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 <http://www.iso.org/obp>

3.1 Grains

3.1.1 grain

closed polygonal shape with more or less curved sides, which can be revealed on a flat cross-section through the sample, polished and prepared for micrographic examination

3.1.2 austenitic grain

crystal with a face-centred cubic crystal structure which may, or may not, contain annealing twins

3.1.3 ferritic grain

crystal with a body-centred cubic crystal structure which never contains annealing twins

Note 1 to entry: Ferritic grain size is generally estimated for unalloyed steels with a carbon content of 0,25 % or less. If pearlite islands of identical dimensions to those of the ferrite grains are present, the islands are then counted as ferrite grains.