



**NSAI**  
Standards

Irish Standard  
I.S. EN ISO 643:2020&LC:2020

Steels - Micrographic determination of the  
apparent grain size (ISO 643:2019,  
Corrected version 2020-03)

**I.S. EN ISO 643:2020&LC:2020**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

*This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):*

*NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.*

*This document is based on:*

*Published:*

*This document was published under the authority of the NSAI and comes into effect on:*

2020-05-15

ICS number:

77.040.99

NOTE: If blank see CEN/CENELEC cover page

NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

## National Foreword

I.S. EN ISO 643:2020&LC:2020 is the adopted Irish version of the European Document EN ISO 643:2020, Steels - Micrographic determination of the apparent grain size (ISO 643:2019, Corrected version 2020-03)

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

For relationships with other publications refer to the NSAI web store.

**Compliance with this document does not of itself confer immunity from legal obligations.**

*In line with international standards practice the decimal point is shown as a comma (,) throughout this document.*

This page is intentionally left blank

## Corrected Version

**Reference:** EN ISO 643:2020

**Title:** Steels - Micrographic determination of the apparent grain size (ISO 643:2019, Corrected version 2020-03)

**Work Item:** EC101164

Brussels, 2020-04-08

**Please include the following minor editorial correction(s) in the document related to:**

the following language version(s) :

- English
- French
- German

for the following procedure :

- PQ/UQ
- Enquiry
- 2nd Enquiry
- Parallel Enquiry
- 2<sup>nd</sup> Parallel Enquiry
- Formal Vote
- 2<sup>nd</sup> Formal Vote
- Parallel Formal Vote
- 2<sup>nd</sup> Parallel Formal Vote
- UAP
- TC Approval
- 2<sup>nd</sup> TC Approval
- Publication
- Parallel Publication

---

It has been brought to our attention that this document, issued on 2020-01-15, requires modification.

ISO has published (Corrected version 2020-03) of ISO 643:2019.

Titles and Forewords have been updated accordingly.

Please find enclosed the updated English and French versions.

We apologise for any inconvenience this may cause.

*This page is intentionally left BLANK.*

EUROPEAN STANDARD

**EN ISO 643**

NORME EUROPÉENNE

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, Corrected version 2020-03)

Aciers - Détermination micrographique de la grosseur de grain apparente (ISO 643:2019, Version corrigée 2020-03)

Stahl - Mikrophotographische Bestimmung der erkennbaren Korngröße (ISO 643:2019, korrigierte Fassung 2020-03)

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

This European Standard was corrected and reissued by the CEN-CENELEC Management Centre on 08 April 2020.

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**

**EN ISO 643:2020 (E)**

<b>Contents</b>	<b>Page</b>
<b>European foreword.....</b>	<b>3</b>



## **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, Corrected version 2020-03 has been approved by CEN as EN ISO 643:2020 without any modification.

This page is intentionally left blank

# INTERNATIONAL STANDARD

# ISO 643

Fourth edition  
2019-12

Corrected version  
2020-03

---

---

## **Steels — Micrographic determination of the apparent grain size**

*Aciers — Détermination micrographique de la grosseur de grain  
apparente*



Reference number  
ISO 643:2019(E)

© ISO 2019

## ISO 643:2019(E)



### **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
<b>Foreword</b> .....	<b>iv</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
3.1 Grains.....	1
3.2 General.....	2
<b>4 Symbols</b> .....	<b>2</b>
<b>5 Principle</b> .....	<b>3</b>
<b>6 Selection and preparation of the specimen</b> .....	<b>4</b>
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
<b>7 Characterization of grain size</b> .....	<b>10</b>
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
<b>8 Test report</b> .....	<b>14</b>
<b>Annex A (informative) Summary of methods for revealing ferritic, austenitic or prior-austenitic grain boundaries in steels</b> .....	<b>15</b>
<b>Annex B (normative) Evaluation method</b> .....	<b>16</b>
<b>Bibliography</b> .....	<b>21</b>

## ISO 643:2019(E)

### 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 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](http://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](http://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](#).

# 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.

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-