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## Steels — Micrographic determination of the apparent grain size

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



Reference number  
ISO 643:2019(E)

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# 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>

## 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.