
Jekla - Mikrografsko določevanje navidezne velikosti kristalnih zrn (ISO 643:2019, popravljena različica 2020-03)

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

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

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

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| 77.080.20 | Jekla | Steels |

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EUROPEAN STANDARD
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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.

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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of an identical text or by endorsement, at the latest by July 2020, and conflicting national standards shall be withdrawn at the latest by July 2020.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.

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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*

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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. (standards.iteh.ai)

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.

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 (standards.iteh.ai)

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.

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3.2 General

3.2.1

index

positive, zero or possibly negative number G which is derived from the mean number m of *grains* (3.1.1) counted in an area of 1 mm^2 of the section of the specimen

Note 1 to entry: By definition, $G = 1$ where $m = 16$; the other indices are obtained by [Formula \(1\)](#).

$$m = 8 \times 2^G \quad (1)$$

3.2.2

intercept

\bar{N}

number of *grains* (3.1.1) intercepted by a test line, either straight or curved

Note 1 to entry: See [Figure 1](#).

Note 2 to entry: Straight test lines will normally end within a grain. These end segments are counted as 1/2 an interception. \bar{N} is the average of a number of counts of the number of grains intercepted by the test line applied randomly at various locations. \bar{N} is divided by the true line length, L_T usually measured in millimetres, in order to obtain the number of grains intercepted per unit length, \bar{N}_L .

3.2.3

intersection

\bar{P}

number of intersection points between *grain* (3.1.1) boundaries and a test line, either straight or curved

Note 1 to entry: See [Figure 2](#).

Note 2 to entry: \bar{P} is the average of a number of counts of the number of grain boundaries intersected by the test line applied randomly at various locations. \bar{P} is divided by the true line length, L_T usually measured in millimetres, in order to obtain the number of grain boundary intersections per unit length, \bar{P}_L .

4 Symbols

The symbols used are given in [Table 1](#).

Table 1 — Symbols

| Symbols | Definition | Value |
|---|--|--|
| \bar{a} | Mean area of grain in square millimetres | $\bar{a} = \frac{1}{m}$ |
| A_F | Apparent area of the test figure in square millimetres | — |
| \bar{d} | Mean grain diameter in millimetres | $\bar{d} = \frac{1}{\sqrt{m}}$ |
| D | Diameter of the circle on the ground glass screen of the microscope or on a photomicrograph enclosing the image of the reference surface of the test piece | 79,8 mm (area = 5 000 mm ²) |
| g | Linear magnification (to be noted as a reference) of the microscopic image | In principle 100 |
| G | Equivalent index of grain size | — |
| ^a The method for designating the direction conforms to ISO 3785. | | |