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Metallic coatings - Measurement of coating thickness -
Scanning electron microscope method (ISO 9220:2022)

EESTI STANDARDI EESSÕNA

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EUROPEAN STANDARD

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English Version

Metallic coatings - Measurement of coating thickness - Scanning electron microscope method (ISO 9220:2022)

Revêtements métalliques - Mesurage de l'épaisseur de revêtement - Méthode au microscope électronique à balayage (ISO 9220:2022)

Metallische Überzüge - Messung der Schichtdicke - Verfahren mit Rasterelektronenmikroskop (ISO 9220:2022)

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

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

European foreword

This document (EN ISO 9220:2022) has been prepared by Technical Committee ISO/TC 107 "Metallic and other inorganic coatings" in collaboration with Technical Committee CEN/TC 262 "Metallic and other inorganic coatings, including for corrosion protection and corrosion testing of metals and alloys" the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by August 2022, and conflicting national standards shall be withdrawn at the latest by August 2022.

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 9220:1994.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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 9220:2022 has been approved by CEN as EN ISO 9220:2022 without any modification.

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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).

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This document was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 262, *Metallic and other inorganic coatings*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 9220:1988), which has been technically revised.

The main changes are as follows:

- addition of two further calibration methods in [5.2](#), [8.2](#), and [8.3](#);
- deletion of technically outdated content concerning instability of SEMs and analogue photos or concerning the operation of SEMs [removal of old Subclauses 6.11, 6.12, 6.13, 8.4, 9.2.1, 9.2.2, 9.3, A.2.3, A.3.2, A.3.3, A.3.4, and A.3.7; revision of item e) in [Clause 12](#)];
- discussion of influences of imaging parameters on measurement uncertainty (new [6.11](#));
- revision of [Clause 10](#) and addition of [Annex B](#) with precision data from round robin tests;
- revision of [Annex A](#) to (re-) align it with ISO 1463:2021;
- adding a bibliography with informative references.

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.

Metallic coatings — Measurement of coating thickness — Scanning electron microscope method

1 Scope

This document specifies a destructive method for the measurement of the local thickness of metallic and other inorganic coatings by examination of cross-sections with a scanning electron microscope (SEM). The method is applicable for thicknesses up to several millimetres, but for such thick coatings it is usually more practical to use a light microscope (see ISO 1463). The lower thickness limit depends on the achieved measurement uncertainty (see [Clause 10](#)).

NOTE The method can also be used for organic layers when they are neither damaged by the preparation of the cross-section nor by the electron beam during imaging.

2 Normative references

There are no normative references in this document.

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:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

local thickness

mean of the thickness measurements, of which a specified number is made within a reference area

[SOURCE: ISO 2064:1996, 3.4]

4 Principle

A test specimen is cut, ground, and polished from a cross-section of the coating for materialographic examination by a scanning electron microscope. The measurement is made on the digital image generated by the SEM using either the tools of the SEM's operating software or by importing the image file together with its calibration data into an image processing software and using that software's tools.

5 Instrumentation

5.1 Scanning electron microscope

Suitable instruments are available commercially.

5.2 Tools to calibrate the length measurement function of the SEM software

Suitable tools are required for the calibration of the length measurement function of the SEM's software, e.g. a stage micrometre, or a graticule, or a piece from a silicon wafer with a regular pattern of (cylindrical) metallic bumps with a certified distance of the cylinder axes, or spherical polymer