



**NSAI**  
Standards

Irish Standard  
I.S. EN ISO 10111:2019

Metallic and other inorganic coatings -  
Measurement of mass per unit area -  
Review of gravimetric and chemical  
analysis methods (ISO 10111:2019)

**I.S. EN ISO 10111:2019**

*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:*

EN ISO 10111:2019

*Published:*

2019-02-06

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

2019-02-24

ICS number:

25.220.20

25.220.40

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 10111:2019 is the adopted Irish version of the European Document EN ISO 10111:2019, Metallic and other inorganic coatings - Measurement of mass per unit area - Review of gravimetric and chemical analysis methods (ISO 10111:2019)

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

EUROPEAN STANDARD

EN ISO 10111

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2019

ICS 25.220.20; 25.220.40

Supersedes EN ISO 10111:2001

English Version

## Metallic and other inorganic coatings - Measurement of mass per unit area - Review of gravimetric and chemical analysis methods (ISO 10111:2019)

Revêtements métalliques et autres revêtements inorganiques - Mesurage de la masse surfacique - Présentation des méthodes d'analyse gravimétrique et chimique (ISO 10111:2019)

Metallische und andere anorganische Schichten - Messung der flächenbezogenen Masse - Übersicht über gravimetrische und chemische Analyseverfahren (ISO 10111:2019)

This European Standard was approved by CEN on 27 December 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, 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 10111:2019 (E)**

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

## **European foreword**

This document (EN ISO 10111:2019) 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 2019, and conflicting national standards shall be withdrawn at the latest by August 2019.

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 10111:2001.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Endorsement notice**

The text of ISO 10111:2019 has been approved by CEN as EN ISO 10111:2019 without any modification.

This page is intentionally left blank



**INTERNATIONAL  
STANDARD**

**ISO  
10111**

Second edition  
2019-01

---

---

**Metallic and other inorganic  
coatings — Measurement of mass per  
unit area — Review of gravimetric and  
chemical analysis methods**

*Revêtements métalliques et autres revêtements inorganiques —  
Mesurage de la masse surfacique — Présentation des méthodes  
d'analyse gravimétrique et chimique*



Reference number  
ISO 10111:2019(E)

© ISO 2019

**ISO 10111:2019(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>
<b>4 Principle</b> .....	<b>2</b>
<b>5 Special equipment</b> .....	<b>2</b>
<b>6 Preparation of test specimen</b> .....	<b>2</b>
6.1 Size.....	2
6.2 Shape.....	2
6.3 Edge condition.....	2
6.4 Heat treatment.....	2
<b>7 Measurement of coated area</b> .....	<b>3</b>
7.1 Measurement method.....	3
7.2 Surface measuring equipment.....	3
7.2.1 Geometrical (projected) surface area.....	3
7.2.2 Surface area increase due to roughness (optional).....	3
7.3 Number of measurements.....	3
<b>8 Determination of mass of coating by chemical analysis</b> .....	<b>4</b>
8.1 General.....	4
8.2 Restrictions.....	4
<b>9 Gravimetric determination of mass of coating</b> .....	<b>4</b>
9.1 Specimen size.....	4
9.2 Limitations.....	4
9.3 Restrictions.....	4
9.4 Gravimetric analysis equipment.....	4
9.5 Procedure.....	5
9.5.1 General.....	5
9.5.2 Difference method with dissolution of the coating.....	5
9.5.3 Direct weighing method with dissolution of the substrate.....	5
9.5.4 Difference method without dissolution.....	5
<b>10 Calculations</b> .....	<b>6</b>
10.1 Surface density.....	6
10.2 Thickness.....	6
<b>Annex A (informative) Reagents for selective dissolution of metal layers</b> .....	<b>7</b>
<b>Bibliography</b> .....	<b>11</b>

## ISO 10111:2019(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 of 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 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*.

This second edition cancels and replaces the first edition (ISO 10111:2000), which has been technically revised. The following changes have been made:

- a) a gravimetric method has been added for weighing the uncoated substrate and the finished sample;
- b) the surface area increase caused by surface roughness has been considered to obtain a more realistic estimation of local geometric coating thickness (optional);
- c) [Annex A](#), which gives reagents for etching or stripping solutions, has been changed to informative as other solutions can be applied;
- d) reagents in [Annex A](#) that referred to no longer existing standards or which contain hazardous chemicals have been removed;
- e) outdated and uncited references in the Bibliography have been removed.

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).

# Metallic and other inorganic coatings — Measurement of mass per unit area — Review of gravimetric and chemical analysis methods

**WARNING** — The use of this document can involve hazardous materials, operations and equipment. It does not purport to address all of the safety or environmental problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel and the environment prior to application of this document.

## 1 Scope

This document gives guidelines for determining the average surface density over a measured area of anodic oxide or of a coating deposited autocatalytically, mechanically, by chemical conversion, by electrodeposition, by hot dip galvanizing and by chemical or physical vapour deposition using gravimetric and other chemical analysis procedures that have attained some degree of national or international standardization.

A variety of procedures are described and include:

- gravimetric procedures for chemical or electrochemical dissolution of the coating or the substrate to determine the coating surface density;
- gravimetric procedures for weighing the uncoated substrate and the coated (finished) specimen to determine the coating surface density;
- analytical procedures that utilize dissolution of the coating for determination of the coating surface density by instrumental chemical analysis methods.

With the exception of the gravimetric method as described in ISO 3892, this document does not give the measurement uncertainties of the methods cited.

## 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.

ISO 2080, *Metallic and other inorganic coatings — Surface treatment, metallic and other inorganic coatings — Vocabulary*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2080 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 <http://www.electropedia.org/>

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](#)
-