

Metallic coatings — Autocatalytic (electroless) nickel-phosphorus alloy coatings — Specification and test methods

The European Standard EN ISO 4527:2003 has the status of a
British Standard

ICS 25.220.40

Confirmed May 2009

National foreword

This British Standard is the official English language version of EN ISO 4527:2003. It is identical with ISO 4527:2003.

The UK participation in its preparation was entrusted to Technical Committee STI/33, Electrodeposited and related coating, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN ISO title page, the EN ISO foreword page, the ISO title page, pages ii to v, a blank page, pages 1 to 22, the annex ZA page and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 23 July 2003

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English version

Metallic coatings - Autocatalytic (electroless) nickel-phosphorus alloy coatings - Specification and test methods (ISO 4527:2003)

Revêtements métalliques - Dépôts autocatalytiques (sans courant) d'alliages de nickel-phosphore - Spécifications et méthodes d'essai (ISO 4527:2003)

Metallische Überzüge - Autokatalytisch (außenstromlos) abgeschiedene Nickel-Phosphor-Legierungs-Überzüge - Spezifikationen und Prüfverfahren (ISO 4527:2003)

This European Standard was approved by CEN on 25 April 2003.

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 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 Management Centre has the same status as the official versions.

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Foreword

This document (EN ISO 4527:2003) 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", 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 November 2003, and conflicting national standards shall be withdrawn at the latest by November 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 4527:2003 has been approved by CEN as EN ISO 4527:2003 without any modifications.

NOTE Normative references to International Standards are listed in Annex ZA (normative).

INTERNATIONAL STANDARD

**ISO
4527**

Second edition
2003-05-15

Metallic coatings — Autocatalytic (electroless) nickel-phosphorus alloy coatings — Specification and test methods

*Revêtements métalliques — Dépôts autocatalytiques (sans courant)
d'alliages de nickel-phosphore — Spécifications et méthodes d'essai*



Reference number
ISO 4527:2003(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 4527 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 3, *Electrodeposited coatings and related finishes*.

This second edition cancels and replaces the first edition (ISO 4527:1987), which has been technically revised.

Introduction

Autocatalytic nickel-phosphorus alloy coatings are produced by the catalytic reduction of nickel ions in hot, usually mildly acidic solutions at atmospheric pressure using hypophosphite ion as the reducing agent. Because the deposited nickel alloy is a catalyst for the reaction, the process is self-sustaining. The coatings produced are uniform in thickness on irregularly shaped parts if the processing solution circulates freely over their surfaces.

The as-deposited coating is a thermodynamically metastable, supersaturated solid solution of phosphorus in nickel containing up to 14 % mass fraction phosphorus. The physical and chemical properties and the structure of autocatalytic nickel-phosphorus coatings are dependent on the composition of the coating, the chemical make-up of the plating solution, the pre-treatment and quality of the substrate, and heat treatment after deposition.

Autocatalytic nickel-phosphorus coatings are applied in order to improve corrosion protection and to provide wear resistance. In general, corrosion performance is significantly improved as the phosphorus content of the deposit is increased to 8 % mass fraction or higher, whereas wear resistance is improved as the phosphorus content of the coating is decreased below that level. With suitable heat treatment however, coatings with high phosphorus contents display greatly improved microhardness and hence, wear resistance.

Metallic coatings — Autocatalytic (electroless) nickel-phosphorus alloy coatings — Specification and test methods

1 Scope

This International Standard specifies the requirements and test methods for autocatalytic nickel-phosphorus alloy coatings applied from aqueous solutions on to metallic substrates.

This International Standard does not apply to autocatalytic nickel-boron alloy coatings, nickel-phosphorus composites and ternary alloys.

WARNING — The use of this International Standard may involve hazardous materials, operation and equipment. This International Standard does not purport to address all the safety problems associated with its use. It is the responsibility of the user of this International Standard to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.

2 Normative references

The following referenced documents are indispensable for the application 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 1463, *Metal and oxide coatings — Measurement of coating thickness — Microscopical method*

ISO 2064, *Metallic and other inorganic coatings — Definitions and conventions concerning the measurement of thickness*

ISO 2079, *Surface treatment and metallic coatings — General classification of terms*

ISO 2080¹⁾, *Surface treatment, metallic and other inorganic coatings — Vocabulary*

ISO 2177, *Metallic coatings — Measurement of coating thickness — Coulometric measurement by anodic dissolution*

ISO 2178, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method*

ISO 2819, *Metallic coatings on metallic substrates — Electrodeposited and chemically deposited coatings — Review of methods available for testing adhesion*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 2859-2, *Sampling procedures for inspection by attributes — Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection*

ISO 2859-3, *Sampling procedures for inspection by attributes — Part 3: Skip-lot sampling procedures*

1) To be published. (Revision of ISO 2080:1981)