
**Metallic and other inorganic coatings —
Autocatalytic nickel over autocatalytic
copper for electromagnetic shielding**

*Revêtements métalliques et autres revêtements inorganiques — Dépôts
autocatalytiques de nickel sur dépôts autocatalytiques de cuivre pour
protection contre les interférences électromagnétiques*

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Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Essential information to be supplied by the purchaser.....	2
5 Designation	3
5.1 General.....	3
5.2 Coating type	3
5.3 Coating grades.....	4
5.4 Examples of designations	4
6 Requirements	5
6.1 Substrate	5
6.2 Appearance	5
6.3 Storage.....	5
6.4 Coating composition	5
6.5 Local coating thickness	6
6.6 Adhesion.....	6
6.7 Electrical continuity and integrity.....	6
6.8 Thermal cycling.....	6
6.9 Shielding effectiveness	6
6.10 Special test specimens	7
7 Sampling.....	7
Annex A (normative) Thickness test methods	8
Bibliography	9

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 17334 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 3, *Electrodeposited coatings and related finishes*.

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Introduction

The proliferation of electronic equipment has created a need for methods for shielding components from the hazards of electromagnetic radiation, hazards that can result in the malfunctioning of computers, as well as medical, navigational, detonation, telecommunication and other devices. Electromagnetic shielding requirements have been established by government regulations and directives in many parts of the world.

The capability of an enclosure, housing or cabinet to prevent electromagnetic radiation from being emitted or absorbed is related to its conductivity; hence, metal enclosures are highly effective for electromagnetic shielding purposes. The cost/weight advantages of plastics, however, have led to their widespread use in computer cabinets and other enclosures. Plastics are non-conductive and as a result, metallic coating methods have been developed to shield components from the interference caused by electromagnetic radiation.

An effective method of protecting computer housings from electromagnetic interference involves the autocatalytic deposition of a layer of copper on the plastic housing. To provide durability and corrosion protection, a thin layer of autocatalytic nickel is applied over the autocatalytic copper. Although this method was first utilized in computer housings made of plastics, it is applicable to other substrates and applications. The need for effective shielding will likely intensify and the use of autocatalytic nickel over autocatalytic copper for electromagnetic shielding purposes is expected to increase.

This International Standard is intended for use by purchasers in specifying requirements to the electroplater, supplier or processor and is to be indicated on the part drawing or purchase order.

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WARNING — This International Standard calls for the use of substances and/or procedures that may be injurious to health if adequate safety measures are not taken. This International Standard does not address any health hazards, safety or environmental matters associated with its use. It is the responsibility of the user of this International Standard to establish appropriate health, safety and environmentally acceptable practices and take suitable actions for any national and international regulations. Compliance with this International Standard does not in itself confer immunity from legal obligations.

1 Scope

This International Standard specifies the requirements for autocatalytic nickel-phosphorus alloy coatings applied over autocatalytic copper coatings to provide electromagnetic interference (EMI) or electrostatic discharge (ESD) protection for parts fabricated from either plastics or metallic materials.

This International Standard does not apply to high-strength steels that are susceptible to hydrogen embrittlement.

2 Normative references

ISO 17334:2008

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

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

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

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

ISO 2859 (all parts), *Sampling procedures for inspection by attributes*

ISO 3543, *Metallic and non-metallic coatings — Measurement of thickness — Beta backscatter method*

ISO 3497, *Metallic coatings — Measurement of coating thickness — X-ray spectrometric methods*

ISO 3882, *Metallic and other inorganic coatings — Review of methods of measurement of thickness*

ISO 4519, *Electrodeposited metallic coatings and related finishes — Sampling procedures for inspection by attributes*

ISO 4525, *Metallic coatings — Electroplated coatings of nickel plus chromium on plastics materials*

ISO 4527, *Metallic coatings — Autocatalytic (electroless) nickel-phosphorus alloy coatings — Specification and test methods*

ISO 16348, *Metallic and other inorganic coatings — Definitions and conventions concerning appearance*

IEC 60454-2, *Pressure-sensitive adhesive tapes for electrical purposes — Part 2: Methods of test*

IEC 61587-3, *Mechanical structures for electronic equipment — Tests for IEC 60917 and IEC 60297 — Part 3: Electromagnetic shielding performance tests for cabinets, racks and subracks*

ASTM D4935, *Standard Test Method for Measuring the Electromagnetic Shielding Effectiveness of Planar Materials*¹⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2064, ISO 2080, ISO 16348 and the following apply.

3.1 shielding effectiveness

ratio of power received with and without a material present for the same incident power, by the following equation:

$$\alpha = 10 (\lg P_1/P_2)$$

where

α is the shielding effectiveness,

P_1 is the received power without the material present;

P_2 is the received power with the material present (see ASTM D4935 or IEC 61587-3).

NOTE Shielding effectiveness is usually expressed in decibels (dB).

4 Essential information to be supplied by the purchaser

When ordering articles to be coated in accordance with this International Standard, the following information shall be provided in writing by the purchaser to the processor or supplier providing the coating services as part of the contract or purchase order, or on engineering drawings:

- the number of this International Standard and the designation, including the deposit type and grade (see Clause 5);
- the specification and metallurgical condition of metallic substrate and surface condition of polymeric substrate; identifications of assemblies of dissimilar substrates; polymeric substrates shall be of a plating grade;
- the appearance required (see 6.2); alternatively, samples showing the required finish or range of finish to be supplied;

¹⁾ This ASTM standard has been withdrawn. However, copies are still publicly available for purchase on the ASTM website.

- d) the significant surfaces, non-significant surfaces, and surfaces that shall be free of any coating, as indicated on the engineering drawings or by the provision of suitably marked samples (see Clause 6);
- e) the requirements for thickness test, and minimum thickness, the adhesion test and the specific test methods for thickness to be used (see 6.5, 6.6 and 6.10);
- f) the minimum requirements for electrical continuity, the thermal cycle resistance, the specific test method for shielding effectiveness to be used and the minimum requirement for shielding effectiveness (see 6.7, 6.8 and 6.9);
- g) the sampling methods, acceptance levels or any other inspection requirements (see Clause 7);
- h) any special requirements, e.g. mechanical roughening of polymeric surfaces to promote adhesion or requirements of any test coupons or test specimens, a porosity test, and the use of any special test specimens or coupons.

5 Designation

5.1 General

The designation is a means of specifying the coatings appropriate for various conditions of service (see Bibliography) and is comprised of the following:

- a) the term "Autocatalytic coating";
- b) the number of this International Standard (ISO 17334) followed by a hyphen;
- c) the symbol of the substrate or the chemical symbol of the basis metal (or for the principal metal if an alloy) followed by a solidus (/) as follows:

PL for a plateable plastic substrate;

Fe for iron or steel;

Zn for zinc alloys;

Al for aluminium or aluminium alloys;

Mg for magnesium and magnesium alloys;

- d) the chemical symbol for autocatalytic copper (Cu);
- e) a number indicating the minimum local thickness, in micrometres, of the autocatalytic copper coating;
- f) the chemical symbol for a nickel-phosphorus alloy coating (NiP) followed by a number in parenthesis giving the percent mass fraction of phosphorus in the coating;
- g) a number indicating the minimum local thickness, in micrometres, of the autocatalytic nickel coating.

See 5.4 for examples of designations.

5.2 Coating type

The coating type designates the minimum local thickness of the autocatalytic copper and autocatalytic nickel coating, the shielding effectiveness of the composite coating and its shielding capability in accordance with Table 1.