
**Metallic coatings — Electrodeposited
coatings of nickel**

Revêtements métalliques — Dépôts électrolytiques de nickel

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ISO 1458:2002

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 1458 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 3, *Electrodeposited coatings and related finishes*.

This third edition cancels and replaces the second edition (ISO 1458:1988), which has been technically revised.

Annexes B, C and D form a normative part of this International Standard. Annex A is for information only.

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Introduction

Decorative, electrodeposited nickel coatings with and without copper undercoats and without chromium top-coats are suitable for applications in which tarnishing is prevented by rubbing or handling in service or by the use of topcoats other than chromium. They are also suitable for those applications where tarnishing is of no importance. Corrosion resistance depends on the type and thickness of the coatings. In general, multilayer nickel coatings provide better protection than single-layer nickel coatings of equal thickness.

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Metallic coatings — Electrodeposited coatings of nickel

1 Scope

This International Standard specifies requirements for nickel electrodeposited coatings that are applied to iron and steel, to zinc alloys, to copper and copper alloys, and to aluminium and aluminium alloys to provide an attractive appearance and corrosion resistance. In addition, it specifies requirements for copper plus nickel coatings applied to iron and steel, and to zinc alloys. Coating designations that differ in thickness and type are specified and guidance is given in selecting the coating appropriate to the service conditions to which the coated product will be exposed.

This International Standard does not specify the surface condition required by the basis metal prior to the coating process, and is not applicable to coatings on sheet strip or wire in the non-fabricated form nor to threaded fasteners or coil springs.

Requirements for nickel plus chromium and copper plus nickel plus chromium coatings for metallic substrates are given in ISO 1456. Requirements for similar coatings for plastic materials are given in ISO 4525. ISO 4526 and ISO 6158 specify requirements for coatings of nickel and chromium, respectively, for engineering purposes.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1463, *Metallic 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 2080, *Surface treatment, metallic and other inorganic coatings — Vocabulary*

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

ISO 2361, *Electrodeposited nickel coatings on magnetic and non-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 3497, *Metallic coatings — Measurement of coating thickness — X-ray spectrometric methods*

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

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 9220, *Metallic coatings — Measurement of coating thickness — Scanning electron microscope method*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 9587, *Metallic and other inorganic coatings — Pretreatments of iron or steel to reduce the risk of hydrogen embrittlement*

ISO 9588, *Metallic and other inorganic coatings — Post-coating treatments of iron or steel to reduce the risk of hydrogen embrittlement*

ISO 10289, *Methods for corrosion testing of metallic and other inorganic coatings on metallic substrates — Rating of test specimens and manufactured articles subjected to corrosion tests*

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

3 Terms and definitions

For the purposes of this International Standard, the definitions given in ISO 2064, ISO 2079, ISO 2080 and ISO 16348 apply.

4 Information to be supplied by the purchaser to the electroplater

4.1 Essential information **iTeh STANDARD PREVIEW** **(standards.iteh.ai)**

When ordering articles to be electroplated in accordance with this International Standard, the purchaser shall provide the following information in writing, in, e.g., the contract or purchase order, or on engineering drawings:

- a) the designation (see clause 6);
- b) the appearance required, e.g., bright, dull or satin (see 6.3 and 7.1). Alternatively, samples showing the required finish or range of finish shall be supplied or approved by the purchaser, and used for comparison purposes (see 7.1);
- c) an indication of the significant surfaces to be made on drawings of the parts, or by the provision of suitably marked specimens;
- d) the type of corrosion test to be used (see 7.5 and Table 6);
- e) the type of adhesion test to be used (see 7.4);
- f) the extent to which defects are able to be tolerated on non-significant surfaces (see 7.1);
- g) the positions on the significant surface for rack or contact marks, where such marks are unavoidable (see 7.1);
- h) sampling methods and acceptance levels (see clause 8);
- i) the tensile strength of the steel and any requirement for pre- or post-treatments of iron or steel to reduce the risk of hydrogen embrittlement, as well as hydrogen embrittlement test methods (see 7.8 and 7.9).

4.2 Additional information

The following additional information may be provided by the purchaser, when appropriate:

- a) any requirements for STEP testing (see 7.6);
- b) thickness requirements on those areas that cannot be reached by a ball 20 mm in diameter (see 7.2);
- c) whether or not a copper undercoat is required [see 6.1 c) and 6.2].

5 Service condition number

The service condition number is used by the purchaser to specify the degree of protection required, as related to the severity of the conditions to which a product is to be subjected, in accordance with the following scale:

- 3 - severe
- 2 - moderate
- 1 - mild

Typical service conditions for which the various service condition numbers are appropriate are listed in annex A.

6 Designation

6.1 General

The coating designation is a means of specifying the basis metal and the types and thicknesses of coatings appropriate for each service condition (see Table 1 to Table 4 for various substrates) and comprises the following:

- a) the term, "Electroplated coating", the number of this International Standard, i.e. ISO 1458, followed by a hyphen;
- b) the chemical symbol for the basis metal (or for the principal metal if an alloy) followed by a stroke, as follows:
 - Fe/ for iron and steel;
 - Zn/ for zinc alloys;
 - Cu/ for copper and copper alloys;
 - Al/ for aluminium and aluminium alloys.
- c) the chemical symbol for copper (Cu), if copper or brass containing more than 50 % copper is used as an undercoat;
- d) a number indicating the minimum local thickness, in micrometres, of the copper coating where applicable;
- e) a letter indicating the type of copper, where applicable (see 6.2);
- f) the chemical symbol for nickel (Ni);
- g) a number indicating the minimum local thickness of the nickel coating in micrometres;
- h) a letter designating the type of nickel coating (see 6.3);
- i) if a topcoat is to be applied over the nickel, its chemical symbol and a number indicating its minimum local thickness shall be appended to the coating designation. If the topcoat is an electrodeposited alloy, the chemical symbols of the principal alloy constituents shall be used. If the topcoat is a precious metal, e.g., gold or silver, the chemical symbol shall be followed by a number in parenthesis giving the minimum content of the precious metal in the topcoat, expressed as mass percent to one decimal point.

See the examples of designations given in 6.4

Table 1 — Nickel and copper plus nickel coatings on steel

Service condition number	Partial designation
3	Fe/Ni30b Fe/Cu20a Ni25b Fe/Ni30p Fe/Cu20a Ni25p Fe/Ni30s Fe/Cu20a Ni25s Fe/Ni25d Fe/Cu20a Ni20d
2	Fe/Ni20b Fe/Cu15a Ni20b Fe/Ni20p Fe/Cu15a Ni20p Fe/Ni20s Fe/Cu15a Ni20s
1	Fe/Ni15d Fe/Cu15a Ni15d Fe/Ni10b Fe/Cu10a Ni10b Fe/Ni10s Fe/Cu10a Ni10s

NOTE An initial copper coating, 5 µm to 10 µm thick, is normally applied to iron and steel from a copper cyanide solution before electroplating with ductile acid copper to prevent immersion deposition and poorly adherent deposits. The initial copper coating (copper strike) may not be substituted for any portion of the ductile acid copper specified in Table 1.

Table 2 — Nickel and copper plus nickel coatings on zinc alloys

Service condition number	Partial designation
3	Zn/Ni25b Zn/Cu15a Ni20b
	Zn/Ni25s Zn/Cu15a Ni20b
	Zn/Ni20d Zn/Cu15a Ni15d
2	Zn/Ni15b Zn/Cu10a Ni15b
	Zn/Ni15s Zn/Cu10a Ni15b
1	Zn/Ni10b Zn/Cu10a Ni10b
	Zn/Ni10s Zn/Cu10a Ni10b

NOTE Zinc alloys must first be electroplated with copper to ensure adhesion of the subsequent nickel coatings. The initial layer of copper is usually electrodeposited from a copper cyanide solution but cyanide-free alkaline copper solutions are also being used. The minimum thickness of the initial copper layer is 8 μm to 10 μm . For articles of complex shape, the minimum copper thickness may need to be increased to about 15 μm to ensure adequate coverage on low-current-density areas outside the significant surfaces. Ductile, levelling copper electrodeposited from acid solutions is usually applied over the initial cyanide copper deposit when the specified copper thickness is greater than 10 μm .

Table 3 — Nickel coatings on copper and copper alloys

Service condition number	Partial designation
3	Cu/Ni20b Cu/Ni20p Cu/Ni20s Cu/Ni20d
	Cu/Ni10b Cu/Ni10s Cu/Ni10p
	Cu/Ni5b Cu/Ni5s