
**Metallic and other inorganic
coatings — Electroplated coatings of
zinc with supplementary treatments
on iron or steel**

*Revêtements métalliques et autres revêtements inorganiques —
Dépôts électrolytiques de zinc avec traitements supplémentaires sur
fer ou acier*

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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).

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html. (standards.iteh.ai)

This document was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 262, *Metallic and other inorganic coatings*, in collaboration with ISO Technical Committee TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 3, *Electrodeposited coatings and related finishes*, in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 2081:2008), which has been technically revised. The following main changes have been made:

- the number of normative references has been reduced;
- reference to ASTM B117 has been replaced with ISO 9227;
- some abbreviated terms have been removed;
- coating designations have been modified;
- reference to ISO 1463 for thickness measurement has been increased;
- reference to use of trivalent chromium has been increased;
- reference to use of hexavalent chromium has been reduced;
- reference to ISO 19598 in relation to supplementary Cr(VI)-free treatment has been added;
- Tables 1 and 2 have been replaced with a revised [Table 1](#) on neutral salt spray corrosion resistance;
- reference to ISO 15330 in relation to hydrogen embrittlement testing has been added;
- supplementary treatment designations have been modified;
- Annex C has been removed.

Introduction

Zinc coatings are applied to iron or steel articles for protective and decorative purposes by electrodeposition from acid zinc chloride, alkaline non-cyanide zinc, and alkaline zinc cyanide solutions. Electroplated, bright zinc coatings are popular and the processes for preparing bright zinc coatings are widely used.

The ability of a zinc coating to prevent corrosion is a function of its thickness and the type of service conditions to which it is exposed. For example, the rate of corrosion of zinc will generally be greater in industrial exposures than in rural ones. The type of service condition should, therefore, be taken into consideration when specifying the minimum coating thickness. Trivalent chromate conversion coatings and other supplementary treatments enhance the corrosion resistance of electrodeposited zinc coatings and are commonly applied after electroplating.

Because the appearance and serviceability of zinc coatings depends on the surface condition of the basis metal, agreement should be reached between the interested parties that the surface finish of the basis metal is satisfactory for electroplating.

Trivalent chromate conversion coatings are omitted, or replaced by other conversion coatings, at the specific request of the purchaser. This document provides the codes for all types of chromate conversion and other supplementary coatings.

With reference to Cr(VI)-free conversion coatings, attention is drawn to ISO 19598. ISO 19598 is applicable to zinc, zinc-iron and zinc-nickel plating, where only trivalent systems are required.

Due to the REACH Regulations the use of hexavalent chromium compounds will be banned in Europe from September 2017 except where specifically authorized. Alternative conversion coatings or substitutes, can be used and are required to satisfy the corrosion requirements given in this document.

Standard designations for metals and alloys can be found in References [12] to [16].

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Metallic and other inorganic coatings — Electroplated coatings of zinc with supplementary treatments on iron or steel

WARNING — This document calls for the use of substances and/or procedures that can be injurious to health if adequate safety measures are not taken. This document does not address any health hazards, safety or environmental matters associated with its use. It is the responsibility of the producers, purchasers and/or user of this document to establish appropriate health, safety and environmentally acceptable practices.

1 Scope

This document specifies requirements for electroplated coatings of zinc with supplementary treatments on iron or steel. It includes information to be supplied by the purchaser to the electroplater, and the requirements for heat treatment before and after electroplating.

It is not applicable to zinc coatings applied

- to sheet, strip or wire in the non-fabricated form,
- to close-coiled springs, or
- for purposes other than protective or decorative.

This document does not specify requirements for the surface condition of the basis metal prior to electroplating with zinc. However, defects in the surface of the basis metal can adversely affect the appearance and performance of the coating.

The coating thickness that can be applied to threaded components can be limited by dimensional requirements, including class or fit.

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

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

ISO 3613, *Metallic and other inorganic coatings — Chromate conversion coatings on zinc, cadmium, aluminium-zinc alloys and zinc-aluminium alloys — Test methods*

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

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

ISO 2081:2018(E)

ISO 9587, *Metallic and other inorganic coatings — Pretreatment 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 10587, *Metallic and other inorganic coatings — Test for residual embrittlement in both metallic-coated and uncoated externally-threaded articles and rods — Inclined wedge method*

ISO 15330, *Fasteners — Preloading test for the detection of hydrogen embrittlement — Parallel bearing surface method*

ISO 15724, *Metallic and other inorganic coatings — Electrochemical measurement of diffusible hydrogen in steels — Barnacle electrode method*

3 Terms, definitions, abbreviated terms and symbols

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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

3.2 Abbreviated terms

ER hydrogen embrittlement relief heat treatment

SR stress relief heat treatment

T2 organic sealant

3.3 Symbols

Fe chemical symbol for iron

Zn chemical symbol for zinc

4 Information to be supplied by the purchaser to the electroplater

4.1 Essential information

The following information shall be supplied to the electroplater in writing, for example, in the contract or purchase order, or on engineering drawings:

- a) the reference to this document, i.e. ISO 2081, and the designation (see [Clause 5](#));
- b) the significant surface indicated, for example, by drawings or by the provision of suitably marked samples;
- c) the nature, condition and finish of the basis metal if they are likely to affect the serviceability and/or appearance of the coating (see [Clause 1](#));

- d) the position on the surface for unavoidable defects, such as rack marks (see [6.1](#));
- e) the finish required, for example, bright, dull or other finish, preferably accompanied by approved samples of the finish (see [6.1](#));
- f) the type of chromate conversion coating or supplementary treatment (see [6.3](#) and [Annex A](#)); chromate conversion coatings shall only be omitted, and alternative conversion coatings and/or other supplementary treatments, such as lacquers, applied over the chromate conversion coating, at the specific request of the purchaser;
- g) the requirements for thickness and adhesion test (see [6.2](#), [6.4](#) and [Annex B](#));
- h) the tensile strength of the parts and the requirements for heat treatment before and/or after electrodeposition (see [6.6](#) and [6.7](#));
- i) sampling methods, acceptance levels or any other inspection requirements, if inspection is different from that given in ISO 4519 (see [Clause 7](#));
- j) any requirements for accelerated corrosion testing (see [6.5](#)) and rating (see [6.5.2](#)).

4.2 Additional information

The following additional information shall also be supplied to the electroplater:

- a) any special requirements for, or restrictions on, preparation of the article to be coated (see References [\[10\]](#) and [\[11\]](#));
- b) any other requirements, such as for articles of complex shape, an area for testing and rating.

5 Designation

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5.1 General

The designation shall appear on engineering drawings, in the purchase order, in the contract or in the detailed product specification. The designation specifies, in the following order, the basis metal, stress relief requirements, the type and thickness of undercoats, if present, the thickness of the zinc coating, heat treatment requirements after electroplating, and the type of conversion coating and/or supplementary treatment (see References [\[17\]](#) and [\[18\]](#)).

5.2 Designation specification

The designation shall comprise the following:

- a) the term “Electrodeposited coating”;
- b) the reference to this document, i.e. ISO 2081;
- c) a hyphen;
- d) the chemical symbol of the basis material, Fe, (iron or steel) followed by its standard designation;
- e) a solidus (/);
- f) the SR designation, if necessary, followed by a solidus (/);
- g) the chemical symbol for zinc, “Zn”;
- h) a number indicating the minimum local thickness, in micrometres, of the zinc coating followed by a solidus (/);
- i) the ER designation, if necessary, followed by a solidus;