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Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods

Revêtements par galvanisation à chaud sur produits finis en fonte et en acier — Spécifications et méthodes d'essai

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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).

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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.

This document was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 4, *Hot dip coatings (galvanized, etc.),* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 262, *Metallic and other inorganic coatings,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 1461:2009), which has been technically revised.

The main changes are as follows:

— definitions have been added for ‘galvanizer’, ‘after-treatment’, ‘additional coating’, ‘wet storage stain’ and ‘duplex system’ in Clause 3;

— the difficulty to remove flux residues and zinc ash when access is restricted has been recognised in 6.1;

— procedures for choice of reference areas have been clarified and additional requirements to avoid reference areas on certain small ancillary elements on a larger article have been added in 6.2.3;

— requirements for renovation of uncoated areas have been revised: the requirements for the pigment of a zinc-containing paint to conform with ISO 3549 have been removed; Annex C has been extended to include additional information on the suitability of different methods of renovation given in 6.3;

— all requirements related to coating thickness, including Table 3 and Table 4, have been placed within 6.5, including requirements linked to the size of the article in the control sample previously within 6.2.3; the lower coating thicknesses that can result in ultra-low reactive steels are recognised in new requirements for these steel types in 6.5;

— information on corrosion resistance of galvanized coatings has been updated, including the reference to ISO 9224 for longer-term corrosion resistance in Annex E.

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.

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Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods

1 Scope

This document specifies the general properties of hot dip galvanized coatings and test methods for hot dip galvanized coatings applied by dipping fabricated iron and steel articles (including certain castings) in a zinc melt (containing not more than 2 % of other metals). This document does not apply to the following:

a) sheet, wire and woven or welded mesh products that are continuously hot dip galvanized;

b) tube and pipe that are hot dip galvanized in automatic plants;

c) hot dip galvanized products (e.g. fasteners) for which specific standards exist and which can include additional requirements or requirements which are different from those of this document.

NOTE Individual product standards can incorporate this document for the galvanized coating by quoting its number, or can incorporate it with modifications specific to the product. Different requirements can also be made for galvanized coatings on products intended to meet specific regulatory requirements.

This document does not apply to after-treatment or additional coating of hot dip galvanized articles.

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 752, *Zinc ingots*

ISO 1460, *Metallic coatings — Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area*

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

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

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*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 14713-2:2019, *Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures — Part 2: Hot dip galvanizing*

EN 1179, *Zinc and zinc alloys — Primary zinc*

EN 13283, *Zinc and zinc alloys — Secondary zinc*

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3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org

3.1
hot dip galvanizing
formation of a galvanized coating of either zinc or zinc iron alloys, or both, on fabricated iron or steel articles by dipping in a *zinc melt* (3.16)

3.2
hot dip galvanized coating
galvanized coating
coating obtained by batch *hot dip galvanizing* (3.1)

3.3
galvanizer
company or organisation that operates a plant for the *hot dip galvanizing* (3.1) of batches of fabricated iron or steel articles

3.4
galvanized coating mass
either total mass of zinc or zinc alloys per area of surface, or both

Note 1 to entry: The galvanized coating mass is expressed in grams per square metre, g/m^2.

3.5
galvanized coating thickness
either total thickness of zinc or zinc alloys, or both

Note 1 to entry: The thickness is expressed in micrometres, µm.

3.6
significant surface
part of the article covered or to be covered by the galvanized coating and for which the galvanized coating is essential for either serviceability or appearance, or both

3.7
control sample
article or group of articles from a lot that is selected for sampling

3.8
reference area
area within which a specific number of single measurements are made

3.9
local galvanized coating thickness
mean value of *galvanized coating thickness* (3.5) obtained from the specific number of measurements within a *reference area* (3.8) for a magnetic test or the single value from a gravimetric test

3.10
mean galvanized coating thickness
average value of the *local galvanized coating thicknesses* (3.9)

3.11
local galvanized coating mass
value of *galvanized coating mass* (3.4) obtained from a single gravimetric test

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3.12
mean galvanized coating mass
average value of the *galvanized coating masses* (3.4) determined either by using a *control sample* (3.7) or by conversion of the *mean galvanized coating thickness* (3.10)

Note 1 to entry: The control sample shall be selected in accordance with Clause 5 using tests in accordance with ISO 1460.

3.13
inspection lot
single order or single delivery load

3.14
acceptance inspection
inspection of an *inspection lot* (3.13) at the *hot dip galvanizing* (3.1) plant, unless otherwise specified

3.15
uncoated area
area on the iron or steel articles that does not react with the molten zinc

3.16
zinc melt
molten mass containing primarily zinc

3.17
weld seepage
emission of previously retained pre-treatment solutions from narrow spaces between two closely contacting surfaces that have been subject to intermittent welding or from very small cavities (pinholes) in the welds of a galvanized article

3.18
after-treatment
immediate application of chemical or other treatments with temporary effects such as inhibition of *wet storage stain* (3.20) or to enhance appearance of galvanized articles

3.19
additional coating
application of coating layers, such as liquid paints or powder coating, after galvanizing as part of a *duplex system* (3.21)

3.20
wet storage stain
surface stain resulting from the formation of zinc corrosion products (usually zinc hydroxide and zinc oxide) when freshly galvanized steel is stored or transported in moist or humid conditions

3.21
duplex system
hot dip galvanized coating (3.2) with an additional liquid paint or powder coating

4 General requirements

4.1 General

This document sets out requirements for the contents of the zinc melt used to apply a galvanized coating to articles (see 4.2). The chemical composition and the surface condition (finish and roughness) of the basis metal, the mass of the parts and the galvanizing conditions can affect the appearance, thickness, texture, and physical and mechanical properties of the galvanized coating. This document does not specify any requirements regarding these points. Guidance on these parameters can be found in ISO 14713-2.

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