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Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of commercial and drawing qualities

Tôles en acier au carbone galvanisées en continu par immersion à chaud, de qualité commerciale et pour emboutissage

ICS: 77.140.50

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Foreword

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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. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 12, *Continuous mill flat rolled products*.

This fifth edition cancels and replaces the fourth edition (ISO 3575:2011), which has been technically revised.

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Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of commercial and drawing qualities

1 Scope

This International Standard is applicable to the requirements for steel sheet, in coils and cut lengths, metallic-coated by the continuous hot-dip process, with zinc and zinc-iron alloy coatings.

The product is intended for applications requiring corrosion resistance, formability and paintability.

The steel sheet is produced in a number of quality designations and grades, coating mass, surface treatments and coating conditions designed to be compatible with differing application requirements.

This International Standard does not cover steels designated as structural quality, which are covered in ISO 4998 [1].

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the reference documents (including any amendments) applies.

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

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

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

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 7438, *Metallic materials — Bend test*

ISO 16163, *Continuously hot-dipped coated steel sheet products — Dimensional and shape tolerances*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

commercial

intended for general fabricating purposes where sheet is used in the flat condition, or for bending or moderate forming

3.2

drawing

intended for parts where drawing or severe forming may be involved

3.3

deep drawing

intended for parts where severe forming or severe drawing may be involved

3.4

deep drawing aluminum killed

intended for fabricating parts where particularly severe drawing or forming may be involved

3.5

extra deep drawing stabilized

intended for applications where maximum formability is required by applying interstitial free steel

3.6

interstitial free steel (IF)

extra-low-carbon steel in which all interstitial elements are stabilized with titanium and/or equivalent elements

Note 1 to entry: to entry Interstitial free steel is sometimes referred to as stabilized steel.

3.7

ageing

change in steel properties with the passage of time

Note 1 to entry: to entry Ageing may result in a change in yield strength and a corresponding decrease in ductility during storage. Ageing always has a negative effect on formability. The redevelopment of a definite yield point phenomenon as a result of ageing can result in a renewed susceptibility to surface imperfections, such as stretcher strain marks (Lüder's Lines) and fluting when the steel is formed. To avoid these adverse outcomes, it is essential that the period between final processing at the producing mill and fabrication be kept to a minimum. Rotation of stock, by using the oldest material first, is important. Effective roller leveling immediately prior to fabrication can achieve reasonable freedom from stretcher strain marks.

3.8

continuous hot-dip zinc-coated steel sheet

steel sheet product in coils or cut lengths manufactured on a continuous coating line with a hot-dip zinc coating on base metal of cold-reduced or hot-rolled descaled steel

3.9

continuous hot-dip zinc-iron alloy coated steel sheet

steel sheet product obtained by processing continuous hot-dip zinc-coated steel sheet to form a zinc-iron alloy coating

Note 1 to entry: to entry This product, designated ZF is not spangled, is normally dull in appearance and, for some applications, may be suitable for immediate painting without further treatment, except normal cleaning. Zinc-iron alloy coatings may powder during severe forming.

3.10

differential coating

coating deliberately produced to have a different coating mass on each surface

3.11

breakage allowance

agreed upon level of acceptable die breakage not subject to claim

3.12

normal spangle

coating formed as a result of unrestricted growth of zinc crystals during normal solidification

Note 1 to entry: to entry This coating has a metallic lustre and is the type normally furnished for a wide variety of applications. It may be furnished S (normal coating, with skin pass) or N (normal coating, as coated); however, it may be variable in appearance and not suitable for decorative painting.

3.13

smooth finish

smoothness produced by skin-passing the coated material in order to achieve an improved surface condition as compared with the normal as-coated product

3.14**skin pass**

light cold rolling of the product

Note 1 to entry: to entry The purpose of the skin passing is one or more of the following: to minimize the appearance of coil breaks, stretcher strains and fluting; to control the shape; to obtain the required surface finish.

Note 2 to entry: to entry Some increase in hardness and some loss in ductility will result from skin passing.

3.15**lot**

50 t or less of steel sheet of the same grade rolled to the same thickness and coating condition

4 Dimensions

4.1 Zinc-coated and zinc-iron alloy-coated steel sheet is produced in thicknesses from 0,25 mm to 5 mm inclusive after coating, and in widths of 600 mm and over in coils and cut lengths. Zinc-coated and zinc-iron alloy-coated steel sheet less than 600 mm wide, slit from wide sheet, will be considered as sheet.

4.2 The thickness of zinc-coated and zinc-iron alloy-coated steel sheet may be specified as a combination of the base metal and metallic coating, or as the base metal alone. The purchaser shall indicate on the order which method of specifying thickness is required. In the event that the purchaser does not indicate any preference, the thickness as a combination of the base metal and coating will be provided. [Annex A](#) describes the requirements for specifying the thickness of the base metal alone.

5 Conditions of manufacture**5.1 Steelmaking**

Unless otherwise agreed by the interested parties, the processes used in making the steel and in manufacturing zinc-coated and zinc-iron alloy-coated steel sheet are left to the discretion of the manufacturer. On request, the purchaser shall be informed of the steelmaking process being used.

5.2 Chemical composition

The chemical composition (heat analysis) shall conform to the requirements given in [Tables 1](#) and [2](#).

5.3 Chemical analysis**5.3.1 Heat analysis**

An analysis of each heat shall be made by the manufacturer in order to determine compliance with the requirements given in [Tables 1](#) and [2](#). On request, a report of the heat analysis shall be made available to the purchaser or the purchaser's representative. Each of the elements listed in [Tables 1](#) and [2](#) shall be included in the report of the heat analysis. When the amount of copper, nickel, chromium or molybdenum present is less than 0,02 %, the analysis may be reported as "<0,02%".

5.3.2 Product analysis

A product analysis may be made by the purchaser in order to verify the specified analysis of the product and shall take into consideration any normal heterogeneity. The product analysis tolerances shall be in accordance with [Tables 2](#) and [3](#).

Table 1 — Chemical composition (heat analysis)

Mass fractions in percent

| Base-metal quality | | C max. | Mn max. | P max. | S max. | Ti max. |
|--------------------|-------------------------------|-----------|------------|-----------|-----------|------------|
| Designation | Name | | | | | |
| 01 | Commercial | 0,15 | 0,60 | 0,05 | 0,035 | |
| 02 | Drawing | 0,10 | 0,50 | 0,04 | 0,035 | |
| 03 ^a | Deep drawing | 0,08 | 0,45 | 0,03 | 0,03 | |
| 04 ^a | Deep drawing aluminium killed | 0,06 | 0,45 | 0,03 | 0,03 | |
| 05 ^a | Extra deep drawing stabilized | 0,02 | 0,25 | 0,02 | 0,02 | 0,15 |

^a Interstitial free steel may be applied (see 5.4.3)**Table 2 — Limits on additional chemical elements**

Mass fractions in percent

| Element | Cu ^a max. | Ni ^a max. | Cr ^{ab} max. | Mo ^{ab} max. | Nb ^c max. | V ^{cd} max. | Ti ^c max. |
|------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|-------------------------|-------------------------|
| Heat analysis | 0,20 | 0,20 | 0,15 | 0,06 | 0,008 | 0,008 | 0,008 |
| Product analysis | 0,23 | 0,23 | 0,19 | 0,07 | 0,018 | 0,018 | 0,018 |

^a The sum of copper, nickel, chromium and molybdenum shall not exceed 0,50 % on heat analysis. When one or more of these elements are specified, the sum does not apply, in which case, only the individual limits on the remaining elements apply.^b The sum of chromium and molybdenum shall not exceed 0,16 % on heat analysis. When one or more of these elements are specified, the sum does not apply, in which case, only the individual limits on the remaining elements apply.^c For interstitial free steels only, the value of 0,15 % titanium, and 0,10 % maximum for niobium and vanadium are acceptable to ensure that the carbon and nitrogen are fully stabilized.^d Heat analysis greater than 0,008 % may be supplied after agreement between the producer and purchaser.**Table 3 — Product analysis tolerances**

Mass fractions in percent

| Element | Maximum of specified element | Tolerance over maximum specified |
|---------|------------------------------|----------------------------------|
| C | 0,15 | 0,03 |
| Mn | 0,60 | 0,03 |
| P | 0,05 | 0,01 |
| S | 0,035 | 0,01 |

NOTE The above maximum tolerance is the allowable excess over the specified requirement and not the heat analysis.

5.4 Mechanical properties

5.4.1 Ordering conditions

5.4.1.1 Zinc-coated and zinc-iron alloy-coated steel sheet of designations 02, 03, 04 and 05 are supplied under either of the following two ordering conditions:

- a) Ordering condition A): steel sheet mechanical properties shall, at the time the steel is made available for shipment, satisfy the applicable requirements of [Table 4](#), when they are determined on test pieces obtained in accordance with the requirements in [Clause 7](#).