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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*

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ISO 3575:2016

<https://standards.iteh.ai/catalog/standards/sist/e2332052-4cca-413e-83ef-139830c22b49/iso-3575-2016>



Reference number  
ISO 3575:2016(E)

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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](http://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](http://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 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](http://www.iso.org/iso/foreword.html).

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 document 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 designations, coating masses, surface treatments and coating conditions designed to be compatible with differing application requirements.

This document does not cover steels designated as structural quality, which are covered in ISO 4998<sup>[1]</sup>.

## 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 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* <https://standards.iteh.ai/catalog/standards/sist/e2332052-4cca-413e-83ef-139830c22b49/iso-3575-2016>

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.

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>

### 3.1

#### **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 aluminium 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: 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: Ageing can 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 levelling 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: This product, designated ZF, is not spangled, is normally dull in appearance and, for some applications, can be suitable for immediate painting without further treatment, except normal cleaning. Zinc-iron alloy coatings can 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: This coating has a metallic lustre and is the type normally furnished for a wide variety of applications. It can be furnished S (normal coating, with skin pass) or N (normal coating, as coated); however, it can 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: 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: Some increase in hardness and some loss in ductility will result from skin passing.

**3.15****lot**

up to a specified quantity of steel sheet of the same designation rolled to the same thickness and coating condition

**3.16****coating mass**

total amount of coating on both sides of the sheet, expressed in grams per square metre

**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	Mn	P	S	Ti
Designation	Name	max.	max.	max.	max.	max.
01	Commercial	0,15	0,60	0,05	0,035	
02	Drawing	0,10	0,50	0,04	0,035	
03 <sup>a</sup>	Deep drawing	0,08	0,45	0,03	0,03	
04 <sup>a</sup>	Deep drawing aluminium killed	0,06	0,45	0,03	0,03	
05 <sup>a</sup>	Extra deep drawing stabilized	0,02	0,25	0,02	0,02	0,15

<sup>a</sup> Interstitial free steel may be applied (see [5.4.3](#)).

**Table 2 — Limits on additional chemical elements**

Mass fractions in percent

Element	Cu <sup>a</sup> max.	Ni <sup>a</sup> max.	Cr <sup>ab</sup> max.	Mo <sup>ab</sup> max.	Nb <sup>c</sup> max.	V <sup>cd</sup> max.	Ti <sup>c</sup> 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

<sup>a</sup> 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.

<sup>b</sup> 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.

<sup>c</sup> 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.

<sup>d</sup> 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

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](#).
- b) Ordering condition B): steel sheet, ordered to make an identified part, shall be supplied with a commitment for satisfactory manufacturing performance within an established breakage allowance, which shall be previously agreed upon by the interested parties. In the agreement, the part name, the details of fabrication, and special requirements (such as freedom from stretcher strain or fluting) shall be specified.

NOTE In the case of ordering condition B, mechanical properties of the steel sheet can also be agreed upon by the interested parties and such properties cannot necessarily satisfy the requirements of [Table 4](#).

### 5.4.2 Fabrication qualities

Zinc-coated and zinc-iron alloy-coated steel sheet is available in several fabrication qualities as given in [3.1](#) to [3.5](#).

### 5.4.3 Interstitial free steel

Stabilized interstitial free steel (IF Steel) is applicable to orders for designations 03, 04 and 05; provided that the purchaser is informed of the substitution and that related shipping documents reflect the actual material shipped.

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