

ISO/~~FDIS~~ PRF 3575:~~xxxx~~(en)

ISO-/TC-17/SC-12

Secretariat:-JISC

Date: 2025-~~01-23~~02-11

## 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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## 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 document 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)).

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This document was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 12, *Continuous mill flat rolled products*.

This sixth edition cancels and replaces the fifth edition (ISO 3575:2016), which has been technically revised.

The main changes are as follows:

- the terms and definitions have been updated;
- coating mass designations “Z080”, “Z120”, “Z140”, “Z220”, “ZF080” and “ZF120” have been added;

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



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

## 1 Scope

This document specifies 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 steel designated as structural quality, which are covered in ISO 4998<sup>[1], [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*

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 16163:2012, *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:

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

### 3.1 ~~3.1~~ commercial

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

3.2 3.2

**drawing**

base-metal quality intended for parts where drawing or severe forming may be involved

3.3 3.3

**deep drawing**

base-metal quality intended for parts where severe forming or severe drawing may be involved

3.4 3.4

**deep drawing aluminium killed**

base-metal quality intended for fabricating parts where particularly severe drawing or forming may be involved

3.5 3.5

**extra-deep drawing stabilized**

base-metal quality intended for applications where maximum formability is required by applying interstitial-free steel

3.6 3.6

**interstitial-free steel**

**IF steel**

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 3.7

**zinc-coated steel sheet**

product obtained by hot-dip coating of cold-reduced sheet coils or hot-rolled descaled sheet coils on a continuous zinc-coating line

3.8 3.8

**zinc-iron alloy-coated steel sheet**

product obtained by heating after processing the zinc-coated steel sheet so that the coating formed on the base metal is composed of zinc-iron alloys

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.

3.9 3.9

**differential coating**

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

3.10 3.10

**breakage allowance**

agreed upon level of acceptable die breakage not subject to claim

3.11 3.11

**normal coating**

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, no skin pass); however, it can be variable in appearance and not suitable for decorative painting.



**3.12 3.12****minimized spangle**

finish obtained by restricting normal spangle formation during the solidification of the zinc

Note-1-to-entry:- This product can have some lack of uniformity in surface appearance within a coil, or from coil to coil.

**3.13 3.13****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; and to obtain the required surface finish.

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

**3.14 3.14****lot**

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

**3.15 3.15****coating mass**

total amount of coating on both sides of the sheet, expressed in grams per square metre (g/m<sup>2</sup>) of sheet

**4 Dimensions**

**4.1 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, is considered as sheet.

**4.2 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](#), [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](#), [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](#)

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 <sup>a</sup>	Drawing	0,10	0,50	0,04	0,035	—
03 <sup>a</sup>	Deep drawing	0,08	0,45	0,03	0,030	—
04 <sup>a</sup>	Deep drawing aluminium killed	0,06	0,45	0,03	0,030	—
05 <sup>a</sup>	Extra-deep drawing stabilized	0,02	0,25	0,02	0,020	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>	Ni <sup>a</sup>	Cr <sup>a,b</sup>	Mo <sup>a,b</sup>	Nb <sup>c</sup>	V <sup>c,d</sup>	Ti <sup>c</sup>
	max.	max.	max.	max.	max.	max.	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 manufacturer and purchaser.

**Table 3 — Product analysis tolerances for ~~table 1~~ Table 1**

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