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## Continuous hot-dip zinc-coated twin-roll cast steel sheet of commercial quality

*Tôles coulées entre cylindres et galvanisées en continu par immersion à chaud, en acier de qualité commerciale*

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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)).

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

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

This second edition cancels and replaces the first edition (ISO 15208:2012), which has been technically revised.

The main changes are as follows:

- editorial update.

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).

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# Continuous hot-dip zinc-coated twin-roll cast steel sheet of commercial quality

## 1 Scope

This document specifies the requirements for steel sheet, in coils and cut length, metallic-coated by the continuous hot-dip zinc-coated twin-roll cast process of commercial quality.

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

The steel sheet is produced in a number of grades, coating masses, surface treatments and ordering conditions.

## 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, *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 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 commercial quality

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

### 3.2 continuous hot-dip zinc-coated 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

### 3.3

#### **normal spangle**

finish obtained 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 spangle with skin pass) or N (normal spangle, no skin pass), however, it can be variable in appearance and not suitable for decorative paintings.

### 3.4

#### **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.

### 3.5

#### **differential coating**

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

### 3.6

#### **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.

### 3.7

#### **twin-roll cast steel sheet**

steel sheet produced by casting to near final thickness directly from the liquid metal with minimal hot-rolling to achieve the final thickness

### 3.8

#### **lot**

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

### 3.9

#### **coating mass**

total amount of zinc on both surfaces of the sheet, expressed in grams per square meter (g/m<sup>2</sup>) of sheet

## 4 Dimensions

**4.1** Zinc-coated commercial quality twin-roll cast steel sheet is produced in thicknesses up to 2,0 mm, inclusive, after zinc coating, and in widths up to 2 000 mm in coils and cut lengths. Zinc-coated twin-roll cast steel sheet less than 600 mm wide, slit from wide sheet, is considered as sheet.

**4.2** The thickness of zinc-coated twin-roll cast steel sheet may be specified as a combination of the base-metal and metallic coating or base-metal alone. The purchaser shall indicate on the order which method of specifying thickness is required. If the purchaser does not indicate any preference, the thickness as a combination of the base-metal and coating shall be provided. [Annex A](#) describes the requirements for specifying the thickness as 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 steel sheet are left to the discretion of the manufacturer. Upon 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 conformity with the requirements given in [Tables 1](#), [2](#) and [3](#). 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 [Table 2](#) and [3](#).

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**Table 1 — Chemical composition (heat analysis)**

Mass fractions in percent

Base-metal quality		C	Mn	P	S	Si <sup>a</sup>
Designation	Name	max.	max.	max.	max.	
HRA	Commercial	0,15	0,70	0,045	0,035	–

<sup>a</sup> "–" indicates that there is no requirement, but the analysis shall be reported.

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

Mass fractions in percent

Element	Cu	Ni	Cr	Mo	Nb	V	Ti
	max.	max.	max.	max.	max.	max.	max.
Heat analysis	0,50	0,30	0,30	0,15	0,008	0,008	0,008
Product analysis	0,53	0,33	0,34	0,16	0,018	0,018	0,018

**Table 3 — Product analysis tolerances**

Mass fractions in percent

Element	Maximum of specified element	Tolerance over the maximum specified
C	0,15	0,03
Mn	0,70	0,05
P	0,045	0,01

NOTE The above maximum tolerance is the allowable excess over the requirements of the heat analysis specified in [Table 1](#).

Table 3 (continued)

Element	Maximum of specified element	Tolerance over the maximum specified
S	0,035	0,01

NOTE The above maximum tolerance is the allowable excess over the requirements of the heat analysis specified in Table 1.

## 5.4 Mechanical properties

Zinc-coated commercial quality twin-roll cast steel sheet does not have any specified minimum mechanical properties, however, the minimum tensile strength for commercial quality is normally expected to be 270 MPa. When the minimum tensile strength is required, the value of 270 MPa may be specified. All tensile strength values are determined to the nearest 10 MPa.

## 5.5 Coating

### 5.5.1 Coating mass

The coating mass shall conform to the limits for the coating designations shown in Table 4. The interested parties shall agree upon the coating mass of differentially coated products. If a maximum coating mass is required, the manufacturer shall be notified at the time of ordering.

Table 4 — Coating mass (total both sides)

Coating mass designation	Minimum check limit	
	Triple spot test g/m <sup>2</sup>	Single spot test g/m <sup>2</sup>
Z001	no minimum <sup>a</sup>	no minimum <sup>a</sup>
Z100	100	85
Z180	180	150
Z200	200	170
Z275	275	235
Z350	350	300
Z450	450	385
Z600	600	510
Z700	700	585

NOTE 1 Because of the many variables and changing conditions that are characteristic of continuous zinc coating, the coating mass is not always evenly divided between the two surfaces of a zinc-coated sheet; neither is the coating evenly distributed from edge to edge. However, it can normally be expected that not less than 40 % of the single spot check limit will be found on either surface.

NOTE 2 The coating thickness can be estimated from the coating mass using the following relationship:

100 g/m<sup>2</sup> total both sides = 0,014 mm total both sides.

<sup>a</sup> No minimum means that there are no established minimum check limits.

### 5.5.2 Coating adherence

The zinc-coated twin-roll cast steel sheet shall be capable of being bent in any direction, in accordance with the mandrel diameter requirements of Table 5, without flaking of the coating on the outside of the bend. Flaking of the coating within 7 mm from the edge of the test piece shall not be cause for rejection.

Table 5 — Coating adherence

Base-metal quality	180° bend-mandrel diameter	
	mm	
	$e \leq 2$	
	Coating mass designation	
Commercial	Up to Z350	Z450 Z600 Z700
	1a	2a
	e: thickness of steel sheet, in millimetres a: thickness of bend test piece, in millimetres	

## 5.6 Weldability

This product is normally suitable for welding, if appropriate welding methods and procedure are used, with special attention to the heavier coatings.

## 5.7 Painting

Continuous hot-dip zinc-coated steel sheet is a suitable base for paint but the first treatment may be different from those used on uncoated steel. Pre-treatment primers, chemical conversion coatings (chromate, phosphate or oxide type) and some paints specially formulated for direct application to zinc surfaces are all appropriate first treatments for hot-dip zinc-coated sheet. In drawing up a painting schedule, consideration shall be given to whether the hot-dip zinc-coated sheet shall be ordered in the passivated or not passivated state.

NOTE Surfaces with certain passivation treatments (e.g. chromated) are not suitable for phosphating or the application of a pre-treatment (etch) primer.

## 5.8 Surface treatment

### 5.8.1 Mill passivation

A chemical treatment is normally applied to zinc coatings to minimize the hazard of wet storage stain (white rust) during shipment and storage. However, the inhibiting characteristics of the treatment are limited, and if a shipment is received wet, the material shall be used immediately or dried.

### 5.8.2 Mill phosphating

Zinc-coated twin-roll cast steel sheet may be processed chemically at the manufacturer's works to prepare all types of coatings for painting without further treatment, except normal cleaning.

### 5.8.3 Oiling

When specified, the zinc-coated twin-roll cast steel sheet as produced shall be oiled to prevent marring and scratching of the soft surface during handling or shipping and to minimize wet storage stain.

NOTE When the zinc-coated twin-roll cast steel sheet has received a passivating treatment, oiling further minimizes the hazard of wet storage stain.