
**Continuous hot-dip zinc-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*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 3575:2005](#)

[https://standards.iteh.ai/catalog/standards/sist/600473e5-0e74-4942-a694-
b345ceb26cae/iso-3575-2005](https://standards.iteh.ai/catalog/standards/sist/600473e5-0e74-4942-a694-b345ceb26cae/iso-3575-2005)



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 3575:2005](#)

<https://standards.iteh.ai/catalog/standards/sist/600473e5-0e74-4942-a694-b345ceb26cae/iso-3575-2005>

© ISO 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 3575 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 12, *Continuous mill flat rolled products*.

This third edition cancels and replaces the second edition (ISO 3575:1996), which has been technically revised.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/600473e5-0e74-4942-a694-b345ceb26cae/iso-3575-2005>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 3575:2005

<https://standards.iteh.ai/catalog/standards/sist/600473e5-0e74-4942-a694-b345ceb26cae/iso-3575-2005>

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

1 Scope

1.1 This International Standard applies to carbon steel sheet of commercial and drawing qualities coated by the continuous hot-dip zinc-coating process.

1.2 Zinc-coated sheet is suitable for applications where resistance to corrosion is of prime importance.

1.3 The steel sheet is produced in a number of qualities, coating mass, surface treatments, and ordering conditions.

1.4 Zinc-coated 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 sheet less than 600 mm wide, slit from wide sheet, will be considered as sheet.

1.5 The thickness of hot-dip zinc-coated and zinc-iron alloy sheet steel 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 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.

1.6 Zinc and zinc-iron alloy coated steel sheet may be ordered in one of two ordering conditions:

a) Condition A): steel ordered to satisfy mechanical property requirements.

b) Condition B): steel ordered to make an identified part.

1.7 Zinc-coated steel sheet is available in several fabrication qualities.

— Commercial: intended for general fabrication purposes where sheet is used in the flat or for bending or moderate forming.

— Drawing: intended for fabricating parts where drawing or severe forming may be involved.

— Deep drawing-aluminium killed (non-aging): intended for fabricating parts where particularly severe drawing or forming may be involved or essential freedom from aging is required.

— Extra deep drawing (stabilized interstitial free): intended for applications requiring interstitial free steel (IF) which is non-aging and has maximum formability.

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

2 Normative references

The following referenced documents are indispensable for the application 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 1460:1992, *Metallic coatings — Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area*

ISO 2178:1982, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method*

ISO 3497:1990, *Metallic coatings — Measurement of coating thickness — X-ray spectrometric methods*

ISO 6892:1998, *Metallic materials — Tensile testing at ambient temperature*

ISO 7438:1985, *Metallic materials — Bend test*

ISO 16160:2000, *Continuously hot-rolled steel sheet products — Dimensional and shape tolerances*

ISO 16162:2000, *Continuously cold-rolled steel sheet products — Dimensional and shape tolerances*

ISO 16163:2000, *Continuously hot-dipped coated steel sheet products — Dimensional and shape tolerances*

3 Terms and definitions

iTeh STANDARD PREVIEW
(standards.iteh.ai)

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

3.1
continuous hot-dip zinc-coated steel sheet
product obtained by hot-dip zinc coating cold-reduced sheet coils or hot-rolled descaled sheet coils on a continuous zinc-coating line to produce either zinc-coated coils or zinc-coated cut lengths

3.2
breakage allowance
agreed upon level of acceptable die breakage not subject to claim

3.3
normal spangle
coating formed as a result of unrestricted growth of zinc crystals during normal solidification

NOTE 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.

3.4
minimized spangle
coating obtained by restricting normal spangle formation during the solidification of the zinc

NOTE This product may have some lack of uniformity in surface appearance within a coil or from coil to coil.

3.5
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

3.6**zinc-iron alloy coating**

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

NOTE 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.

3.7**skin pass**

light cold-rolling of the zinc-coated steel sheet

NOTE The purpose of the skin pass is to produce a higher degree of surface smoothness and thereby improve the surface appearance. The skin pass also temporarily minimizes the occurrence of a surface condition known as stretcher strain (Luder's Lines) or fluting during the fabrication of finished parts. The skin pass also controls and improves flatness. Some increase in hardness and loss of ductility will result from skin passing.

3.8**differential coating**

coating having a coating mass on one surface significantly different from the coating mass on the other surface

4 Requirements**4.1 Chemical composition**

The chemical composition (heat analysis) shall not exceed the values given in Tables 1 and 2. On request, a report of the heat analysis shall be made to the purchaser.

A verification analysis (product analysis) may be made by the purchaser to verify the specified analysis of the semi-finished or finished steel and shall take into consideration any normal heterogeneity. Non-killed steels, such as rimmed or capped, are not technologically suited for verification analysis. The product analysis tolerances are shown in Table 3.

The processes used in making the steel and in manufacturing zinc-coated sheet are left to the discretion of the manufacturer. When requested, the purchaser shall be informed of the steelmaking process being used.

On request, a report of the heat analysis shall be made to the purchaser.

Table 1 — Chemical composition (heat analysis), %

Base-metal quality		C	Mn	P	S	Ti
Designation	Name	max.	max.	max.	max.	max.
01	Commercial	0,15	0,60	0,05	0,05	
02	Drawing	0,12	0,50	0,04	0,04	
03 ^a	Deep drawing	0,10	0,45	0,03	0,03	
04 ^a	Deep drawing special killed	0,08	0,45	0,03	0,03	
05 ^a	Extra deep drawing stabilized	0,02	0,25	0,02	0,02	0,15

^a For interstitial free steels only, the values of 0,15 % titanium, and 0,10 % maximum for niobium and vanadium are acceptable to ensure that the carbon and nitrogen are fully stabilized.

Table 2 — Limits on additional chemical elements, %

Element	Cu ^a max.	Ni ^a max.	Cr ^{a, b} max.	Mo ^{a, b} max.	Nb ^c max.	V ^{c, d} 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

NOTE Each of the elements listed in this table 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 %.

^a The sum of copper, nickel, chromium and molybdenum shall not exceed 0,50 % on the 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, %

Element	Maximum of specified element	Tolerance over maximum specified
C	0,25	0,04
Mn	1,70	0,14
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.

4.2 Mechanical properties

Zinc-coated sheet of designations 01, 02, 03, 04 and 05 are supplied under the following two ordering conditions:

- a) Ordering condition A). Steel when ordered to mechanical properties shall, at the time the steel is made available for shipment, satisfy the applicable requirements of Table 4.
- b) Ordering condition B). Steel when ordered to make an identified part shall be supplied with a commitment for satisfactory manufacturing performance within a proper breakage allowance, which shall be previously agreed upon by the interested parties. In these cases, the part name, the details of fabrication, and special requirements (such as freedom from stretcher strain or fluting) shall be specified.

NOTE Prolonged storage of the sheet can cause a change in mechanical properties (increase in hardness and decrease in elongation), leading to a decrease in drawability. To minimize this effect, quality 03, 04 and 05 should be specified.

Table 4 — Mechanical properties

Base-metal quality ^a		R_e max. ^b N/mm ² ^e	R_m max. ^c N/mm ²	A min ^d		
Designation	Name			$L_o = 80$ mm	$L_o = 50$ mm	$L_o = 5,65\sqrt{S_o}$ ^f
01	Commercial	—	—	—	—	—
02	Drawing	300 ^g	430	24	23	22
03	Deep drawing	260	410	26	25	24
04	Deep drawing special killed	220	410	29	28	27
05	Extra deep drawing stabilized	200	350	37	36	35

R_e = yield stress
 R_m = tensile strength
 A = percent elongation after fracture
 L_o = gauge length on test piece
 S_o = original cross-sectional area of gauge length

NOTE 1 Time period from date of shipment for values stated in this table to be applicable.

Designation	Time period
01	—
02	8 days
03	1 month
04	6 months
05	6 months

NOTE 2 For products produced according to performance criteria 4.2, the typical mechanical properties presented here are non-mandatory. For products specified according to mechanical properties, the purchaser may negotiate with the supplier if a specific range, or a more restrictive range, is required for the application, therefore, by agreement, these values may be specified.

NOTE 3 These typical mechanical properties apply to the full range of steel sheet thicknesses. The yield tends to increase and some of the formability aspects tend to decrease as the sheet thickness decreases.

^a All qualities are available with a minimized spangle zinc coating.
^b The yield values apply to 0,2 % proof stress if the yield point is not pronounced, otherwise to the lower yield point (R_{eL}).
^c Minimum tensile strength for qualities 02, 03, 04 and 05 would normally be expected to be 270 N/mm². All tensile strength values are determined to the nearest 10 N/mm².
^d For material up to and including 0,6 mm in thickness, the elongation values in the table shall be reduced by 2.
^e 1 N/mm² = 1 MPa.
^f May be used for material over 3 mm in thickness.
^g This value applies to skin-passed products only.

4.3 Coating

4.3.1 Coating mass

The coating mass limits shall conform to the limits for the designations shown in Table 5. The coating mass is the total amount of coating on both sides of the sheet, expressed in grams per square metre. The coating mass of differentially coated product shall be agreed upon by the interested parties. If a maximum coating mass is required, the manufacturer shall be notified at the time of ordering.

Table 5 — Coating mass (total both sides)

Coating designation	Minimum check limit	
	Triple-spot test g/m ² (of sheet)	Single-spot test g/m ² (of sheet)
Z001	No minimum ^a	No minimum ^a
Z100	100	85
Z180	180	150
Z200	200	170
Z275	275	235
Z350	350	300
Z450	450	385
Z600	600	510
Z700	700	595
ZF001	No minimum	No minimum
ZF100	100	85
ZF180	180	150

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 zinc 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 The coating thickness may be estimated from the coating mass by using the following relationship:
 100 g/m² total both sides = 0,014 mm total both sides.

^a "No minimum" means that there are no established minimum check limits for triple- and single-spot tests.

[ISO 3575:2005](https://standards.iteh.ai/catalog/standards/sist/600473e5-0e74-4942-a694-b345ceb26cae/iso-3575-2005)

<https://standards.iteh.ai/catalog/standards/sist/600473e5-0e74-4942-a694-b345ceb26cae/iso-3575-2005>

4.3.2 Coating adherence

The zinc-coated sheet shall be capable of being bent in any direction, in accordance with the mandrel diameter requirements of Table 6, 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 a cause for rejection. The bend test requirements of Table 6 do not apply to zinc-iron alloy coating.

Table 6 — Coating adherence — Bend test mandrel diameter

Base-metal quality	Coated metal –180° bend mandrel diameter mm								
	Coating designation								
	<i>e</i> < 3 mm				<i>e</i> ≥ 3 mm				
	up to Z275	Z300 Z350	Z450 Z600	Z700	up to Z275	Z300 Z350	Z450	Z600	Z700
Commercial	1 _a	1 _a	2 _a	3 _a	2 _a	2 _a	2 _a	3 _a	4 _a
Drawing	0	1 _a	2 _a	2 _a	0	1 _a	2 _a	2 _a	2 _a
Deep drawing	0	1 _a	2 _a	2 _a	0	1 _a	2 _a	2 _a	2 _a
Deep drawing special killed	0	1 _a	2 _a	2 _a	0	1 _a	2 _a	2 _a	2 _a
Extra deep drawing stabilized	0	1 _a	2 _a	2 _a	0	1 _a	2 _a	2 _a	2 _a

a = bend mandrel diameter = *e*

e = thickness of steel sheet, in millimetres

4.4 Weldability

The product is suitable for welding if appropriate welding methods and procedures are used with special attention to the heavier coatings. Zinc-iron alloyed coatings (ZF) are usually more suitable than other coatings (Z) for resistance welding.

4.5 Painting

Hot-dip zinc-coated steel sheet is a suitable base for paint, but the first treatment may be different from those used on mild 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 passivated or not passivated.

4.6 Surface treatment

4.6.1 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. This treatment is not usually applied to zinc-iron alloyed coatings because it interferes with the adhesion of most paints.

4.6.2 Mill phosphating

Zinc-coated 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.

4.6.3 Oiling

The zinc-coated steel sheet as produced may be oiled to prevent marring and scratching of the soft surface during handling or shipping and to minimize wet storage stain. When the zinc-coated sheet has received a passivating treatment, oiling will further minimize the hazard of wet-storage stain.

4.7 Coated coil joining

Continuous coil coating lines use various methods to join coil ends. These methods include lap welding, butt welding, and stitching. The shipment of coils containing the joined coil ends shall be permitted if agreed upon between the manufacturer and purchaser.

4.8 Dimensional and shape tolerances

4.8.1 Dimensional tolerances applicable to zinc-coated steel sheet shall be as given in ISO 16163. The tolerances for thickness apply to products whose thickness is a combination of base metal and coating thickness.

4.8.2 When the base metal thickness is specified, the thickness tolerances of Tables 6, 7 and 8 of ISO 16163:2000 shall apply to the average product thickness as calculated in accordance with Annex A. The tolerances for thickness of the base metal shall be as given in ISO 16160 for hot-rolled steel, and ISO 16162 for cold-rolled steel.

5 Sampling

5.1 Chemical composition

Each heat shall be tested by the manufacturer to determine compliance with the requirements of Tables 1 and 2.