INTERNATIONAL STANDARD

ISO 5002

Fourth edition
2013-11-15

Hot-rolled and cold-reduced electrolytic zinc-coated carbon steel sheet of commercial and drawing qualities

Tôles en acier au carbone laminées à chaud et à froid, revêtues par zingage électrolytique (tôles électro-zinguées) de qualité commerciale et pour emboutissage

Reference number
ISO 5002:2013(E)

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Published in Switzerland

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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. www.iso.org/directives

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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

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: http://www.iso.org/iso/home/standards_development/resources-for-technical-work/foreword.htm

This fourth edition cancels and replaces the third edition (ISO 5002:2008), of which it constitutes a minor revision.

Hot-rolled and cold-reduced electrolytic zinc-coated carbon steel sheet of commercial and drawing qualities

1 Scope

This International Standard specifies the characteristics of carbon steel sheet of commercial and drawing qualities in cut length or coil form, zinc coated by electrolytic deposition. Electrolytic zinc-coated sheet is intended for the manufacture of formed or of miscellaneous parts, and can be supplied chemically treated to render it more suitable for painting. The zinc coating is expressed in micrometres of thickness per side, for equally coated, differentially coated, or one-side-coated sheets. These sheets are generally produced with coatings, which are not intended to withstand outdoor exposure without chemical treatment and painting. Electrolytic zinc-coated sheet can be produced in thicknesses of 0,36 mm and thicker (normally up to 4,0 mm) and in widths of 600 mm and over in coils or cut lengths. It is recognized that materials thinner than 0,36 mm or thicker than 4,0 mm can be suitable for electrolytic zinc coating, and, if required, be the subject of agreement between the interested parties.

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 referenced document (including any amendments) applies.

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

ISO 7438, *Metallic materials — Bend test*

ISO 16160, *Hot-rolled steel sheet products — Dimensional and shape tolerances*

ISO 16162, *Cold-rolled 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
electrolytic zinc-coated steel sheet
product obtained by electrolytic deposition of a zinc coating on steel sheet on a zinc coating line to produce either electrolytic zinc-coated coils or electrolytic zinc-coated cut lengths

3.2
skin pass
light cold rolling of hot-rolled descaled sheet or of the cold-reduced and annealed steel sheet prior to zinc coating

Note 1 to entry: 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 (Luders 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.

3.3
stabilized interstitial free steel
extra low carbon steel in which all interstitial elements are combined with titanium and/or equivalent elements

3.4
grade substitution
interstitial free steel (IF steel) may be applied on orders specifying CR4

Note 1 to entry: Deep drawing special killed, provided that the customer is informed of the substitution and related shipping documents reflecting the actual material shipped.

3.5
lot
50 t or less of sheet of the same designation rolled to the same thickness and condition

4 Dimensions

4.1 The thickness of zinc-coated sheet can be specified as a combination of the base metal and metallic coating, or as the base metal alone. The purchaser indicates 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 requirement for specifying the thickness as base metal alone.

4.2 Electrolytic zinc-coated sheet less than 600 mm wide can be slit from wide sheet and will be considered as sheet.

5 Conditions of manufacture

5.1 Steelmaking

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

5.2 Chemical composition

The chemical composition (heat analysis) shall not exceed the values given in Tables 1, 2, and 3.

Table 1 — Chemical composition (heat analysis) for hot-rolled electrolytic zinc-coated carbon steel sheet

Mass fractions in percent

Quality		C max.	Mn max.	P max.	S max.
Designation	Name				
HR1	commercial	0,12	0,60	0,045	0,035
HR2	drawing	0,10	0,45	0,035	0,035
HR3	deep drawing	0,08	0,40	0,030	0,030
HR4	deep drawing aluminium killed	0,08	0,35	0,025	0,030

Table 2 — Chemical composition (heat analysis) for cold-rolled electrolytic zinc-coated carbon steel sheet

Mass fractions in percent

Quality		C max.	Mn max.	P max.	S max.	Ti[a] max.
Designation	**Name**					
CR1	commercial	0,15	0,60	0,050	0,035	—
CR2	drawing[c]	0,10	0,50	0,040	0,035	—
CR3	deep drawing[c]	0,08	0,45	0,030	0,03	—
CR4	deep drawing aluminium killed[c] (non-ageing)	0,06	0,45	0,030	0,03	—
CR5	extra deep drawing[b] (stabilized interstitial free)	0,02	0,25	0,020	0,02	0,15

a Titanium may be replaced totally or partially by niobium or vanadium. Carbon and nitrogen shall be completely stabilized.

b By agreement, the manganese, phosphorus, and sulfur maximums may be adjusted.

c If IF steel is to be applied to CR1 or CR4 orders, the values of 0,15 % maximum Ti and 0,10 % maximum Nb and V are acceptable to ensure that carbon and nitrogen are fully stabilized.

5.3 Chemical analysis

5.3.1 Heat analysis

An analysis of each heat of steel shall be made by the manufacturer in order to determine compliance with the requirements given in Tables 1, 2 and 3. On request, at the time of ordering, this analysis shall be reported to the purchaser or his representative. Each of the elements listed in Tables 1 and 2 shall be included in the report of the heat analysis. If one or more of the elements in Table 3 is/are specified, the analysis shall be reported.

5.3.2 Product analysis

A 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. The sampling method and deviation limits shall be agreed upon between the manufacturer and the purchaser at the time of ordering. The product analysis tolerances shall be in accordance with Table 3 and Table 4.

Table 3 — Limits on additional chemical elements

Mass fractions in percent

Elements	Heat analysis max.	Product analysis max.
Cu[a]	0,20	0,23
Ni[a]	0,20	0,23
Cr[a,b]	0,15	0,19
Mo[a,b]	0,06	0,07
Nb[c,d]	0,008	0,018
V[c,d]	0,008	0,018
Ti[c,d]	0,008	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 will 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 will apply.

c An analysis greater than 0,008 % may be supplied after agreement between the producer and the consumer.

d For IF steel, only the values of 0,15 % maximum Ti and 0,010 % maximum for Nb and V are acceptable to ensure that carbon and nitrogen are fully stabilized.

Table 4 — 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
Ti	0,15	0,01

NOTE The maximum tolerance in this table is the allowable excess over the specified requirements and not the heat analysis.

5.4 Coating

5.4.1 Coating mass

The amount of coating is expressed in micrometres of thickness per surface of sheet and shall conform to the requirements of minimum thickness given in Table 5.

5.4.2 Coating adherence

The zinc-coated sheet shall be capable of being bent in any direction, in accordance with the mandrel diameter requirements for the quality designations included in Table 6.

Table 5 — Zinc coatings for electrolytic zinc-coated hot-rolled and cold-reduced steel sheet

Coating designation[a]	Nominal thickness per surface µm	Minimum thickness per surface µm	Nominal coating mass per surface[b] g/m^2
ZE 04	0,4	0,4	3
ZE 10	1,0	0,9	7
ZE 14	1,4	1,2	10
ZE 25	2,5	2,2	18
ZE 28	2,8	2,4	20
ZE 38	3,8	3,4	27
ZE 42	4,2	3,6	30
ZE 50	5,0	4,5	36
ZE 56	5,6	4,8	40
ZE 70	7,0	6,0	50
ZE 75	7,5	6,8	54
ZE 100	10,1	9,1	75
ZE 135	13,5	12,2	96
ZE 150	15,0	13,5	107

NOTE The density of zinc used is 7 100 kg/m^3.

a Equally coated material should be designated as ZE 10/10, for example. Differentially coated material should be designated as ZE 50/10, for example. Single-surface-coated material should be designated as ZE 38/0, for example.

b This is for information only.

Table 6 — Coating bend test requirements for electrolytic zinc-coated hot-rolled and cold-reduced steel sheet

Designation	180° bend mandrel diameter	
	$e < 3$	$e \geq 3$
HR1, HR2, HR3, HR4	0	1,0a
CR1, CR2, CR3, CR4, CR5	0	0

NOTE 1 e is the thickness of the sheet in millimetres.

NOTE 2 a is the thickness of bend test piece.

5.5 Fabrication qualities

5.5.1 Commercial quality electrolytic zinc-coated sheet (HR1 or CR1) is intended for general fabricating purposes where sheet is used in the flat state or for bending or moderate forming.

5.5.2 Drawing quality electrolytic zinc-coated sheet (HR2, HR3, and HR4 or CR2, CR3, CR4, and CR5) is intended for drawing or severe forming. It is furnished according to all requirements of this International Standard or by agreement when ordered to fabricate an identified part, in which case the mechanical properties of Table 4 (for hot-rolled steel sheet) and Table 5 (for cold-reduced steel sheet) do not apply.

Drawing qualities are identified as follows:

— HR2/CR2 (drawing quality);

— HR3/CR3 (deep drawing quality);

— HR4/CR4 [deep drawing quality aluminium killed (see 5.9)];

— CR5 [extra deep drawing quality (stabilized interstitial free)].

5.6 Weldability

The product is suitable for welding if appropriate conditions are selected.

5.7 Application

It is desirable that electrolytic zinc-coated steel sheet be identified for fabrication by the name of the part or by the intended application. Steel sheet of drawing qualities HR2, HR3, and HR4 and CR2, CR3, CR4, and CR5 may be produced to make an identified part within a properly established breakage allowance, which shall be previously agreed upon between the interested parties. In this case, the part name, the details of fabrication, and special requirements (i.e. exposed or unexposed, freedom from stretcher strains or fluting, and coating performance requirements) shall be specified, and the mechanical properties of Table 7 or 8 do not apply.

5.8 Mechanical properties

Except when ordered according to an identified part as explained in 5.6, at the time that the steel is made available for shipment, the mechanical properties shall be as stated in Table 7 or 8 when they are determined on test pieces obtained according to the requirements of Clause 7. Prolonged storage of the sheet can cause a change in mechanical properties, leading to a decrease in drawability. To minimize this effect, quality CR4 or CR5 should be specified. The properties in Table 8 are after skin passing.

Table 7 — Mechanical property requirements for hot-rolled electrolytic zinc-coated carbon steel sheet

Base metal quality		R_m[a] max. MPa	A[b] min. % Material thickness mm[b]			
			$e < 3$		$3 \le e \le 6$	
Designation	Name		$L_o = 80$ mm	$L_o = 50$ mm	$L_o = 5{,}65\sqrt{S_o}$	$L_o = 50$ mm
HR1	commercial	440	23	24	28	29
HR2	drawing	420	25	26	30	31
HR3	deep drawing	400	28	29	33	34
HR4	deep drawing aluminium killed	380	31	32	36	37

R_m tensile strength

A percent elongation after fracture

L_o gauge length of original test piece

S_o original cross-sectional area of gauge length

e thickness of steel sheet in millimetres

1 MPa = 1 N/mm^2

a The minimum tensile strength for quality HR2, HR3, and HR4 would normally be expected to be 270 N/mm^2. All tensile strength values are determined to the nearest 10 MPa.

b The non-proportional test piece with a fixed gauge length (50 mm), up to 6-mm-thick sheet, can be used in conjunction with a conversion table. In case of dispute, however, only the results obtained on a proportional test piece will be valid for material 3 mm and over in thickness.

Table 8 — Mechanical property requirements[a] for cold-reduced electrolytic zinc-coated carbon steel sheet

Quality		R_e[a] max. MPa	R_m max. MPa	A[b] min. %			
Designation	Name			L_o = 80 mm	L_o = 50 mm	$\bar{r}$ [c,d,e,g]	$\bar{n}$ [c,d,f,g]
CR1	commercial[h]	280	410	27 (<0,6 mm) 28 (≥0,6 mm)	28	—	—
CR2	drawing	240	370	33 (<0,6 mm) 34(≥0,6 mm)	31	—	—
CR3	deep drawing	220	350	35 (<0,6 mm) 36 (≥0,6 mm)	35	1,3 min.	0,16 min.
CR4	deep drawing aluminium killed (non-ageing)	210	350	37 (<0,6 mm) 38 (≥0,6 mm)	37	1,4 min.	0,19 min.
CR5	extra deep drawing (stabilized interstitial free)	190	350	39 (<0,6 mm) 40 (≥0,6 mm)	38	1,7 min.	0,22 min.

R_e yield strength

R_m tensile strength

A percent elongation after fracture

L_o gauge length of original test piece

r plastic strain ratio

n tensile strain hardening exponent

1 MPa = 1N/mm^2

a The minimum tensile strength for qualities CR2, CR3, and CR4 would normally be expected to be 270 MPa. All tensile strength values are determined to the nearest 10 MPa. For designing purposes, the lower limit for R_e may be assumed to be 140 MPa for grades CR1, CR2, CR3, and CR4, and 120 MPa for grade CR5.

b For material up to and including 0,6 mm in thickness, the elongation values in this table shall be reduced by 1.

c r and n values are only applicable to thicknesses ≥ 0,5 mm. For thicknesses >2,0 mm, the r value is reduced by 0,2.

d r can also be written as r-bar and n can also be written as n-bar.

e r is an index of the drawability of the product.

f n is an index of the stretchability of the product.

g For grades CR3, CR4, and CR5, r-bar and n-bar values may be modified or excluded from this specification by the agreement between the producer and the purchaser.

h Mechanical properties are not generally done on commercial quality products and the values in this table are for information only.

5.9 Strain ageing

Electrolytic zinc-coated steel sheet (except CR4 and CR5) tends to strain age and this may lead to the following:

a) surface marking from stretcher strains or fluting when the steel is formed;

b) deterioration in ductility.

Cold-reduced electrolytic zinc-coated carbon steel sheet of quality CR4 supplied in the skin-passed condition may be subject to strain ageing under certain conditions.

Strain ageing can be caused by either carbon or nitrogen atoms, which exist in a supersaturated solid solution and diffuse to dislocation sites with time and temperature. The addition of aluminium in sufficient quantities causes the removal of nitrogen from solid solution as particles of aluminium nitride. This practice tends to minimize room temperature ageing due to nitrogen and results in the general understanding that cold-rolled aluminium killed steel is free of ageing concerns generally associated with CR4. However, carbon, which is usually not retained in solid solution with the slow cooling typical of batch annealing, can be retained in solid solution during the continuous annealing process. If the annealing process and steel chemistry are not properly controlled, material with carbon remaining in solid solution after continuous annealing may result and such material will strain age at room temperature and the problems noted above can occur. Chemical stabilization, as with CR5, prevents this problem, as does proper processing with CR4 material.

Because of these factors, it is essential that the period between final processing at the mill and fabrication be kept to a minimum. Rotation of stock, by using the oldest material first, is important. Stocking of such steels for extended periods of time should be avoided.

For skin-passed sheet, effective roller leveling immediately prior to fabrication at the manufacturer's plant can achieve reasonable freedom from stretcher strain. Freedom from stretcher strain for a period of 6 months can be achieved by the supply of skin-passed non-ageing steel. Grade CR4 or CR5 should be specified in such cases where Luders lines are not acceptable and where roller leveling is not possible.

5.10 Surface treatment of electrolytic zinc-coated products

5.10.1 General

The requirements for solutions used in surface treatments for paint preparation, surface passivation, or both should be agreed upon between the interested parties at the time of ordering, taking into consideration the user's paint schedule and paint systems.

5.10.2 Surface preparation for painting

Electrolytic zinc-coated steel sheet may be processed chemically (such as phosphating or other suitable methods) at the manufacturer's mill to prepare the sheet for painting without further treatment, except normal cleaning, if required.

5.10.3 Mill passivation

A chemical treatment is normally applied to zinc coating to minimize the hazard of wet storage stain (white rust) during shipment and storage. The type of chemical treatment may be agreed upon between the manufacturer and the purchaser. However, the inhibiting characteristics of the treatment are limited and, if the material becomes wet during shipment or storage, the material should be used immediately or dried.

5.11 Oiling

The electrolytic zinc-coated steel sheet as produced may be oiled to minimize wet storage stain. When the zinc-coated sheet has received a passivating treatment, oiling will minimize further the hazard of wet storage stain. Removal of the oil may create difficulties (such as staining) if an unsuitable cleaning solution is used.

5.12 Painting

Electrolytic zinc-coated steel sheet is a suitable base for paint but the first treatments may be different from those used on mild steel. Pretreatment primers, chemical conversion coatings, and some paint specially formulated for direct application to zinc surfaces are all appropriate first treatments for electrolytic zinc-coated sheet (see 5.10).

6 Dimensional and shape tolerances

Dimensional and shape tolerances applicable to hot-rolled electrolytic zinc-coated carbon steel sheet of commercial and drawing qualities shall be as given in ISO 16160. Dimensional and shape tolerances applicable to cold-reduced zinc-coated carbon steel sheet of commercial and drawing qualities shall be as given in ISO 16162.

7 Sampling

7.1 Tensile sampling

When ordered according to mechanical properties, a representative sample for the tensile property test required in Tables 6 and 7 shall be taken from each lot of sheet for shipment.

7.2 Coating tests

7.2.1 Coating mass

The producer shall develop a testing plan with a frequency sufficient to adequately characterize the lot of material and ensure conformance with specification requirements.

7.2.2 Coating adherence

One representative sample for the coating adherence bend test shall be taken from each lot of sheet for shipment. The specimens for the coated bend test shall not be taken closer than 25 mm from a side edge. The minimum width for the test specimen shall not be less than 50 mm.

8 Test methods

8.1 Tensile test

The tensile test shall be carried out in accordance with ISO 6892-1. Transverse test pieces shall be taken midway between the centre and edge of the sheet as rolled. The base metal thickness shall be used to calculate the cross-sectional area needed for the tensile test; however, for orders specifying the thickness "as base metal only", there are two permissible methods for determining the base metal thickness.

a) Option A: Determine the actual base metal thickness by direct measurement of the substrate of a specimen whose coating has been removed.

b) Option B: Calculate the base metal thickness by subtraction of the average coating thickness for the appropriate coating designation included in Annex A from the actual coated thickness of the test specimen.

8.2 Coating tests

8.2.1 Coating mass

8.2.1.1 The purchaser may conduct verification tests by securing a sample piece approximately 300 mm in length by the as-coated width, and cutting three test specimens, one from the mid-width position and one from each side, not closer than 25 mm to the side edge. The minimum area of the three specimens shall be 1 200 mm^2.

8.2.1.2 The coating mass shall be the minimum coating mass found on any one of the three specimens taken in accordance with 8.2.1.1. The zinc coating mass may be determined by any of the recognized and acceptable analytical methods.

8.2.1.3 When the purchaser wishes to relate the thickness of coating to the mass of coating, the spot test procedure may be used.

The spot test result shall be the lowest coating mass found on any of the three specimens taken in accordance with 7.2. The zinc coating mass may be determined by any of the recognized and acceptable analytical methods.

8.2.2 Coating adherence

The bend test shall be conducted in accordance with the methods specified in ISO 7438. The bend test may be substituted for another type of test by agreement between the purchaser and the manufacturer. The acceptance criterion for the bend test is no flaking of the coating.

9 Retests

If a test does not give the required results, two additional tests shall be taken at random from the same lot. Both retests shall conform to the requirements of this International Standard; otherwise, the lot may be rejected.

10 Resubmission

The manufacturer may resubmit, for acceptance, the products that have been rejected during earlier inspection because of unsatisfactory properties, after it has subjected them to a suitable treatment, which, on request, will be indicated to the purchaser. In this case, the tests should be carried out as if they applied to a new batch.

The manufacturer has the right to present the rejected products for a new examination for compliance with the requirements for another grade.

11 Workmanship

The electrolytic zinc-coated steel sheet in cut lengths shall be free from any laminations, surface flaws, and other imperfections that are detrimental to subsequent appropriate processing. Processing for shipment in coils does not afford the manufacturer the opportunity to readily observe or to remove defective portions as can be carried out on the cut-length product.

12 Inspection and acceptance

While not usually required for products covered by this International Standard, when the purchaser specifies that inspection and tests for acceptance be observed prior to the shipment from the manufacturer's works, the manufacturer shall provide the purchaser's inspector with all reasonable facilities to determine that the steel is being furnished in accordance with this International Standard.

Steel that is reported to be defective after arrival at the user's works shall be set aside, properly and correctly identified, and adequately protected. The supplier shall be notified in order that it may properly investigate.

13 Coil size

When zinc-coated steel is ordered in coils, a minimum or range of acceptable inside diameters (ID) shall be specified. In addition, the maximum outside diameter (OD) and maximum acceptable coil mass shall be specified.

14 Marking

14.1 Unless otherwise stated, the following minimum requirements for identifying the steel shall be legibly stenciled on the top of each lift, or shown on a tag attached to each coil or shipping unit:

a) the manufacturer's name or identifying brand;

b) the number of this International Standard, i.e. ISO 5002:2013;

c) the quality designation number;

d) the coating designation number;

e) the order number;

f) the product dimensions;

g) the lot number;

h) the mass;

i) the surface treatment.

14.2 In the case of differential coatings, the coating thicknesses shall be marked as follows:

a) for cut lengths, the coating designation on the upper surfaces of a sheet of these piled over the coating designation of the lower surfaces;

b) for coils, the coating designation on the outer surface of a coil over the coating designation on the inner surface;

c) in cases where a mark expressing differential coating is required on a cut length or coil, the symbol D shall be suffixed to the symbol of the minimum coating mass on the marked surface.

EXAMPLE ZE 38/25D

NOTE See Clause 15.

15 Designation

The electrolytic zinc-coated material is designated as HR (for hot-rolled), followed by the numbers 1, 2, 3, or 4, and CR (for cold-reduced), followed by the numbers 1, 2, 3, 4, or 5, which are common to other International Standards, indicating the qualities of commercial, drawing, deep drawing, deep drawing aluminium killed (non-ageing), and extra deep drawing (stabilized interstitial free). The letters ZE are used to designate the electrolytic zinc-coated product. The coating thickness designation follows the ZE, as indicated in Table 5. Superimposed numbers are used to designate the coating thickness per side. When the numbers are different, a differential coating is indicated. When the notation 0 appears as one number in the designation, a one-side coating is indicated.

The surface treatment is designated as C (mill passivated), P (mill phosphated), N (non-treatment), O (oiled), X (unoiled), or a combination of C, P, or N and O or X. Another chemical treatment may be applied by agreement between the purchaser and the manufacturer.

EXAMPLE Hot-rolled steel sheet with an electrolytically deposited zinc coating of 2,5 µm thickness on each side, chemically passivated and oiled, is designated as follows:

HR1 ZE 25/25CO

Cold-reduced steel sheet with an electrolytically deposited zinc coating of 2,5 µm thickness on each side, chemically passivated and oiled, is designated as follows:

CR1 ZE 25/25CO

16 Information to be supplied by the purchaser

To adequately specify requirements of this International Standard, enquiries and orders shall include the following information:

a) a reference to this International Standard, i.e. ISO 5002:2013;

b) the name and quality of the material, for example, cold-reduced electrolytic zinc-coated sheet (CR2) (see 5.5);

c) the coating designation number (see Table 5);

d) the dimensions of the product and the quantity required; for cut lengths, thickness (combination of base metal and coating or base metal alone), width, length, and bundle mass and the total quantity required; for coils, thickness (combination of base metal and coating or base metal alone), width, minimum or range of inside diameter, outside diameter, and the maximum acceptable coil mass, and the quantity required;

NOTE 1 When the base metal alone is specified, see Annex A for details.

NOTE 2 When the method of specifying thickness is not indicated, the combination of base metal and coating will be provided.

e) the application (name of part), if possible (see 5.7);

f) for drawing qualities HR2, HR3, HR4, CR2, CR3, CR4, and CR5, whether ordered according to mechanical properties or to fabricate an identified part (see 5.7 and 5.8);

g) surface treatment (see 5.10);

h) oiled, if required (see 5.11);

i) the coil size requirements (see Clause 13);

j) the report of heat analysis, if required (see 5.3.1);

k) details of fabrication or special requirements (fluting or coating performance);

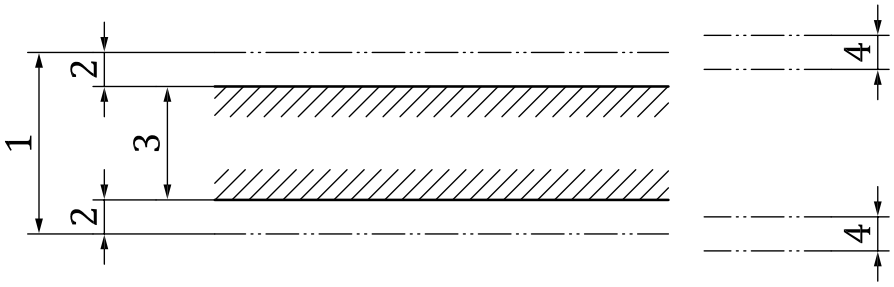
l) inspection and tests for acceptance prior to shipment from the producer's works, if required (see Clause 12).

EXAMPLE International Standard ISO 5002:nnnn, cold-reduced electrolytic zinc-coated sheet, commercial quality CR1, coating designation ZE 25/25, normal thickness tolerance, 0,6 mm × 1 000 mm × 2 000 mm, 20 000 kg, roll-formed tracks.

Annex A
(normative)

Specification of thickness as base metal alone

When specified by the purchaser, the ordered thickness shall be the base metal thickness. In these cases, the average coated product thickness shall be calculated as the base metal thickness + the average thickness for each surface (see Table A.1) of the coating mass as indicated in Figure A.1. Thickness tolerance tables apply to the average coated product thickness.



Key

1 average coated product thickness
2 average coating thickness
3 base metal thickness
4 thickness tolerance

Figure A.1 — Calculation of the average coated product thickness

Table A.1 — Average coating thickness for coating mass per surface

Coating designation	Average coating thickness for calculation per surface mm	Standard coating mass of one surface g/m^2
ZE 04	0	3
ZE 10	0,001[b]	7
ZE 14	0,001[a]	10
ZE 25	0,002[b]	18
ZE 30	0,003[a]	20
ZE 38	0,004[b]	27
ZE 42	0,004[a]	30
ZE 50	0,005[b]	36
ZE 56	0,005[a]	40
ZE 70	0,006[a]	50
ZE 75	0,008[b]	54

NOTE The actual coating thickness may be applied to the average coating thickness for calculation per surface by agreement between the purchaser and the manufacturer.

a Coating thickness is derived from actual production results.

b Coating thickness is derived from the nominal thickness.

Table A.1 *(continued)*

Coating designation	Average coating thickness for calculation per surface mm	Standard coating mass of one surface g/m^2
ZE 100	0,010[b]	75
ZE 135	0,014[b]	96
ZE 150	0,015[b]	107

NOTE The actual coating thickness may be applied to the average coating thickness for calculation per surface by agreement between the purchaser and the manufacturer.

a Coating thickness is derived from actual production results.

b Coating thickness is derived from the nominal thickness.

Bibliography

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

[2] ISO 3573, *Hot-rolled carbon steel sheet of commercial and drawing qualities*

[3] ISO 3574, *Cold-reduced carbon steel sheet of commercial and drawing qualities*

[4] ISO 3575, *Continuous hot-dip zinc-coated carbon steel sheet of commercial and drawing qualities*

[5] ISO 10113, *Metallic materials — Sheet and strip — Determination of plastic strain ratio*

[6] ISO 10275, *Metallic materials — Sheet and strip — Determination of tensile strain hardening exponent*

[7] ASTM A 879/A 879M, *Specification for Steel Sheet Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface*[1)]

[8] ASTM A 917, *Standard Specification for Steel Sheet, Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface (General Requirements)*

[9] JIS G 3313, *Electrolytic zinc-coated steel sheets and coils*

[10] EN 10152, *Electrolytically zinc coated cold rolled steel flat products for cold forming — Technical delivery conditions*

1) This document is recognized by ISO/TC17/SC12 to cover a subject similar to that of this International Standard. This information is given for the convenience of users of this International Standard and constitutes neither an endorsement of the document by TC17/SC12 or ISO, nor a statement regarding its degree of equivalence with this International Standard.

ICS 77.140.50

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