INTERNATIONAL STANDARD

ISO 14788

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Continuous hot-dip zinc-5 % aluminium alloy coated steel sheet

Tôles en acier revêtues à chaud en continu d'alliage zinc-aluminium 5 %

Reference number
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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.

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 14788 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 14788:2005), which has been technically revised.

Continuous hot-dip zinc-5 % aluminium alloy coated steel sheet

1 Scope

This International Standard is applicable to the minimum requirements for steel sheet, in coils and cut lengths, metallic-coated by the continuous hot-dip process, with zinc-5 % aluminium alloy coating.

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

The steel sheet is produced in a number of qualities and grades, coating mass, surface treatments and coating conditions designed to be compatible with differing application requirements.

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, *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 16163:2011, *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.

3.1 Quality applications

3.1.1
commercial
intended for general fabricating purposes where sheet is used in the flat condition, or for bending or moderate forming

3.1.2
drawing
intended for parts where drawing or severe forming may be involved

3.1.3
deep drawing
intended for parts where severe forming or severe drawing may be involved

3.1.4
deep drawing aluminium killed (non-ageing)
intended for fabricating parts where particularly severe drawing or forming may be involved or essential freedom from ageing is required

3.1.5
extra-deep drawing (stabilized)
intended for applications requiring interstitial-free steel (IF) which is non-ageing and has maximum formability

3.2
aluminium killed
steel which has been deoxidized with aluminium that is sufficient to prevent the evolution of gas during solidification

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

NOTE Stabilized steel is sometimes referred to as interstitial-free steel.

3.4
continuous hot-dip zinc-5 % aluminium-coated steel sheet
product obtained by hot-dip coating of steel sheet coils on a continuous coating line to produce either coated coils or cut lengths

3.5
normal spangle
coating formed as a result of the unrestricted growth of zinc-5 % aluminium alloy crystals during normal solidification

3.6
smooth finish
smooth coating produced by skin passing the coated material in order to achieve an improved-surface condition as compared with the normal as-coated product

3.7
skin pass
light cold rolling of the 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 (Lüders' lines) or fluting during the fabrication of finished parts. The skin pass also controls and improves flatness.

3.8
ageing
susceptibility of zinc-5 % aluminium alloy coated steel sheet to changes in properties with the passage of time

NOTE Ageing may result in a change in yield strength and corresponding decrease in ductility during storage. Ageing always has a negative effect on formability. The redevelopment of an upper yield point as a result of ageing can result in renewed susceptibility to surface imperfections, such as stretcher-strain marks (Lüders' 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.

4 Thickness

4.1 Zinc-5 % aluminium alloy coated steel sheet is produced in thicknesses up to 5 mm after coating, and in widths of 600 mm and over in coils and cut lengths. Zinc-5 % aluminium alloy coated steel sheet less than 600 mm wide may be slit from wide sheet and will be considered as sheet.

4.2 The thickness of zinc-5 % aluminium alloy coated 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 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 Requirements

5.1 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 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 steels, 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-5 % aluminium alloy coated sheet are left to the discretion of the manufacturer. When requested, the purchaser shall be informed of the steel-making process being used.

Table 1 — Chemical composition (heat analysis), % (mass fraction)

Quality		C % max.	Mn % max.	P % max.	S % max.	Ti % max.
Designation	**Name**					
01	Commercial	0,15	0,60	0,05	0,035	—
02	Drawing	0,10	0,50	0,04	0,035	—
03	Deep drawing	0,08	0,45	0,03	0,03	—
04	Deep drawing aluminium killed	0,06	0,45	0,03	0,03	—
05	Extra-deep drawing (stabilized interstitial-free)	0,02	0,25	0,02	0,02	0,15
06	Structural	0,25	1,70	0,05	0,05	—
For interstitial-free steels only, the values of 0,15 % maximum for titanium, and 0,10 % maximum for niobium and vanadium are acceptable to ensure that the carbon and nitrogen are fully stabilized. By agreement, the levels of manganese, phosphorus, sulfur and titanium may be adjusted.						

Table 2 — Limits on additional chemical elements, % (mass fraction)

Element	Cu[a] max.	Ni[a] max.	Cr[ab] max.	Mo[ab] max.	Nb[c] max.	V[cd] max.	Ti[d] 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

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 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] 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 consumer.

Table 3 — Product analysis tolerances, % (mass fraction)

Element	Maximum of specified element	Tolerance over maximum specified
C	0,15	0,03
	0,25	0,04
Mn	0,60	0,03
	1,70	0,05
P	0,05	0,01
S	0,05	0,01
Ti	0,15	0,01

NOTE The above maximum tolerance is the allowable excess over the specified requirement and not the heat analysis.

5.2 Mechanical properties

5.2.1 Commercial and drawing qualities

Zinc-5 % aluminium alloy coated steel sheet of designations 01, 02, 03, 04 and 05 is 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 to satisfactory manufacturing performance within a properly established breakage allowance, which shall be previously agreed upon between 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.

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 04 or 05 should be specified.

5.2.2 Structural quality

The mechanical properties, at the time the steel is made available for shipment, shall satisfy the requirements listed in Table 5.

5.2.3 Fabrication qualities

Zinc-5 % aluminium alloy coated steel sheet is available in several fabrication qualities.

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

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

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

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

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

Structural: zinc-5 % aluminium alloy coated steel sheet is produced in six grades as defined by a minimum yield stress and is intended for structural applications.

Table 4 — Mechanical properties

Base-metal quality[a]		R_{eL}[b] MPa[g] max.	R_m[c] MPa max.	A, %[d] min.		$\bar{r}$ [efh] min.	$\bar{n}$ [efh] min.
Designation	Name			$L_0 = 80$ mm	$L_0 = 50$ mm		
01	Commercial	—	—	—	—	—	—
02	Drawing	340	430	30	31	—	—
03	Deep drawing	300	410	34	35	—	—
04	Deep drawing aluminium killed	270	410	36	37	—	—
05	Extra-deep drawing (stabilized interstitial-free)	250	380	38	38	1,4	0,17

R_{eL} yield stress
R_m tensile stress
A percentage elongation after fracture
L_0 gauge length of test piece
$\bar{r}$ index of drawability of the product
$\bar{n}$ index of the stretchability of the product

NOTE 1 Duration of applicability of values stated in this table:

Designation	Time period
01	—
02	8 days
03	30 days
04	6 months
05	6 months

NOTE 2 For products produced according to performance criteria (ordering condition B), the typical mechanical properties presented here are not mandatory. For products ordered according to specific mechanical properties (ordering condition A), the purchaser can negotiate with the supplier if a specific range of values or a more restrictive range is required for the application. Therefore, these values can be specified by agreement.

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

[a] All qualities are available with a normal spangle or smooth finish.

[b] The yield values apply to 0,2 % proof stress if the yield point is not pronounced, otherwise to the lower yield point (σ_{el}).

[c] The minimum tensile strength for qualities 02, 03 and 04 would normally be expected to be 270 MPa. For design purposes, the lower limit for R_{eL} may be assumed to be 140 MPa for grades 01, 02, 03, and 04, and 120 MPa for grade 05.

[d] For materials of thickness up to and including 0,6 mm, the elongation percentages in this table shall be reduced by 2.

[e] $\bar{r}$ and $\bar{n}$ values are only applicable to thickness $\geqslant$ 0,5 mm. For thickness $>$ 2,0 mm, the $\bar{r}$ value is reduced by 0,2.

[f] $\bar{r}$ can also be written as r-bar and $\bar{n}$ can also be written as n-bar.

[g] 1 MPa = 1 N/mm^2.

[h] $\bar{r}$ and $\bar{n}$ values may be modified or excluded from this specification, by agreement between the producer and the purchaser.

5.3 Coating

5.3.1 Coating mass

The coating mass limits shall conform to the limits for the designations shown in Table 6. The coating mass is the total amount of coating on both sides of the sheet, expressed in grams per square metre.

5.3.2 Coating adherence

The coated sheet shall be capable of being bent in any direction, in accordance with the mandrel diameter requirements of Table 7, 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.

Table 5 — Mechanical properties of structural-quality steels

Grade	R_e min.[a] MPa	R_m min. MPa	A min.[b], %	
			$L_0 = 50$ mm	$L_0 = 80$ mm
220	220	310	20	18
250	250	360	18	16
280	280	380	16	14
320	320	430	14	12
350	350	450	12	10
380	380	540	12	10
550[c]	550	570	—	—
In determining the base-metal mechanical properties, the base-metal thickness should be measured after stripping the coating from the end of the specimen contacting the grips of the tension-testing machine before testing.				

[a] The yield stress specified in this table shall be the lower yield stress (R_{el}). The values can also be measured by 0,5 % total-elongation proof stress (proof stress under load) or by 0,2 % offset when a definite yield phenomenon is not present. When the upper yield stress (R_{eh}) is specified, the values shall be 20 MPa above the R_{el} values for each grade.

[b] The elongation values in the table shall be reduced by 2 for material up to and including 0,6 mm in thickness.

[c] Grade 550 is in the unannealed condition and therefore has limited ductility. If the hardness is HRB 85 or higher, no tension test is required. Bend testing for coating adherence is not applicable to Grade 550.

Table 6 — Coating mass (total both sides) test limits for zinc-5 % aluminium alloy coated steel sheet

Coating designation	Triple-spot test total for both sides min. g/m^2	Single-spot test total for both sides min. g/m^2
ZA001	no minimum	no minimum
ZA080	80	70
ZA090	90	75
ZA095	95	80
ZA100	100	85
ZA120	120	100
ZA130	130	110
ZA135	135	115
ZA140	140	120
ZA150	150	130
ZA160	160	135
ZA180	180	155
ZA185	185	155
ZA200	200	170
ZA225	225	190
ZA250	250	210
ZA255	255	215
ZA275	275	235
ZA300	300	255
ZA350	350	300
ZA450	450	385
ZA600	600	510
ZA700	700	595

NOTE 1 Not all coating designations are available from all producers.

NOTE 2 The coating mass, in grams per square metre, refers to the total coating on both surfaces. Because of the many variables and changing conditions that are characteristics of continuous hot-dip coating, the coating mass is not always evenly divided between the two surfaces of a sheet, nor is the coating evenly distributed from edge to edge. However, it can normally be expected that no less than 40 % of the single-spot test limit will be found on either surface.

NOTE 3 The coating thickness can be estimated from the coating mass by using the following relationship:

— 100 g/m^2 total for both sides ≅ 0,015 mm total for both sides.

Table 7 — Coating adherence — Bend-test mandrel diameter

Base-metal quality	**Coated metal –** 180° **bend mandrel diameter,** mm								
	Coating designation								
	$e < 3$ mm				$e \geqslant 3$ mm				
	up to ZA275	ZA300 ZA350	ZA450 ZA600	ZA700	up to ZA275	ZA300 ZA350	ZA450	ZA600	ZA700
Commercial	1a	1a	2a	3a	2a	2a	2a	3a	4a
Drawing designations 02, 03, 04, and 05	0	1a	2a	2a	0	1a	2a	2a	2a
Structural grade									
220	1a	1a	2a	3a	2a	2a	2a	3a	4a
250	1a	1a	2a	3a	2a	2a	2a	3a	4a
280	2a	2a	2a	3a	3a	3a	3a	3a	4a
320	3a	3a	3a	3a	3a	3a	3a	3a	4a
350	3a	3a	3a	3a	3a	3a	3a	3a	4a
380	3a	3a	3a	3a	3a	3a	3a	3a	4a
a = thickness of bend-test piece, in millimetres e = sheet thickness range									

5.4 Weldability

The product is normally suitable for welding, such as spot welding, roller-seam welding and fusion welding, if appropriate welding conditions are selected with special attention to the heavier coatings. When the carbon content increases above 0,15 %, spot welding becomes increasingly difficult. Because the heat of welding might have a significant effect on lowering the strength of grade 550, this grade is not recommended for welding.

5.5 Painting

Hot-dip zinc-5 % aluminium alloy coated steel sheet is a suitable base for paint, but the first treatment may be different from those used on uncoated steel. Pretreatment 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-5 % aluminium alloy coated sheet. In a painting schedule, it should be considered whether the product should be ordered with or without chemical passivation. Surfaces with certain passivation treatments (e.g. chromated) are not suitable for phosphating or the application of a pretreatment (etch) primer.

5.6 Surface treatment

5.6.1 Mill passivation

A chemical treatment may be applied to zinc-5 % aluminium alloy coated steel sheet, to minimize the hazard of wet-storage stains 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.

5.6.2 Oiling

Oiling of the as-produced zinc-5 % aluminium alloy coated steel sheet prevents marring and scratching of the soft surface during handling or shipping, and helps to minimize the hazard of wet-storage stains (known as white rust on this type of product). For these reasons, the purchaser is advised to consider specifying the zinc-5 % aluminium alloy coated steel in the oiled condition, provided this is compatible with his processing system.

5.7 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 may be permitted if agreed upon between the manufacturer and purchaser.

5.8 Dimensional and shape tolerances

5.8.1 Dimensional tolerances applicable to zinc-5 % aluminium alloy 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.

5.8.2 When the base-metal thickness is specified, the thickness tolerances of Tables 2, 3 and 4 of ISO 16163:2011 shall apply to the average coated-product thickness as calculated in accordance with Annex A.

6 Sampling

6.1 Chemical composition

A heat analysis of each heat shall be made by the manufacturer to determine compliance with the requirements of Tables 1 and 2.

6.2 Tensile test

When required, one representative transverse test shall be taken from each lot for shipment to determine compliance with the requirements of Tables 4 and 5. Transverse test pieces shall be taken mid-way between the centre and the edge of the sheet as-rolled. A lot consists of 50 t or less of sheet of the same grade rolled to the same thickness and condition.

6.3 Coating tests

6.3.1 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.

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 from the side edge. The minimum specimen area shall be 1 200 mm^2.

6.3.2 Triple-spot test

The triple-spot test result shall be the average coating mass found on the three specimens taken in accordance with 6.3.1.

6.3.3 Single-spot test

The single-spot test result shall be the minimum coating mass found on any one of the three specimens used for the triple-spot test. Material, which has been slit from wide coil, shall be subject to a single-spot test only.

6.4 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 be taken not closer than 25 mm from the side edge. The minimum width of the test specimen shall be 50 mm.

6.5 Retest

If a test does not satisfy the specified results, two more test pieces shall be taken at random from the same lot. Both retests shall conform to the requirements of this International Standard; otherwise the lot shall be rejected.

7 Test methods

7.1 Tensile tests

The tests shall be conducted in accordance with the methods specified in ISO 6892-1. Transverse test pieces shall be taken mid-way between the centre and the 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 thickness “as base metal only”, there are two permissible methods for determining the base-metal thickness.

a) Option A — Determination of the actual base-metal thickness through direct measurement of the substrate of a specimen whose coating has been removed.

b) Option B — Calculation of 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.

7.2 Coating properties

7.2.1 Coating mass

The manufacturer shall conduct tests using methods deemed necessary to ensure that the material complies with the requirements shown in Table 3. Commonly used methods include those specified in ISO 1460, ISO 3497 or ISO 2178. The coating mass is determined by converting coating thickness measurements made with magnetic gauges (ISO 2178) or by X-ray spectrometry (ISO 3497). The test methods in ISO 2178 and ISO 3497 may be used as a basis for acceptance but not for rejection. In cases of dispute, ISO 1460 shall be used as the referee method.

7.2.2 Coating adherence

Bend tests shall be conducted in accordance with the methods specified in ISO 7438.

8 Designation system

8.1 Introduction

The designation system includes the coating name, coating type, coating mass, coating condition, surface treatment, base-metal quality or grade of structural steel.

8.2 Coating name

The letters ZA are used to indicate the zinc-5 % aluminium alloy coating.

8.3 Coating type

The designators T1 and T2 are used to indicate the type of coating.

The product is produced in two types:

— T1: zinc-5 % aluminium-mischmetal alloy coating;

— T2: zinc-5 % aluminium-0,1 % magnesium alloy coating.

NOTE There can be differences in product characteristics between type 1 and type 2 coated steel sheet, depending on the intended application.

8.4 Coating mass

The coating mass designations are 001, 080, 090, 095, 100, 120, 130, 135, 140, 150, 160, 180, 185, 200, 225, 250, 255, 275, 300, 350, 450, 600, and 700 as indicated in Table 6.

The coating is expressed as the total mass on both surfaces, in grams per square metre. The coating mass specified should be compatible with the desired service life, the thickness of the base metal, and with the forming requirements involved.

NOTE For differential coatings, the coating mass of each surface, which is based on the agreement of the interested parties, is shown in the order of top surface and bottom surface. An example of a differential coating designation is ZAT120S60C02.

8.5 Coating condition

The conditions of coating designations are:

— N: normal spangle coating (as-produced);

— S: smooth finish (skin passed).

NOTE 1 The normal spangle is the “as-coated” condition and the smooth finish is achieved with a skin pass.

NOTE 2 End-use applications might require negotiation between the supplier and consumer to establish specific surface requirements.

8.6 Surface treatment

The surface treatment designations are:

— O oiling;

— CO mill passivation plus oiling;

— C mill passivation.

8.7 Base-metal quality

The base-metal quality designations are:

— 01 Commercial;

— 02 Drawing;

— 03 Deep drawing;

— 04 Deep drawing aluminium killed (non-ageing);

— 05 Extra-deep drawing (stabilized interstitial-free).

Three digits as described in Table 5 indicate structural grades.

8.8 Examples

8.8.1 An example of a complete designation is ZAT1 160NC02. This designation example includes the following components:

— ZA: zinc-5 % aluminium alloy coating;

— T1: coating type 1;

— 160: coating mass designation;

— N: normal spangle coating condition;

— C: mill passivation;

— 02: drawing quality.

8.8.2 An example of a complete designation for one of the structural-quality products is ZAT2 150SCO350. This designation example includes the following components:

— ZA: zinc-5 % aluminium alloy coating;

— T2: coating type 2;

— 150: coating mass designation;

— S: smooth finish condition;

— CO: mill passivation plus oiling;

— 350: structural steel grade.

9 Resubmission

9.1 The manufacturer may resubmit, for acceptance, the products that have been rejected during earlier inspection because of unsatisfactory properties, after he has subjected them to a suitable treatment (selection, heat 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 lot.

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

10 Workmanship

The zinc-5 % aluminium alloy coated steel sheet in cut lengths shall be free from amounts of 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 observe readily or to remove defective portions as can be carried out in the cut-length product.

11 Inspection and acceptance

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

11.2 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.

12 Marking

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

a) manufacturer's name or identifying brand;

b) a reference to this International Standard, i.e. ISO 14788:2011;

c) product designation (coating type, coating mass, coating condition, surface treatment and quality or grade or the base metal);

d) order number;

e) product dimensions;

f) lot number;

g) mass.

13 Information to be supplied by the purchaser

To adequately specify requirements in accordance with this International Standard, enquiries and orders should include the following information:

a) a reference to this International Standard, i.e. ISO 14788:2011;

b) complete designation of the material, i.e. coating name, coating type, coating mass, coating condition, surface treatment, and base-metal quality or grade;

EXAMPLE Zinc-5 % aluminium alloy, type 1 coated steel sheet, commercial quality, normal spangle, passivated and oiled, ZAT1 160NC01 (see Clause 8).

c) dimensions: 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(s), maximum outside diameter, and acceptable maximum coil mass and total 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 method will be provided.

d) the application (name of part), if available;

NOTE 3 Identification of the application provides the opportunity to assess the compatibility of the end use with the ordered quality and coating designation. Proper identification of the part can include a description of the part or a visual examination of a submitted part and/or prints, or any combination thereof.

e) ordering condition A or B;

f) mill passivation, if required (see 5.6.1);

g) oiling, if required (see 5.6.2);

h) report of heat analysis and/or mechanical properties, if required (see 5.1 and 5.2);

i) details of fabrication, special requirements or application (i.e. coating performance, non-fluting, paintability, weldability, exposure environment, etc.);

j) inspection and tests for acceptance prior to shipment from the producer's works, if required (see Clause 11).

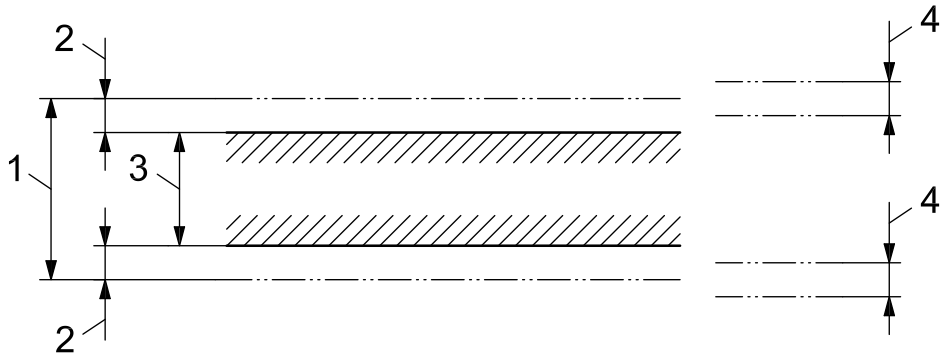
NOTE 4 A typical ordering description is as follows:

International Standard ISO 14788:2011, zinc-5 % aluminium alloy, type 1, coated steel sheet, commercial quality, designation ZAT1 160C01, normal thickness tolerance, 1,0 mm × 1 200 mm × coil, 1 200 mm max. OD, 600 mm ID, 20 000 kg, exhaust pipe tubing, ordering condition A.

Annex A
(normative)

Orders requiring base-metal thickness

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 + average coating 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 tolerances

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

Table A.1 — Average thickness for coating mass — Total for both sides

Coating designation	Average coating thickness[a] for calculation, mm
ZA080	0,018
ZA090	0,020
ZA095	0,021
ZA100	0,023
ZA120	0,028
ZA130	0,030
ZA135	0,030
ZA140	0,032
ZA150	0,034
ZA160	0,034
ZA180	0,037
ZA185	0,037
ZA200	0,043
ZA225	0,046
ZA250	0,053
ZA255	0,053
ZA275	0,058
ZA300	0,061
ZA350	0,069
ZA450	0,089
ZA600	0,110
ZA700	0,129

[a] Coating mass data derived from actual production results.

Bibliography

[1] JIS G3317, *Hot-dip zinc-5 % aluminum alloy-coated steel sheets and coils*[1)]

[2] ASTM A875/A875M, *Standard Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-Dip Process*[1)]

1) This document is recognized by ISO/TC 17/SC 12 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 TC 17/SC 12 or ISO, nor a statement regarding its degree of equivalence with this International Standard.

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