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Steel sheet, zinc-5 % aluminium alloy-coated by the continuous hot-dip process, of commercial, drawing and structural qualities

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

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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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

This fourth edition cancels and replaces the third edition (ISO 14788:2011), which has been technically revised.

Steel sheet, zinc-5 % aluminium alloy-coated by the continuous hot-dip process, of commercial, drawing and structural qualities

1 Scope

This document 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 quality designations and grades, coating type, coating mass, surface treatments and coating finish conditions designed to be compatible with differing application requirements.

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 terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
commercial
base-metal quality intended for general fabricating purposes where sheet is used in the flat condition, or for bending or moderate forming

3.2
drawing
base-metal quality intended for parts where drawing or severe forming may be involved

3.3
deep drawing
base-metal quality intended for parts where severe forming or severe *drawing* (3.2) may be involved

3.4
deep drawing aluminium killed
base-metal quality intended for fabricating parts where particularly severe *drawing* (3.2) or forming may be involved or essential freedom from *ageing* (3.13) is required

3.5
extra-deep drawing stabilized
base-metal quality intended for applications requiring *interstitial-free steel* (*IF steel*) (3.6) which is non-ageing and has maximum formability

3.6
interstitial-free steel
IF steel
extra-low-carbon steel in which all interstitial elements are combined with titanium and/or equivalent elements

Note 1 to entry: Interstitial-free steel is sometimes referred to as "stabilized steel".

3.7
breakage allowance
agreed upon level of acceptable die breakage not subject to claim

3.8
continuous hot-dip zinc-5 % aluminium-coated steel sheet
steel sheet product in coils or cut lengths manufactured on a continuous coating line with a hot-dip zinc-5 % aluminium coating on base metal of cold-reduced or hot-rolled descaled steel

3.9
differential coating
coating deliberately produced to have a different coating mass on each surface

3.10
normal spangle
coating formed as a result of the unrestricted growth of zinc-5 % aluminium alloy crystals during normal solidification

3.11
smooth finish
smoothness produced by *skin passing* (3.12) the coated material in order to achieve an improved surface condition as compared with the normal as-coated product

3.12
skin pass
light cold rolling of the coated steel sheet

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.

3.13
ageing
change in steel properties with the passage of time

Note 1 to entry: Ageing may result in a change in yield strength and a corresponding decrease in ductility during storage. Ageing always has a negative effect on formability. The redevelopment of a definite yield point phenomenon as a result of ageing can result in a renewed susceptibility to surface imperfections, such as stretcher strain marks (Lüder's 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.

3.14
lot
up to a specified quantity of steel sheet of the same designation rolled to the same thickness and coating condition

3.15
coating mass
total amount of coating on both sides of the sheet

Note 1 to entry: Expressed in grams per square metre.

4 Dimensions

4.1 Zinc-5 % aluminium alloy-coated steel sheet is produced in thicknesses from 0,25 mm to 5 mm inclusive after coating, and in widths of 600 mm and over in coils and cut lengths. Zinc-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 shall be provided. Annex A describes the requirements for specifying the thickness of the base metal alone.

5 Conditions of manufacture

5.1 Steelmaking

Unless otherwise agreed by the interested parties, the processes used in making the steel and in manufacturing zinc-5 % aluminium alloy-coated sheet are left to the discretion of the manufacturer. On request, the purchaser shall be informed of the steelmaking process being used.

5.2 Chemical composition

The chemical composition (heat analysis) shall conform to the requirements given in Tables 1 and 2.

5.3 Chemical analysis

5.3.1 Heat analysis

An analysis of each heat shall be made by the manufacturer in order to determine compliance with the requirements given in Tables 1 and 2. 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 shall be in accordance with Tables 2 and 3.

Table 1 — Chemical composition (heat analysis)

Mass fractions in percent

Base-metal quality		C	Mn	P	S	Ti
Designation	Name	max.	max.	max.	max.	max.
01	Commercial	0,15	0,60	0,05	0,035	—
02	Drawing	0,10	0,50	0,04	0,035	—
03[a]	Deep drawing	0,08	0,45	0,03	0,03	—
04[a]	Deep drawing aluminium killed	0,06	0,45	0,03	0,03	—
05[a]	Extra-deep drawing stabilized	0,02	0,25	0,02	0,02	0,15
220 to 550	Structural	0,25	1,70	0,035[b]	0,035	—

[a] Interstitial-free steel may be applied (see 5.4.1.3).

[b] Grades 250 and 280: phosphorus – 0,10 % max. Grade 350: phosphorus – 0,20 % max.

Table 2 — Limits on additional chemical elements

Mass fractions in percent

Element	Cu[a] max.	Ni[a] max.	Cr[a,b] max.	Mo[a,b] max.	Nb[c] max.	V[c,d] 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

[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 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 % maximum for 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 manufacturer and the purchaser.

Table 3 — Product analysis tolerances for Table 1

Mass fractions in percent

Element	Maximum of specified element	Tolerance over maximum specified
C	0,02	0,01
	0,15	0,03
	0,25	0,04
Mn	0,60	0,03
	1,70	0,05
P	0,20	0,01
S	0,035	0,01
Ti	0,15	0,01

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

5.4 Mechanical properties

5.4.1 Commercial and drawing quality

5.4.1.1 Ordering conditions

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, when they are determined on test pieces obtained in accordance with the requirements in Clause 7. The values specified in Table 4 are applicable for the periods indicated in Table 5 from the time that the steel is available for shipment.

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.

In the case of ordering condition B, mechanical properties of the steel sheet may also be agreed upon by the interested parties and such properties may not necessarily satisfy the requirements of Table 4.

5.4.1.2 Fabrication qualities

Zinc-5 % aluminium alloy-coated steel sheet is available in several fabrication qualities as given in 3.1 to 3.5.

5.4.1.3 Interstitial-free steel

Stabilized interstitial-free (IF) steel is applicable to orders for designations 03, 04 and 05, provided that the purchaser is informed of the substitution and that related shipping documents reflect the actual material shipped.

Table 4 — Mechanical properties of commercial and drawing quality grades

Base-metal quality		R_{eL} max.[a]	R_m max.[b]	A min.[c] %		$\bar{r}$ min.[d,e,f]	$\bar{n}$ min.[d,e,f]
Designation	Name	MPa	MPa	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	250	380	38	38	1,4	0,17

R_{eL} = lower yield strength

R_m = tensile strength

A = percentage elongation after fracture

L_o = gauge length of original test piece

$\bar{r}$ = index of drawability of the product

$\bar{n}$ = index of the stretchability of the product

1 MPa = 1 N/mm^2

For products produced according to performance criteria (ordering condition B), the typical mechanical properties presented here are non-mandatory. For products specified according to mechanical properties (ordering condition A), the purchaser may negotiate with the manufacturer if a specific range, or a more restrictive range, is required for the application. When agreed to, such values may be specified.

NOTE With the exception of footnote c and d, these typical mechanical properties apply to the full range of steel sheet thicknesses. The yield strength tends to increase and some of the formability tends to decrease as the sheet thickness decreases.

a The values apply to 0,2 % proof strength when a definite yield phenomenon is not present, otherwise to the lower yield strength, R_{eL}.

b 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. All tensile strength values are determined to the nearest 10 MPa.

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

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

e $\bar{r}$ can also be written as *r*-bar and $\bar{n}$ can also be written as *n*-bar.

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

Table 5 — Applicable period for values specified in Table 4

Designation	Period
01	Not applicable
02	8 d
03	30 d
04	6 months
05	6 months

5.4.2 Structural quality

The mechanical properties, at the time the steel is made available for shipment, shall satisfy the requirements listed in Table 6.

Table 6 — Mechanical properties of structural-quality grades

Grade designation	R_{eL} min.	R_m min.	A min.[a] %	
			L_0 = 80 mm	L_0 = 50 mm
	MPa	MPa		
220	220	310	18	20
250	250	360	16	18
280	280	380	14	16
320	320	430	12	14
350	350	450	10	12
380	380	540	10	12
550[b]	550	570	—	—

R_{eL} = lower yield strength

R_m = tensile strength

A = percentage elongation after fracture

L_o = gauge length of original test piece

e = thickness of steel sheet in mm

a = thickness of bend test piece in mm

1 MPa = 1 N/mm^2

NOTE 1 R_{eL} is measured by 0,5 % total elongation proof strength (proof strength under load) or by 0,2 % offset when a definite yield phenomenon is not present.

NOTE 2 In determining the base-metal mechanical properties, the base-metal thickness is measured after stripping the coating from the end of the specimen contacting the grips of the tension-testing machine before testing.

[a] The elongation values in the table shall be reduced by 2 and the yield strength increased by 20 MPa for material up to and including 0,6 mm in thickness.

[b] Grade 550 is in the unannealed condition and therefore has limited ductility. If the hardness is 85 HRB or higher, no tension test is required.

5.5 Coating

5.5.1 Coating mass

The coating mass limits shall conform to the limits for the designations shown in Table 7. The coating mass is the total amount of coating on both sides of the sheet, expressed in grams per square metre. 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.

5.5.2 Coating adherence

Zinc-5 % aluminium alloy-coated steel sheet shall be capable of being bent in any direction, in accordance with the mandrel diameter requirements of Table 8, 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 7 — Coating mass (total both sides)

Coating mass designation	Minimum check limit	
	Triple-spot test g/m^2	Single-spot test g/m^2
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 Because of the many variables and changing conditions that are characteristic of continuous aluminium-zinc coating, the coating mass is not always evenly divided between the two surfaces of a sheet, neither is the coating evenly distributed from edge to edge. However, it can normally be expected that no 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 by using the following relationship: 100g/m^2 total mass both sides ≈ 0,015 mm total thickness both sides.

Table 8 — Coating adherence — Bend-test mandrel diameter

Base-metal quality		Coated metal — 180° bend mandrel diameter, mm[a]								
Designation	Name	Coating designation								
		e < 3 mm				e ≥ 3 mm				
		up to ZA275	ZA300 ZA350	ZA450 ZA600	ZA700	up to ZA275	ZA300 ZA350	ZA450	ZA600	ZA700
01	Commercial	1a	1a	2a	3a	2a	2a	2a	3a	4a
02, 03, 04, and 05	Drawing designations	0	1a	2a	2a	0	1a	2a	2a	2a
220	Structural grades	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
550		—	—	—	—	—	—	—	—	—

a = thickness of bend-test piece, in millimetres

e = thickness of steel sheet, in millimetres

[a] Bend testing for coating adherence is not applicable to grade 550.

5.6 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.

5.7 Painting

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. 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 zinc-5 % aluminium alloy-coated sheet. In drawing up a painting schedule, consideration shall be given to whether the zinc-5 % aluminium alloy-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 Coating finish condition

The coating finish of zinc-5 % aluminium alloy-coated steel sheet is either a normal, as-coated surface with unrestricted spangle growth (see 3.11), or a skin passed, surface that has improved smoothness compared to an as-coated surface (see 3.12 and 3.13).

5.9 Surface treatment

5.9.1 Mill passivation

A chemical treatment is normally applied to zinc-5 % aluminium alloy-coated steel sheet to minimize the hazard of wet storage staining (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.

5.9.2 Oiling

When specified, zinc-5 % aluminium alloy-coated 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 zinc-5 % aluminium alloy-coated steel sheet has received a passivating treatment, oiling will further minimize the hazard of wet storage stain.

5.10 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 purchaser and the manufacturer.

5.11 Dimensional and shape tolerances

5.11.1 Dimensional and shape tolerances applicable to zinc-5 % aluminium alloy-coated steel sheet shall be as specified in ISO 16163. The tolerances for thickness apply to products whose thickness is a combination of base metal and coating thickness.

5.11.2 When base metal thickness is specified, the thickness tolerances of ISO 16163 shall apply to the product thickness calculated in accordance with Annex A.

6 Sampling

6.1 Tensile test

When required, one representative transverse sample from each lot of 50 t or less for shipment shall be taken for the tensile test to verify conformance to the requirements of Tables 4 and 6.

6.2 Coating tests

6.2.1 Coating mass

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

6.2.1.2 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 each of the three specimens shall be 1 200 mm^2.

6.2.2 Triple-spot test

The triple-spot test result shall be the average coating mass found on the three specimens taken in accordance with 6.2.1.

6.2.3 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.

6.2.4 Coating adherence

One representative sample for the coating-adherence bend test shall be taken from each lot of 50 t or less 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.

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 as-coated sheet. 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 equivalent 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 6. Commonly used methods include 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) using the relationship given in Table 6. Either the test method in ISO 2178 or ISO 3497 shall 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 General

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

8.2 Coating designation

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

8.2.2 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.

8.3 Coating mass

8.3.1 The coating mass designations are ZA001, ZA080, ZA090, ZA095, ZA100, ZA120, ZA130, ZA135, ZA140, ZA150, ZA160, ZA180, ZA185, ZA200, ZA225, ZA250, ZA255, ZA275, ZA300, ZA350, ZA450, ZA600 and ZA700, as indicated in Table 7.

8.3.2 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 ZAT1200080C02 (see 8.7.3).

8.4 Coating finish condition

The coating finish condition designations are as follows:

— N: as-coated finish, no skin pass;

— S: smooth finish with skin pass.

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 manufacturer and the purchaser to establish specific surface requirements.

8.5 Surface treatment

The surface treatment designations are as follows:

— C: mill passivation;

— O: oiling;

— CO: mill passivation and oiling.

8.6 Base-metal quality

The base-metal quality designations are as follows:

— 01: commercial quality;

— 02: drawing quality;

— 03: deep drawing quality;

— 04: deep drawing aluminium killed quality;

— 05: extra-deep drawing stabilized quality.

Structural quality grades are indicated by three digits according to Table 6.

8.7 Examples

8.7.1 An example of a complete designation is ZAT1160NC02. This designation example is obtained by combining the following components:

— ZA: zinc-5 % aluminium alloy coating;

— T1: coating type 1;

— 160: coating mass;

— N: as coated finish, no skin pass;

— C: mill passivation;

— 02: drawing quality.

8.7.2 An example of a complete designation for a structural-quality product is ZAT2150SCO350. This designation example is obtained by combining the following components:

— ZA: zinc-5 % aluminium alloy coating;

— T2: coating type 2;

— 150: coating mass;

— S: smooth finish with skin pass;

— CO: mill passivation plus oiling;

— 350: structural steel grade.

8.7.3 An example for differential coatings is ZAT1200080C02. The standard designation would give the top surface before the bottom surface. This designation example is obtained by combining the following components:

— ZA: zinc-5 % aluminium alloy coating;

— T1: coating type 1;

— 200: coating-mass top surface;

— 080: coating-mass bottom surface;

— N: as coated finish, no skin pass;

— C: mill passivation;

— 02: drawing quality.

9 Retests

9.1 Machining and flaws

If any tensile test piece shows defective machining or develops flaws, it shall be discarded and another test piece shall be substituted.

9.2 Elongation

On any tensile test, if any part of the fracture is outside the middle half of the gauge length as scribed before the test, the test shall be discarded and a retest carried out.

9.3 Additional tests

If any test does not give the specified results, two additional tests shall be conducted on samples selected at random from the same lot. Both retests shall conform to the requirements of this document; otherwise the lot shall be rejected.

10 Resubmission

10.1 The manufacturer may resubmit, for acceptance, the products that have been rejected during earlier inspection because of unsatisfactory properties, after the rejected products have been subjected to a suitable treatment (e.g. 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.

10.2 The manufacturer may present the rejected products to a new examination for compliance with the requirements for another quality.

11 Workmanship

11.1 The surface condition shall be that normally obtained for a zinc-5 % aluminium alloy-coated steel sheet product.

11.2 The steel sheet in cut lengths shall be free from quantities of laminations, surface flaws and other imperfections that are detrimental to the final product or to subsequent appropriate processing.

11.3 Processing for shipment in coils does not afford the manufacturer the opportunity to observe readily or to remove non-conforming portions, as can be carried out on the cut length product. However, this does not relieve the manufacturer of responsibility to provide a product that meets the requirement for surface condition that is normally obtained on zinc-5 % aluminium alloy-coated steel sheet products.

12 Inspection and acceptance

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

12.2 Steel that is reported to be nonconforming after arrival at the user's works shall be set aside, properly and correctly identified and adequately protected. The manufacturer shall be notified in order that the reported nonconforming material may be properly investigated.

13 Coil size

When steel sheet in accordance with this document is ordered in coils, a minimum or range of acceptable inside diameter(s) (ID) shall be specified. In addition, the maximum outside diameter (OD) and the maximum acceptable coil mass shall be specified.

