

# Hot-dip 55 % aluminium-zinc alloy-coated steel sheets and coils

**Introduction** This Japanese Industrial Standard has been prepared based on the second edition of **ISO 9364** *Continuous hot-dip zinc aluminium/zinc-coated steel sheet of commercial, drawing and structural qualities* published in 2001 with some modifications which consider the realities of the domestic market. In order to promote the diffusion of **ISO** Standards, it is important to broadly provide the users of steel products with information about the contents of **ISO** Standards. From such a perspective, the second edition of **ISO 9364** published in 2001 has been adopted in annex 4 (informative) to this Standard without any modification in its technical content.

In addition, although the specified items of clause 5, clause 7, clause 8, clause 15, 16.4, clause 17, clause 18, and clause 19 are specified without any modification in their technical content of the original International Standard, other specified items are specified with some modifications of the original International Standard. A list of modifications of this Standard is given in annex 5 (informative) with the explanations.

**1 Scope** This Standard specifies the steel sheets and coils (hereafter referred to as “sheet and coil”) which are coated by the hot-dip process in a coating bath containing about 55 % aluminium, 1.6 % silicon, with the balance being zinc, as a standard composition. In this case, the term “sheet” includes not only sheets in flat form but also corrugated sheets of the shapes and dimensions specified in **JIS G 3316**.

Remarks : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are **IDT** (identical), **MOD** (modified), and **NEQ** (not equivalent) according to **ISO/IEC Guide 21**.

ISO 9364:2001 *Continuous hot-dip zinc aluminium/zinc-coated steel sheet of commercial, drawing and structural qualities* (MOD)

**2 Normative references** The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions (including amendments) of the standards indicated below shall be applied.

JIS G 0320 *Standard test methods for heat analysis of steel products*

JIS G 0404 *Steel and steel products—General technical delivery requirements*

JIS G 0415 *Steel and steel products—Inspection documents*

JIS G 0594 *Methods of accelerated cyclic corrosion resistance tests for anodic coatings with exposure to salt spray, dry and wet conditions*

JIS G 3316 *Shapes and dimensions of corrugated steel sheets*

JIS H 0401 *Methods of test for hot dip galvanized coatings*

- JIS H 8502 *Methods of corrosion resistance test for metallic coatings*  
 JIS K 0119 *General rules for X-ray fluorescence spectrometric analysis*  
 JIS K 5621 *Anticorrosive paint for general use*  
 JIS Z 2201 *Test pieces for tensile test for metallic materials*  
 JIS Z 2241 *Method of tensile test for metallic materials*  
 JIS Z 8401 *Guide to the rounding of numbers*

**3 Grade and symbol** Sheet and coil shall be classified into 5 grades using hot-rolled sheet coils as the base metal (hereafter referred to as “hot-rolled base metal”) and into 7 grades using cold-reduced sheet coils as the base metal (hereafter referred to as “cold-reduced base metal”), and their symbols shall be as given in tables 1 and 2.

**Table 1 Grade and symbol (for hot-rolled base metal used)**

Unit: mm

Classified symbol	Applicable nominal thickness <sup>(1)</sup>	Application
SGLHC	1.6 or over up to and incl. 2.3	Commercial quality
SGLH400	1.6 or over up to and incl. 2.3	Structural quality
SGLH440		
SGLH490		
SGLH540		

**Table 2 Grade and symbol (for cold-reduced base metal used)**

Unit: mm

Classified symbol	Applicable nominal thickness <sup>(1)</sup>	Application
SGLCC	0.25 or over up to and incl. 2.3	Commercial quality
SGLCD	0.40 or over up to and incl. 1.6	Drawing quality
SGLCDD	0.40 or over up to and incl. 1.6	Deep drawing quality
SGLC400	0.25 or over up to and incl. 2.3	Structural quality
SGLC440	0.25 or over up to and incl. 2.3	Structural quality
SGLC490	0.25 or over up to and incl. 2.3	Structural quality
SGLC570	0.25 or over up to and incl. 2.0	Structural quality

Note <sup>(1)</sup> The nominal thickness shall be in accordance with **10 a**).

Remarks 1 Nominal thicknesses other than those listed in table 2 may be agreed upon between the purchaser and the manufacturer.

2 Sheet and coil for roofing and architectural siding shall be accompanied by the symbol R for roofing and the symbol A for architectural siding after the classified symbol given in table 2.

In this case, the nominal thickness and the mass of coating shall be as specified in annex 1.

- 3 For the sheet and coil subjected to corrugating in accordance with **JIS G 3316**, the symbol W and the shape symbol for corrugated sheets shall be suffixed to the classified symbol given in table 2.

In this case, the nominal thickness and the mass of coating shall be as specified in annex 2.

**4 Chemical composition** For the chemical composition of base metal, when the test in 16.1 is performed, the cast analysis shall be as given in table 3 and table 4.

**Table 3 Chemical composition (for hot-rolled base metal used)**

Unit: %

Classified symbol	C	Mn	P	S
SGLHC	0.15 max.	0.80 max.	0.05 max.	0.05 max.
SGLH400	0.25 max.	1.70 max.	0.20 max.	0.05 max.
SGLH440	0.25 max.	2.00 max.	0.20 max.	0.05 max.
SGLH490	0.30 max.	2.00 max.	0.20 max.	0.05 max.
SGLH540	0.30 max.	2.50 max.	0.20 max.	0.05 max.

Remarks : The report of cast analysis of C, Mn, P and S shall be in accordance with the agreement between the purchaser and the manufacturer.

**Table 4 Chemical composition (for cold-reduced base metal used)**

Unit: %

Classified symbol	C	Mn	P	S
SGLCC	0.15 max.	0.80 max.	0.05 max.	0.05 max.
SGLCD	0.10 max.	0.45 max.	0.03 max.	0.03 max.
SGLCDD	0.08 max.	0.45 max.	0.03 max.	0.03 max.
SGLC400	0.25 max.	1.70 max.	0.20 max.	0.05 max.
SGLC440	0.25 max.	2.00 max.	0.20 max.	0.05 max.
SGLC490	0.30 max.	2.00 max.	0.20 max.	0.05 max.
SGLC570	0.30 max.	2.50 max.	0.20 max.	0.05 max.

Remarks : The report of cast analysis of C, Mn, P and S shall be in accordance with the agreement between the purchaser and the manufacturer.

## 5 Coating surface finishes

**5.1 Normal spangle** A coating having spangles as a result of the unrestricted growth of alloy crystals during normal solidification.

**5.2 Skin pass** Skin passing to obtain surface smoothness shall be specified by the purchaser. In this case, the symbol shall be S.

**6 Coating mass** Coating mass shall be tested in accordance with **16.2**, and minimum coating mass on both surfaces (total mass on both surfaces) for equally coated sheet and coil and the symbol thereof shall be as follows:

- a) Coating mass for equally coated sheet and coil shall be expressed as the coating mass on both surfaces of the sheet and coil. Minimum coating mass and its symbol shall be as shown in table 5.
- b) Minimum coating mass at a single spot on either side of equally coated sheet and coil should be about 40 % or more of the minimum coating mass at a single spot on both surfaces (total mass on both surfaces).

**Table 5 Minimum coating mass for equally coated sheet and coil (total mass on both surfaces)**

Unit: g/m<sup>2</sup> (both surfaces)

Coating mass symbol	Average minimum coating mass in triple-spot test	Minimum coating mass at a single spot
(AZ70) <sup>(2)</sup>	70	60
AZ90	90	76
AZ120	120	102
AZ150	150	130
AZ170	170	145
(AZ185) <sup>(2)</sup>	185	160
(AZ200) <sup>(2)</sup>	200	170

Note <sup>(2)</sup> The values in parentheses may be applied in accordance with the agreement between the purchaser and the manufacturer.

- Remarks
- 1 The average minimum coating mass in the triple-spot test (total mass on both surfaces) shall be the average of the measured coating masses of three test pieces cut from the test specimen.
  - 2 The minimum coating mass at a single spot (total mass on both surfaces) shall be the smallest of the measured coating masses of the three test pieces cut from the test specimen.
  - 3 The maximum coating mass (total mass on both surfaces) may be agreed upon between the purchaser and the manufacturer.

**7 Chemical treatment** Symbols for chemical treatment for flat sheet and coil shall be as given in table 6. Unless otherwise specified, chromate treatment shall be applied.

**Table 6 Type of chemical treatment and symbol**

Type of chemical treatment	Symbol
Chromate treatment	C
Untreated	M

Remarks : Chemical treatments other than those listed in table 6 may be agreed upon between the purchaser and the manufacturer.

**8 Oiling** Symbols for oiling for flat sheet and coil shall be as given in table 7. Unless otherwise specified, the sheet and coil shall be unoiled.

**Table 7 Discrimination of oiling and symbol**

Discrimination of oiling	Symbol
Oiled	O
Unoiled	X

**9 Mechanical properties**

**9.1 Applicable mechanical properties** Applicable mechanical properties for flat sheet and coil shall be as given in table 8.

**Table 8 Applicable mechanical properties**

Classified symbol	Bendability	Yield point or proof stress, tensile strength and elongation
SGLHC	○	—
SGLH400	○	○
SGLH440	( <sup>3</sup> )	○
SGLH490	○	○
SGLH540	( <sup>3</sup> )	○
SGLCC	○	—
SGLCD	○	○
SGLCDD	○	○
SGLC400	○	○
SGLC440	○	○
SGLC490	○	○
SGLC570	—	○

Note (<sup>3</sup>) For SGLH440 and SGLH540, bendability shall be subject to agreement between the purchaser and the manufacturer.

**9.2 Bendability** As to bendability for the flat sheet and coil specified in 9.1, when the sheet and coil are tested in accordance with 16.4 and table 9, there shall not be any flaking of the coating, cracking (visible to the naked eye) or fracture of the base metal on the outside of the bent portion (within an area not less than 7 mm from each side of the test piece).

**Table 9 Bendability**

Classified symbol		Internal spacing of the bend (number of sheets of the nominal thickness)			
		Under 1.6 mm in nominal thickness		1.6 mm or over up to and incl. 2.3 mm in nominal thickness	
Hot-rolled base metal	Cold-reduced base metal	AZ90	AZ120, AZ150	AZ90	AZ120, AZ150
SGLHC	SGLCC	1	2	1	2
—	SGLCD	0	1	0	1
—	SGLCDD	0	1	0	1
SGLH400	SGLC400	2	3	2	3
—	SGLC440	3	4	3	4
SGLH490	SGLC490	3	4	3	4
—	SGLC570	—	—	—	—

- Remarks 1 The bending angle shall be 180° regardless of the classified symbol.
- 2 When hot-rolled base metal is used, the above shall apply to the nominal thicknesses of 1.6 mm and over.
- 3 The values for the coating mass symbol (AZ70), AZ170, (AZ185) and (AZ200) shall be as agreed between the purchaser and the manufacturer.
- 4 The values for SGLH440 and SGLH540 shall be subject to agreement between the purchaser and the manufacturer.

**9.3 Yield point or proof stress, tensile strength and elongation** When sheet and coil are tested in accordance with 16.5, the yield point or proof stress, tensile strength and elongation shall comply with tables 10 or 11.

The yield point shall be the upper yield point.

**Table 10 Yield point or proof stress, tensile strength and elongation (for hot-rolled base metal used)**

Classified symbol	Yield point or proof stress N/mm <sup>2</sup>	Tensile strength N/mm <sup>2</sup>	Elongation %	Test piece and direction of tensile test
SGLHC	(205 min.)	(270 min.)	—	No. 5, in rolling direction
SGLH400	295 min.	400 min.	18 min.	No. 5, in rolling direction or perpendicular to the rolling direction
SGLH440	( <sup>4</sup> )	440 min.	( <sup>4</sup> )	
SGLH490	365 min.	490 min.	16 min.	
SGLH540	( <sup>4</sup> )	540 min.	( <sup>4</sup> )	

Note (<sup>4</sup>) The values for SGLH440 and SGLH540 shall be as agreed between the purchaser and the manufacturer.

- Remarks 1 The values in parentheses in table 10 are shown for informative reference.
- 2 1 N/mm<sup>2</sup> = 1 MPa

**Table 11 Yield point or proof stress, tensile strength and elongation (for cold-reduced base metal used)**

Classified symbol	Yield point or proof stress N/mm <sup>2</sup>	Tensile strength N/mm <sup>2</sup>	Elongation %					Test piece and direction of tensile test
			Nominal thickness mm					
			0.25 or over to and excl. 0.40	0.40 or over to and excl. 0.60	0.60 or over to and excl. 1.0	1.0 or over to and excl. 1.6	1.6 or over up to and incl. 2.3	
SGLCC	(250 min.)	(270 min.)	(20 min.)	(21 min.)	(24 min.)	(24 min.)	(25 min.)	No. 5, in rolling direction
SGLCD	—	270 min.	—	27 min.	31 min.	32 min.	33 min.	
SGLCDD	—	270 min.	—	29 min.	32 min.	34 min.	35 min.	
SGLC400	295 min.	400 min.	16 min.	17 min.	18 min.	18 min.	18 min.	No. 5, in rolling direction or perpendicular to the rolling direction
SGLC440	335 min.	440 min.	14 min.	15 min.	16 min.	18 min.	18 min.	
SGLC490	365 min.	490 min.	12 min.	13 min.	14 min.	16 min.	16 min.	
SGLC570	560 min.	570 min.	—	—	—	—	—	

Remarks 1 The values in parentheses in table 11 are shown for informative.

2 For SGLCD and SGLCDD, coating mass symbols AZ170, (AZ185) and (AZ200) are not applied.

3 1 N/mm<sup>2</sup> = 1 MPa

**10 Presentation of dimensions** The dimensions of sheet and coil shall be expressed as follows:

- a) The thickness of sheet and coil shall be expressed as the thickness of the base metal prior to coating, and this shall be regarded as the nominal thickness. The thickness after coating on the base metal shall be regarded as the product thickness.
- b) The dimensions of sheet shall be expressed in thickness, width and length in millimetres, respectively.
- c) The dimensions of coil shall be expressed in thickness and width in millimetres, respectively. When the mass of coil is expressed as theoretical mass, however, the length shall be given in metres.

**11 Standard dimensions** The standard dimensions of sheet and coil shall be as specified below. However, the standard nominal thickness of corrugated sheet and the standard width and length prior to corrugation shall comply with annex 2. Further, the standard length and width of corrugated sheet after corrugation shall comply with **JIS G 3316**.

- a) **Standard nominal thickness** The standard nominal thickness of sheet and coil shall be as given in table 12.

**Table 12 Standard nominal thickness**

Unit: mm

0.27	0.30	0.35	0.40	0.50	0.60	0.70	0.80	0.90	1.0	1.2	1.4	1.6	1.8	2.0	2.3
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- b) **Standard width and standard length of sheet** The standard width of sheet and coil and the standard length of sheet shall be as given in table 13.

**Table 13 Standard width and length**

Unit: mm

Standard width	Standard length of sheet						
762	1 829	2 134	2 438	2 743	3 048	3 353	3 658
914	1 829	2 134	2 438	2 743	3 048	3 353	3 658
1 000	2 000						
1 219	2 438	3 048	3 658				

Remarks : As for coil, 610 mm shall also be regarded as the standard width, in addition to those given in table 13.

## 12 Dimensional tolerances

**12.1 Product thickness tolerances** Tolerances for the product thickness of sheet and coil shall be as follows:

- Product thickness tolerances shall apply to nominal thickness rounded to three decimal places plus the equivalent thickness of coating given in table 17.
- Product thickness tolerances shall be as given in table 14, 15 or 16.
- Thickness shall be measured at any point not less than 25 mm from a side edge.

**Table 14 Product thickness tolerances**  
(for hot-rolled base metal used for commercial quality)

Unit: mm

Nominal thickness	Width	
	Under 1 200	1 000 or over up to and incl. 1 250
1.6 or over to and excl. 2.00	± 0.17	± 0.18
2.00 or over up to and incl. 2.30	± 0.18	± 0.20



**Table 15 Product thickness tolerances**  
(for hot-rolled base metal used for structural quality)

Unit: mm

Nominal thickness	Width
	1 250 or under
1.6 or over to and excl. 2.00	±0.20
2.00 or over up to and incl. 2.30	±0.21

**Table 16 Product thickness tolerances (for cold-reduced base metal used)**

Unit: mm

Nominal thickness	Width		
	Under 630	630 or over to and excl. 1 000	1 000 or over up to and incl. 1 250
(Under 0.25)	±0.04	±0.04	±0.04
0.25 or over to and excl. 0.40	±0.05	±0.05	±0.05
0.40 or over to and excl. 0.60	±0.06	±0.06	±0.06
0.60 or over to and excl. 0.80	±0.07	±0.07	±0.07
0.80 or over to and excl. 1.0	±0.07	±0.07	±0.08
1.0 or over to and excl. 1.25	±0.08	±0.08	±0.09
1.25 or over to and excl. 1.60	±0.09	±0.10	±0.11
1.60 or over to and excl. 2.00	±0.11	±0.12	±0.13
2.00 or over up to and incl. 2.50	±0.13	±0.14	±0.15
(2.50 or over)	±0.15	±0.16	±0.17

Remarks : The values in parentheses are shown for reference.

**Table 17 Equivalent coating thickness**

Unit: mm

Coating mass symbol	(AZ70)	AZ90	AZ120	AZ150	AZ170	(AZ185)	(AZ200)
Equivalent coating thickness	(0.026)	0.033	0.043	0.054	0.062	(0.067)	(0.072)

Remarks : The values in parentheses are shown for reference.

**12.2 Width tolerances** Tolerances for the width of sheet and coil shall be as given in table 18.

**Table 18 Width tolerances**

Unit: mm

For hot-rolled base metal used		For cold-reduced base metal used
Tolerance (A)	Tolerance (B)	
+25 0	+10 0	+7 0

Remarks : Generally, mill edge is applied to tolerance (A), and cut edge is applied to tolerance (B).

**12.3 Length tolerances** Tolerances for the length of sheet shall be as given in table 19.

**Table 19 Length tolerances**

Unit: mm

For hot-rolled base metal used	For cold-reduced base metal used
+15 0	+15 0

**13 Shapes**

**13.1 Camber** Maximum camber for flat sheet and coil shall be as given tables 20 and 21.

**Table 20 Maximum camber (for hot-rolled base metal used)**

Unit: mm

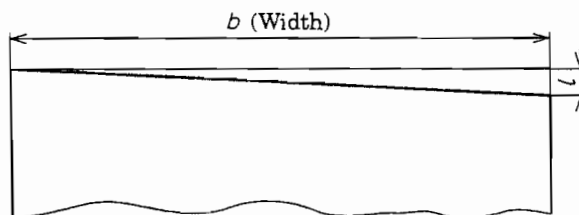
Width	Flat sheet			Coil
	Length			
	Under 2 500	2 500 or over to and excl. 4 000	4 000 or over	
Under 630	5	8	12	5 in any 2 000 length
630 or over to and excl. 1 000	4	6	10	
1 000 or over	3	5	8	

**Table 21 Maximum camber (for cold-reduced base metal used)**

Unit: mm

Width	Flat sheet		Coil
	Length		
	Under 2 000	2 000 or over	
Under 630	4	4 in any 2 000 length	2 in any 2 000 length
630 or over	2	2 in any 2 000 length	

**13.2 Out-of-square** Out-of-square for flat sheet shall be expressed as  $\frac{l}{b} \times 100$  (%) in figure 1 and shall not exceed 1 %.



**Figure 1 Out-of-square for flat sheet**

**13.3 Flatness** Flatness for flat sheet shall be as given in tables 22 and 23. Flatness shall be measured with a sheet lying under its own weight on a flat surface, and the value of flatness shall be obtained by subtracting the sheet thickness from the maximum deviation from the flat horizontal surface. The value thus obtained shall apply to the upper surface of the sheet.

**Table 22 Flatness (for hot-rolled base metal used)**

Unit: mm

Width	Flatness
1 250 or under	16 max.

**Table 23 Flatness (for cold-reduced base metal used)**

Unit: mm

Width	Type		
	Bow	Edge wave <sup>(5)</sup>	Centre buckle <sup>(6)</sup>
Under 1 000	12 max.	8 max.	6 max.
1 000 or over up to and incl. 1 250	15 max.	9 max.	8 max.

Notes <sup>(5)</sup> It refers to the type of flatness in which a wave appears at the edge (the end in the width direction) of sheet and coil.

<sup>(6)</sup> It refers to the type of flatness in which a wave appears at the central part of sheet and coil.

**14 Mass and tolerances**

**14.1 Mass of sheet** The mass of sheet shall, as a rule, be given in theoretical mass in kilogrammes.

**14.2 Mass of coil** The mass of coil shall be given in either actual or theoretical mass in kilogrammes.

**14.3 Calculation method of mass** The calculation method of the mass of sheet and coil shall comply with table 24 according to nominal dimensions and coating mass.

**Table 24 Calculation method of mass**

Calculation order		Calculation method	Number of figures in resultant values
Basic mass of base metal    kg/mm · m <sup>2</sup>		7.85 (1 mm thickness · 1 m <sup>2</sup> area)	—
Unit mass of base metal        kg/m <sup>2</sup>		Basic mass (kg/mm · m <sup>2</sup> ) × nominal thickness (mm)	Rounded off to 4 significant figures.
Unit mass after coating        kg/m <sup>2</sup>		Unit mass of base metal (kg/m <sup>2</sup> ) + coating mass constant (given in table 25)	Rounded off to 4 significant figures.
Sheet	Area of sheet                    m <sup>2</sup>	Width (mm) × length (mm) × 10 <sup>-6</sup>	Rounded off to 4 significant figures.
	Mass of a single sheet        kg	Unit mass after coating (kg/m <sup>2</sup> ) × area (m <sup>2</sup> )	Rounded off to 3 significant figures.
	Mass of a single bundle       kg	Mass of a single sheet (kg) × number of sheets in a single bundle of the same dimensions	Rounded off to integral number of kg.
	Total mass                      kg	Total mass of each bundle (kg)	Integral number of kg.
Coil	Unit mass of coil                kg/m	Unit mass after coating (kg/m <sup>2</sup> ) × width (mm) × 10 <sup>-3</sup>	Rounded off to 3 significant figures.
	Mass of a single coil         kg	Unit mass of coil (kg/m) × length (m)	Rounded off to integral number of kg.
	Total mass                      kg	Total mass of each coil (kg)	Integral number of kg.

- Remarks 1 The number of sheets, when the bundle mass is specified, shall be obtained by dividing the specified mass by the mass of a single sheet of the same shape, dimensions and coating mass, to be rounded off to an integral number.
- 2 The width dimension to be used for calculating the area of corrugated sheet shall be that prior to corrugation.
- 3 The method of rounding off numerical values shall be in accordance with rule A of JIS Z 8401.

**Table 25 Coating mass constants for mass calculation**

Unit: mm

Coating mass symbol	(AZ70)	AZ90	AZ120	AZ150	AZ170	(AZ185)	(AZ200)
Coating mass constant	(0.095)	0.120	0.160	0.200	0.230	(0.250)	(0.270)

Remarks : The values in parentheses are shown for reference.

**14.4 Tolerances for theoretical mass of sheet** Tolerances for the theoretical mass of sheet, which are expressed as the percentage obtained by dividing the difference between the theoretical mass obtained by 14.3 and the actual mass by the theoretical mass, shall be as given in table 26.

**Table 26 Mass tolerances**

Theoretical mass of a single lot kg	Tolerance %	Remarks
Under 600	±10	Calculation shall be made regarding a lot of sheets of the same quality, shape, dimensions and coating mass.
600 or over to and excl. 2 000	± 7.5	
2 000 or over	± 5	

**15 Appearance** Sheet and coil shall be free from defects detrimental to practical use, except the case of coil, which may contain some irregular portions such as welds.

## 16 Tests

### 16.1 Analysis test of chemical composition

#### 16.1.1 General matter of analysis test and sampling method of analysis sample

The chemical composition of base metal of the sheet and coil shall be obtained by means of the cast analysis, and the general matter of analysis test and sampling method of analysis sample shall be in accordance with clause 8 of **JIS G 0404**.

**16.1.2 Analytical method** The analytical method shall be in accordance with **JIS G 0320**.

### 16.2 Coating mass test

**16.2.1 Sampling of test specimen** One test specimen shall be taken from every 50 t or fraction thereof of the products of the same dimensions and coating mass.

For corrugated sheet, the test specimen shall be taken from a flat sheet prior to corrugation.

**16.2.2 Sampling of test piece** The sampling of test pieces shall be in accordance with either the triple-spot test method specified in 4.2.1 b) of **JIS H 0401** or the method specified in annex 3.

**16.2.3 Test method** Coating mass shall be measured on both surfaces of a test piece, and its test method shall use either the antimony-chloride solution, hexamethylene tetramine solution as specified in **JIS H 0401** or shall be as specified in annex 3. A fluorescent X-ray method may be used in the manufacturing line, upon agreement between the purchaser and the manufacturer.

**16.3 Corrosion resistance test of coating** The corrosion resistance test of coating shall be performed according to any method of clause 8 of **JIS H 8502**, table 4 of 7.12 of **JIS K 5621** or **JIS G 0594**.

In addition, this test shall be performed in accordance with the agreement between the purchaser and the manufacturer, and the evaluation criteria (setting of reference value and characteristics) may be as agreed between the purchaser and the manufacturer.

## 16.4 Bend test

**16.4.1 General requirements for test** General requirements for bend test shall comply with clause 9 of JIS G 0404.

**16.4.2 Sampling of test specimen** One test specimen shall be taken from every 50 t or fraction thereof of the products of the same grade, dimensions and coating mass.

**16.4.3 Test piece** Test pieces shall have a width of 75 mm to 125 mm and a suitable length of about twice the width. Unless otherwise specified, one test piece shall be cut from each test specimen parallel to the rolling direction of the base metal.

**16.4.4 Bending of test piece** The test piece shall, as a rule, be bent manually with a vise at an angle of 180° in the longitudinal direction of the test piece, as shown in figure 2. When a hand vise is not available, other suitable means of testing may be adopted.

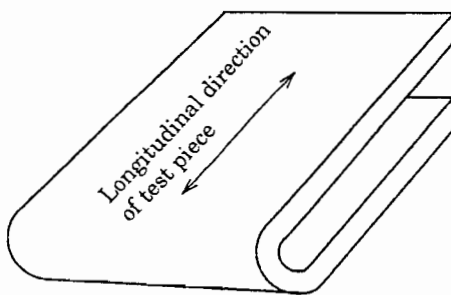


Figure 2 Direction of bend test

## 16.5 Tensile test

**16.5.1 General requirements for test** General requirements for tensile test shall comply with clause 9 of JIS G 0404.

**16.5.2 Sampling of test specimen** One test specimen shall be taken from every 50 t or fraction thereof of the products of the same grade, dimensions and coating mass.

**16.5.3 Test piece** The test piece shall be the No. 5 test piece specified in JIS Z 2201, and one test piece shall be cut from each test specimen in the direction as shown in table 10 and table 11.

**16.5.4 Test method** The test method shall be in accordance with JIS Z 2241.

**16.5.5 Thickness for tensile strength calculation** The thickness to be used for tensile strength calculation shall be either the actually measured thickness after the removal of the coating or one obtainable by subtracting the equivalent coating thickness from the actually measured coated thickness.

## 17 Inspection

**17.1 Inspection** Inspection shall be as follows:

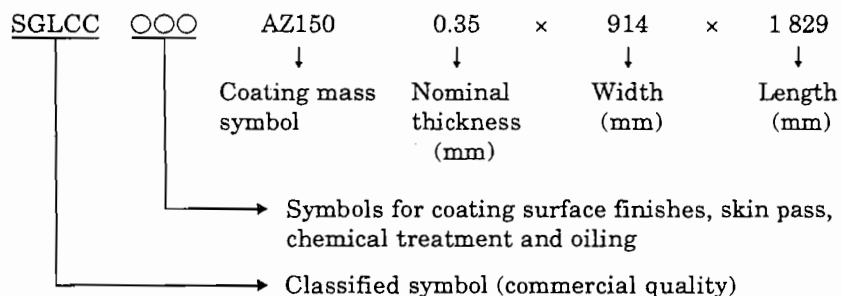
- a) Coating mass shall comply with the requirements of clause 6.
- b) Mechanical properties shall comply with the requirements of clause 9.
- c) Dimensions shall comply with the requirements of clause 12.
- d) Shapes shall comply with the requirements of clause 13.
- e) Mass shall comply with the requirements of clause 14.
- f) Appearance shall comply with the requirements of clause 15.

**17.2 Reinspection** When a part of test results for coating mass, bending and tension fails to comply with the requirements, a retest on the relevant items may be carried out in accordance with 9.8 of **JIS G 0404**, to determine whether it is acceptable or not.

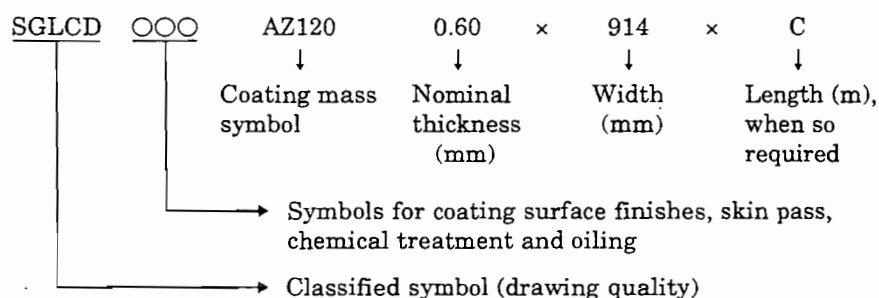
**18 Markings** Markings shall be as follows:

- a) For each package or bundle of the sheet and coil that have passed inspection, the following items shall be legibly marked by a suitable means, except that, upon agreement between the purchaser and the manufacturer, some of these items may be omitted.
  - 1) Classified symbol
  - 2) Symbol for skin passing, chemical treatment, oiling, etc.  
Remarks : These symbols shall be marked when specified by the purchaser.
  - 3) Coating mass symbol
  - 4) Dimensions
  - 5) Number of sheets or mass
  - 6) Identification number of product
  - 7) Manufacturer's name or identifying brand
- b) Marking on each sheet that has passed inspection may be omitted, except that, upon agreement between the purchaser and the manufacturer, some or all of the following items may be marked on each sheet by a suitable means.
  - 1) Nominal thickness
  - 2) Classified symbol
  - 3) Coating mass symbol
  - 4) Manufacturer's name or identifying brand
- c) Markings shall be as shown in the following examples.

**Example 1 For sheet**



**Example 2 For coil**



**19 Items to be confirmed at the time of order** The purchaser and the manufacturer should include the following information in an inquiry sheet and an order sheet in order to specify the matter according to this Standard appropriately.

- a) Classification symbol (see table 1 and table 2)
- b) Dimensions (for standard nominal thickness, standard width and length, see table 12 and table 13)
- c) Skin passing
- d) Coating mass symbol (see table 5)
- e) Symbol for chemical treatment (see table 6)
- f) Symbol for oiling (see table 7)
- g) Maximum mass and minimum mass of one bundle or one coil of a product
- h) Total mass ordered
- i) Tolerance on width in the case of a coil (see table 18)
- j) Internal diameter or external diameter in the case of a coil
- k) Application, processing method, etc. when possible

**20 Report** When there is a request of the purchaser beforehand, the manufacturer shall submit the inspection document to the purchaser. In this case, the report shall comply with the requirements of clause 13 in **JIS G 0404**. Unless otherwise especially specified, the specification of inspection document shall be symbol 2.3 or 3.1.B in table 1 of **JIS G 0415**.



**Annex 1 (normative)**

**Nominal thicknesses and coating mass symbols for sheets and coils for roofing and architectural siding**

**1 Scope** This annex specifies nominal thicknesses and coating mass symbols for sheets and coils (using cold-reduced base metal) for roofing and architectural siding.

**2 Nominal thicknesses and coating mass symbols** The nominal thicknesses and coating mass symbols applicable to sheets and coils for roofing and architectural siding shall be as given in annex 1 table 1.

**Annex 1 Table 1 Nominal thickness and coating mass symbol**

Unit: mm

Use	Nominal thickness	Coating mass symbol
For roofing	0.35 or over	AZ150
For architectural siding	0.27 or over up to and incl. 0.50	AZ90, AZ120, AZ150
	Over 0.50 up to and incl. 1.0	AZ120, AZ150
	Over 1.0	AZ150

Remarks : The application of AZ170, (AZ185) and (AZ200) may be agreed upon between the purchaser and the manufacturer.

**Annex 2 (normative)**

**Nominal thicknesses, coating mass symbols and standard dimensions for corrugated sheets**

**1 Scope** This annex specifies nominal thicknesses, coating mass symbols and standard dimensions for corrugated sheets.

**2 Nominal thicknesses and coating mass symbols** The nominal thicknesses and coating mass symbols applicable to corrugated sheets shall be as given in annex 2 table 1.

**Annex 2 Table 1 Nominal thickness and coating mass symbol**

Unit: mm

Nominal thickness	Coating mass symbol
0.25 or over up to and incl. 0.50	AZ90, AZ120, AZ150
Over 0.50 up to and incl. 1.0	AZ120, AZ150

Remarks : The application of AZ170, (AZ185) and (AZ200) may be agreed upon between the purchaser and the manufacturer.

**3 Standard dimensions**

**3.1 Standard nominal thickness** The standard nominal thicknesses of corrugated sheets shall be as given in annex 2 table 2.

**Annex 2 Table 2 Standard nominal thickness**

Unit: mm

0.25	0.27	0.30	0.35	0.40	0.50	0.60	0.80	1.0
------	------	------	------	------	------	------	------	-----

**3.2 Standard widths and lengths of corrugated sheets prior to corrugation** The standard widths and lengths of corrugated sheets prior to corrugation shall be as given in annex 2 table 3.

**Annex 2 Table 3 Standard width and length**

Unit: mm

Standard width before corrugation	Standard length							
762	1 829	2 134	2 438	2 743	3 048	3 353	3 658	
914	1 829	2 134	2 438	2 743	3 048	3 353	3 658	
1 000	2 000							

### Annex 3 (normative)

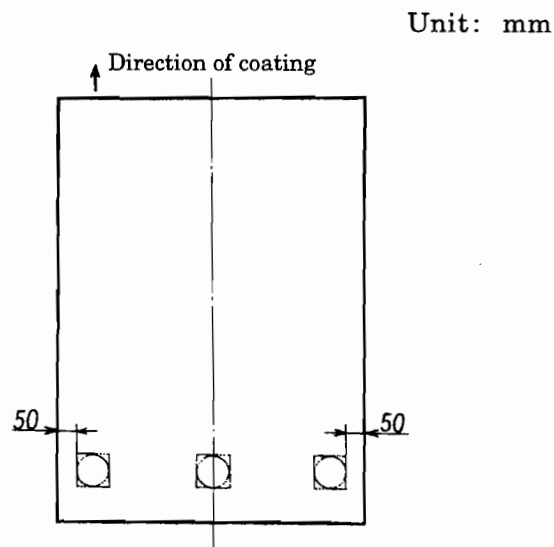
## Test method for the coating mass of hot-dip 55 % aluminium-zinc alloy-coated steel sheets and coils using fluorescent X-rays

**1 Scope** This annex specifies the test method for the coating mass of hot-dip 55 % aluminium-zinc alloy-coated steel sheets and coils using fluorescent X-rays.

### 2 Test piece

**2.1 Size of test piece** A test piece shall be of the size that allows a fluorescent X-ray irradiation area of 314 mm<sup>2</sup> or over up to and including 2 581 mm<sup>2</sup>.

**2.2 Test piece sampling location** Test pieces shall be cut off from the test specimens prepared in accordance with the provision of 16.2.1 of the text at the locations shown in annex 3 figure 1. However, cutting of test pieces may be omitted when coating mass measurements are made at the same locations.

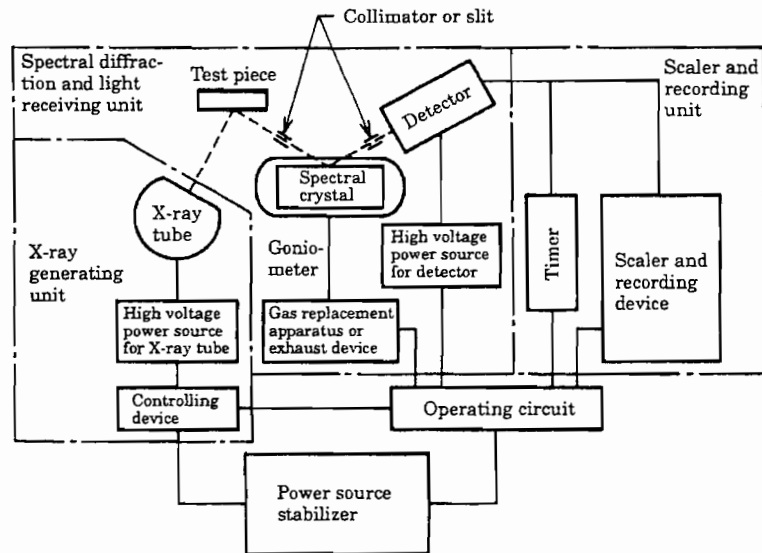


**Annex 3 Figure 1 Test piece sampling location**

**3 Test apparatus** Either of the two apparatus provided in 3.1 and 3.2 may be used (see JIS K 0119), according to the generating source of radiation to be used for exciting the test piece.

**3.1 Apparatus using X-ray tube as generating source** The apparatus using an X-ray tube as the generating source shall be as follows:

- a) An example of the apparatus is shown in annex 3 figure 2.



**Annex 3 Figure 2 Fluorescent X-ray test apparatus  
(using X-ray tube)**

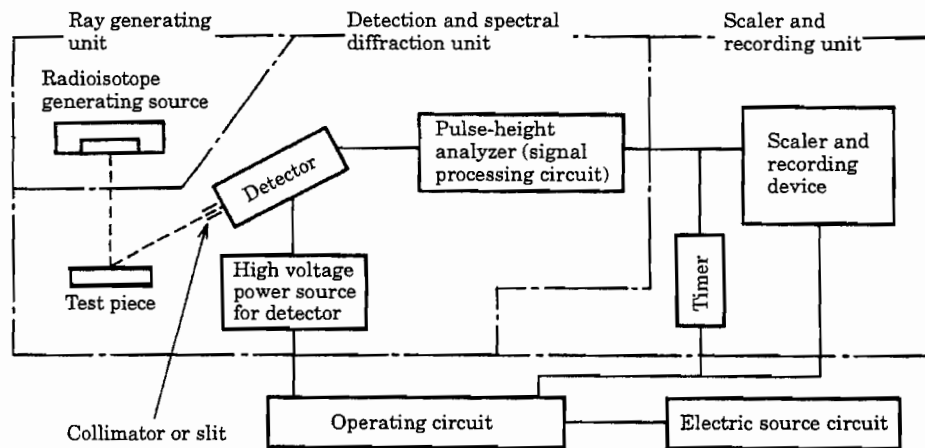
- b) **X-ray generating unit** This unit consists of an X-ray tube, which generates a sufficient quantity of X-rays to excite and determine the constituent atoms of the test piece, and power source capable of supplying the necessary acceleration voltage and tube current.
- c) **Spectral diffraction and light receiving unit** This unit is designed to spectrally diffract and detect the fluorescent X-rays emitted from the zinc which is excited by X-ray irradiation, and consists of a specimen chamber, a goniometer, a collimator or slit, a spectral crystal, a detector, etc.

For the detector, a Geiger-Müller counter, a scintillation counter, etc. shall be adopted.

- d) **Scaler and recording unit** This unit designed to measure, indicate the record the output of the detector is usually equipped with an operating circuit for automatic measurement, and consists of a counting rate meter, a proportional amplifier, a pulse-height analyzer, a scaler, a time, a printer, etc.

**3.2 Apparatus using radioisotope as generating source** The apparatus using a radioisotope as the generating source shall be as follows:

- a) **Example of apparatus** An example of the apparatus is shown in annex 3 figure 3.



**Annex 3 Figure 3 Fluorescent X-ray test apparatus  
(using radioisotope)**

- b) **Radiation-source unit** A radioisotope radiation source which emits a sufficient quantity of X-rays to excite and determine the constituent atoms of the test piece shall be used.
- c) **Detection and spectral diffraction unit** This unit is designed to detect and spectrally diffract the fluorescent X-rays emitted from the zinc which is excited by  $\gamma$ -ray irradiation, and consists of a specimen chamber, a collimator or slit, a detector, a proportional amplifier, a pulse-height analyzer, etc.

For the detector, a proportional counter, scintillation counter, a Geiger-Müller counter, etc. shall be adopted.

- d) **Scaler and recording unit** This unit designed to measure, indicate and record the output of the pulse-height analyzer is usually equipped with an operating circuit for automatic measurement, and consists of a counting rate meter, a scaler, a timer, a printer, etc.

**4 Spectral line for measurement** The spectral line for measurement shall be  $ZnK\alpha$  (first order), with a wavelength of 14.35 nm.

**5 Operation** The operation involved shall be as follows:

- a) A test piece shall be placed correctly in the specimen chamber of the apparatus.
- b) X-rays or  $\gamma$ -rays shall be irradiated on the test piece under the predetermined conditions, and the amount of fluorescent X-rays shall be read with the indicator.
- c) The test piece of which the zinc coating mass became known in accordance with the method specified in **JIS H 0401** shall be used, and the working curve shall be made from the relational expression of the intensity of fluorescent X-rays and the zinc coating mass.
- d) An indicated value on the indicator shall be converted into a coating mass per  $m^2$  ( $g/m^2$  per side) with the aid of the table (working curve) corresponding to the predetermined conditions.

- e) The above procedure shall be repeated for the reverse side of the test piece to obtain its coating mass, and the total mass of coating on both sides shall be taken as the coating mass ( $\text{g}/\text{m}^2$ , both surfaces) of the test piece.

## Annex 4 (informative)

### Continuous hot-dip 55 % aluminium/zinc-coated steel sheet of commercial, drawing and structural qualities

**Introduction** This annex has been prepared based on the second edition of **ISO 9364** *Continuous hot-dip aluminium/zinc-coated steel sheet of commercial, drawing and structural qualities* published in 2001 without modifying the technical contents. This annex can not be used to substitute the provisions of the text of this Standard.

#### 1 Scope

**1.1** This annex specifies the characteristics of steel of commercial, drawing and structural qualities coated by a continuous hot-dip aluminium/zinc alloy coating process. The aluminium/zinc alloy composition by mass is nominally 55 % aluminium, 1.6 % silicon and the balance zinc. The product is intended for applications where the corrosion characteristics of aluminium coupled with those of zinc are desired.

**1.2** Aluminium/zinc-coated steel sheet is produced in thicknesses up to 5.0 mm after coating, and in widths of 600 mm and over in coils and cut lengths. Aluminium/zinc-coated steel sheet less than 600 mm wide may be slit from wide sheet and will be considered as sheet.

NOTE : Values of total theoretical thickness for coating mass are given in annex 4 attached table 1.

**1.3** Commercial quality aluminium/zinc-coated steel sheet (quality 0.1) is intended for general fabricating purposes where sheet is used in the flat, or for bending or moderate forming.

**1.4** Drawing quality aluminium/zinc-coated steel sheet (qualities 02 and 03) are intended for drawing or severe forming. It is furnished to all the requirements of this annex or, with agreement when ordered, to fabricate an identified part, in which case the mechanical properties of annex 4 table 3 do not apply.

Drawing qualities are identified as follows:

02 : Drawing quality

03 : Deep drawing quality

**1.5** Structural quality aluminium/zinc-coated steel sheet is produced in six grades as defined by a minimum yield stress.

**2 Normative references** The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards only the edition of indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply.

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

ISO 3497:2000 *Metallic coatings—Measurement of coating thickness—X-ray spectrometric methods*

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

**3 Terms and definitions** For the purposes of this annex, the following terms and definitions apply.

**3.1 continuous hot-dip aluminium/zinc coated steel sheet** product obtained by hot-dip coating steel sheet coils on a continuous aluminium/zinc coating line to produce either coated coils or cut lengths

### **3.2 types of aluminium/zinc coatings**

**3.2.1 normal spangle coating** coating formed as a result of unrestricted growth of aluminium/zinc crystals during normal solidification

**3.2.2 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

NOTE: End-use applications may require negotiations between the supplier and consumer in order to establish specific surface requirements.

**3.3 skin pass** A light cold rolling of the product

NOTE: The purpose of the skin passing is one or more of the following:

- a) to minimize the appearance of coil breaks, stretcher strains (Luder's lines) and fluting;
- b) to control the shape;
- c) to obtain the required surface finish.

**3.4 aluminum killed** deoxidized with aluminum sufficient to prevent the evolution of gas during solidification

**3.5 resquared** attempt to approach a true 90° angle at the shear cut

NOTES 1 This normally applies to steel sheet for which tighter than standard width, length, camber or out-of-square tolerances are required and which typically necessitates an additional shearing operation after the sheet has been cut to length from a coil.

2 "Resquared" is referred to as "restricted" in some areas of the world.

## **4 Designations**

**4.1 General** The designation system includes the coating mass designation, coating condition, surface treatment, quality and grade of steel.

The letters AZ in annex 4 table 1 are used to indicate 55 % aluminium/zinc coating.



**4.2 Coating mass** The coating mass designations are 090, 100, 150, 165, 185 and 200 as listed in annex 4 table 1.

The coating is expressed as the total mass on both surfaces in g/m<sup>2</sup>. The coating mass specified shall be compatible with the desired service life, the thickness of the base metal and the forming requirements involved.

**4.3 Coating type** The type of coating is designated as:

- N normal spangle coating (as coated);
- S skin-passed for improved surface (smoother) condition.

**4.4 Surface treatment** The surface treatment is designated as:

- A oiling;
- B mill passivation plus oiling;
- C mill passivation;
- D no surface treatment.

**4.5 Base metal quality** This is designated as:

- 01 commercial quality;
- 02 drawing quality;
- 03 deep drawing quality.

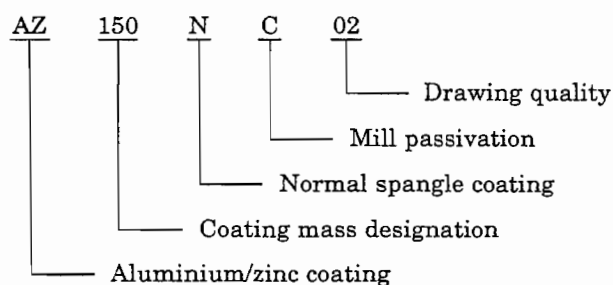
Structural quality grades are indicated by three digits as listed in annex 4 table 2.

**4.6 Complete designation**

**Example 1**

Aluminium killed steel sheet with a coating of 55 % aluminium/zinc of mass 150, of normal spangle quality, that has undergone mill passivation and is of drawing quality, is designated as follows:

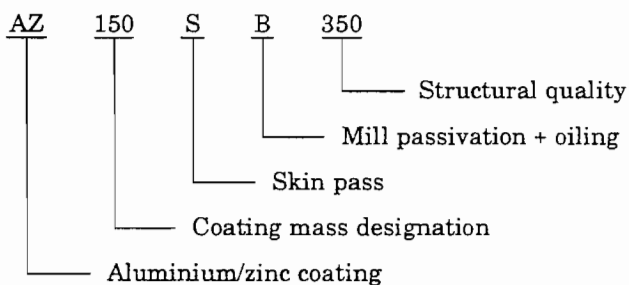
AZ150NC02



**Example 2**

Steel sheet with a coating of 55 % aluminium/zinc of mass 150, in the skin-passed condition, that has undergone mill passivation plus oiling and is of structural quality grade is designated as follows:

AZ150SB350



**Annex 4 Table 1 Minimum coating mass for equally coated sheet and coil (total mass on both surface)**

Unit: g/m<sup>2</sup>

Coating designation	Triple-spot test average	Single-spot test
AZ090	90	75
AZ100	100	85
AZ150	150	130
AZ165	165	140
AZ185	185	160
AZ200	200	170

NOTE : The coating mass in grammes per square metre refers to the total coating on both surfaces. Because of the many variables and changing conditions that are characteristic of continuous hot-dip 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 test limit will be found on either surface.

**Annex 4 Table 2 Mechanical properties of structural-quality steels and coating bend test**

Grade	$R_e$ min.  N/mm <sup>2</sup>	$R_m$ min.  N/mm <sup>2</sup>	A min. <sup>(1)</sup>		Coated metal 180° bend mandrel diameter	
			%		mm	
			$L_0=50$ mm	$L_0=80$ mm	$e < 3$ mm	$e \geq 3$ mm
220	220	320	20	18	1e	2e
250	250	350	18	16	1e	2e
280	280	390	16	14	2e	3e
320	320	430	14	12	3e	3e
350	320	450	12	10	—	—
550 <sup>(2)</sup>	550	560	—	—	—	—

$R_e$  = yield stress—can be either  $R_{eL}$  or  $R_{eH}$  but not both  
 $R_{eL}$  = lower yield stress  
 $R_{eH}$  = higher yield stress  
 $R_m$  = tensile strength  
A = percentage elongation after fracture  
 $L_0$  = gauge length on test piece  
e = thickness of bend test piece  
1 N/mm<sup>2</sup> = 1 MPa

NOTES 1  $R_{eL}$  can 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.  
2 In determining the base metal mechanical properties, base metal thickness should be measured after stripping the coating from the end of the specimen contacting the grips of the tensile-testing machine before testing.

Notes <sup>(1)</sup> Use either  $L_0 = 50$  mm or  $L_0 = 80$  mm to measure elongation. For material up to and including 0.6 mm in thickness, the elongation values in annex 4 table 4 shall be reduced by 2.  
<sup>(2)</sup> Grade 550 is the unannealed condition and therefore has limited ductility. If the hardness is HRB85 or higher, no tensile test is required.

## 5 Manufacturing processes

**5.1 Strain ageing** Aluminium/zinc coated steel sheet tends to strain age, and this may lead to the following:

- a) surface marking from stretcher strain (Luder's lines) or fluting when the steel is formed;
- b) a deterioration in ductility.

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. Reasonable freedom from stretcher strain can be achieved by effective roller levelling immediately prior to fabrication at the purchaser's plant.

**5.2 Mill passivation** A chemical treatment may be applied to aluminium/zinc-coated steel sheet to minimize the hazard of wet storage stain (white rust) during shipment and storage. However, the inhibiting characteristics of the treatment are limited and if a shipment is received wet, the material shall be used immediately or dried.

**5.3 Painting** Hot-dip aluminium/zinc-coated steel sheet is a suitable base for paint but the first treatment may be different from those used on mild 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/aluminium-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.

**5.4 Oiling** Oiling of the as-produced aluminium/zinc-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 black rust on this type of product). For these reasons, the purchaser is advised to consider specifying the aluminium/zinc-coated steel in the oiled condition, provided this is compatible with his processing system.

**5.5 Coating line butt welds** These may be permitted if agreed upon between the purchaser and the manufacturer.

## **6 Conditions of manufacture**

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

**6.2 Chemical composition of the steel** The chemical composition (heat analysis) shall be in accordance with the values given in annex 4 tables 3 and 4.

### **6.3 Chemical analysis**

**6.3.1 Heat analysis** heat analysis of each heat of steel shall be made by the manufacturer to determine compliance with the requirements of annex 4 tables 3 and 4. When requested, this analysis shall be reported to the purchaser or his representative.

**6.3.2 Product analysis** A product analysis may be made by the purchaser to verify the specified analysis of the product and shall take into consideration any normal heterogeneity. Non-killed steels (such as rimmed or capped) are not technologically suited to product analysis. For killed steels, the sampling method and deviation limits shall be agreed upon between manufacturer and purchaser at the time of ordering.

**Annex 4 Table 3 Chemical composition (heat analysis)**

Unit: %

Base metal quality		C max.	Mn max.	P max.	S max.
Name	Designation				
Commercial	01	0.10	0.60	0.030	0.035
Drawing	02 and 03	0.06	0.50	0.020	0.025
Structural	220 to 550	0.25 <sup>(1)</sup>	1.15	0.20 <sup>(2)</sup>	0.040

Notes (1) Grade 350 may exceed the limits given in annex 4 table 4 or conform to all requirements of annex 4 table 4 and have 0.40 % max. carbon.

(2) Grades 250 and 280 phosphorus: 0.10 % max. Grade 350: phosphorus: 0.20 % max.

**Annex 4 Table 4 Limits on additional chemical elements<sup>(1)</sup>**

Unit: %

Element max.	Heat analysis	Product analysis
Cu <sup>(2)</sup>	0.20	0.23
Ni <sup>(2)</sup>	0.20	0.23
Cr <sup>(2), (3)</sup>	0.15	0.19
Mo <sup>(2), (2)</sup>	0.06	0.07
Nb <sup>(4)</sup>	0.008	0.018
V <sup>(4)</sup>	0.008	0.018
Ti <sup>(4)</sup>	0.008	0.018

Notes (1) 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 %".

(2) 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.

(3) 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.

(4) Heat analysis greater than 0.008 % may be supplied after agreement between the purchaser and the manufacturer.

**6.4 Steel substrate** Unless otherwise agreed between interested parties, the rolling condition of the sheets to be coated (cold-rolled sheet or hot-rolled sheet) is at the discretion of the manufacturer.

**6.5 Coating mass** The coating mass shall conform to the requirements presented in annex 4 table 1 for the specified coating designation. The coating mass is the total amount of the aluminium/zinc alloy, including both sides of the sheet, expressed in grammes per square metre (g/m<sup>2</sup>) of sheet. Methods of checking that the material complies with this annex are given in 8.2.1 and 9.2.2 to 9.2.4.

**6.6 Weldability** The product is suitable for welding if appropriate welding conditions are selected with special attention paid to the heavier coatings. If appropriate welding conditions are selected, the product is suitable for spot welding and roller seam welding, as well as fusion welding.

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.

**6.7 Application** It is desirable that the specified product be identified for fabrication by name of the part or by intended application, which shall be compatible with the grade and coating designation specified. Proper identification of the part may include visual examination, prints or description, or a combination of these.

Drawing qualities (02 and 03) may be produced to make an identified part according to a performance criteria or 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 and the mechanical properties in annex 4 table 5 do not apply.

## **6.8 Mechanical properties**

**6.8.1 Drawing qualities** Except when ordered according to an identified part as explained in 6.7, at the time that the steel is made available for shipment, the mechanical properties shall be as stated in annex 4 table 5 when they are determined on test pieces obtained in accordance with requirements of 8.1.

NOTE : Prolonged storage of the sheet may cause a change in the mechanical properties (increase in hardness and decrease in elongation) leading to adverse effect on formability. See note 1, annex 4 table 5.

**6.8.2 Structural qualities** At the time that the steel is made available for shipment, the mechanical properties shall be as stated in annex 4 table 2 when they are determined on test pieces obtained in accordance with the requirements of 8.1.

**7 Dimensional tolerances** Dimensional tolerances shall be in accordance with annex 4 tables 6 to 17. The thickness is the total of the base metal and the coating.

**Annex 4 Table 5 Mechanical properties**

Base metal quality		$R_e$ max. (1)	$R_m$ max. (2)	$A$ min. (3) %		
Name	Designation	N/mm <sup>2</sup> (2), (4)	N/mm <sup>2</sup>	$L_0=50$ mm	$L_0=80$ mm	$L_0=5.65 \sqrt{S_0}$ (5)
Commercial	01	—	—	—	—	—
Drawing	02	300 (6)	430	24	23	22
Deep drawing	03	260	410	26	25	24

$R_e$  = yield stress  
 $R_m$  = tensile strength  
 $A$  = percentage elongation after fracture  
 $L_0$  = gauge length on test piece  
 $S_0$  = original cross-sectional area of gauge length

NOTES 1 Time periods that may be applied for values stated in this table:

Quality	Time period
Commercial	—
Drawing	8 days
Deep drawing	1 month

2 For products produced according to performance criteria, the typical mechanical properties presented here are non-mandatory. They are intended solely to provide the purchaser with as much information as possible to make an intelligent ordering decision. Values outside these ranges are to be expected. The purchaser may negotiate with the supplier if a specific range, or a more restrictive range, is required for the application.

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

Notes (1) The yield values apply to 0.2 % proof stress if the yield point is not pronounced, otherwise to the lower yield point ( $R_{eL}$ ).

(2) Minimum tensile strength for drawing qualities would normally be expected to be 260 N/mm<sup>2</sup>. All tensile strength values determined to the nearest 10 N/mm<sup>2</sup>.

(3) For material  $\leq 0.6$  mm in thickness, the elongation values in the table shall be reduced by 2.

(4) 1 N/mm<sup>2</sup> = 1 MPa.

(5) May be used for material > 3 mm in thickness.

(6) This value applies to skin-passed products only.

**Annex 4 Table 6 Normal thickness tolerances for commercial and drawing quality coils and cut lengths**

Unit: mm

Specified width	Thickness tolerances <sup>(1)</sup> for specified thicknesses <sup>(2)</sup>										
	≤ 0.4	> 0.4 ≤ 0.6	> 0.6 ≤ 0.8	> 0.8 ≤ 1.0	> 1.0 ≤ 1.2	> 1.2 ≤ 1.6	> 1.6 ≤ 2.0	> 2.0 ≤ 2.5	> 2.5 ≤ 3.0	> 3.0 ≤ 4.0	> 4.0 ≤ 5.0
600 ≤ 1 200	±0.05	±0.06	±0.08	±0.09	±0.10	±0.12	±0.18	±0.19	±0.21	±0.23	±0.25
> 1 200 ≤ 1 500	±0.06	±0.07	±0.09	±0.10	±0.11	±0.13	±0.20	±0.22	±0.23	±0.25	±0.27
> 1 500 ≤ 1 800	—	±0.09	±0.10	±0.11	±0.13	±0.15	±0.22	±0.24	±0.25	±0.27	±0.29

NOTE : Given the difference in tolerances and physical properties of hot-rolled and cold-rolled sheet products, the user and supplier may negotiate a specific type of substrate.  
Where thickness tolerance is based on base metal thickness the value of 0.01 mm will be subtracted from the values in these tables.

Notes <sup>(1)</sup> The thickness tolerances for sheet in coil form are the same as for sheet supplied in cut lengths but in cases where welds are present, the tolerances shall be double those given over a length of 15 m in the vicinity of the weld.  
<sup>(2)</sup> Thickness is measured at any point on the sheet not less than 25 mm from a side edge.

**Annex 4 Table 7 Normal thickness tolerances for structural-quality coils and cut lengths**

Unit: mm

Specified width	Thickness tolerances <sup>(1)</sup> for specified thicknesses <sup>(2)</sup>										
	≤ 0.4	> 0.4 ≤ 0.6	> 0.6 ≤ 0.8	> 0.8 ≤ 1.0	> 1.0 ≤ 1.2	> 1.2 ≤ 1.6	> 1.6 ≤ 2.0	> 2.0 ≤ 2.5	> 2.5 ≤ 3.0	> 3.0 ≤ 4.0	> 4.0 ≤ 5.0
600 ≤ 1 200	±0.06	±0.07	±0.09	±0.10	±0.11	±0.13	±0.18	±0.19	±0.21	±0.23	±0.25
> 1 200 ≤ 1 500	±0.07	±0.08	±0.10	±0.11	±0.12	±0.14	±0.20	±0.22	±0.23	±0.25	±0.27
> 1 500 ≤ 1 800	—	±0.10	±0.11	±0.12	±0.14	±0.16	±0.22	±0.24	±0.25	±0.27	±0.29

NOTE : Given the difference in tolerances and physical properties of hot-rolled and cold-rolled sheet products, the user and supplier may negotiate a specific type of substrate.  
Where thickness tolerance is based on base metal thickness the value of 0.01 mm will be subtracted from the values in these tables.

Notes <sup>(1)</sup> Thickness tolerances for sheet in coil form are the same as for sheets supplied in cut lengths, but in cases where welds are present, the tolerances shall be double those given over a length of 15 m in the vicinity of the weld. For specified strength levels of  $R_e = 360 \text{ N/mm}^2$  and greater increase the thickness tolerances by 10 %, by applying normal rounding off procedures. Tolerances for grade 550 shall be as agreed upon between the purchaser and the manufacturer.  
<sup>(2)</sup> Thickness is measured at any point on the sheet not less than 25 mm from a side edge.



**Annex 4 Table 8 Restricted thickness tolerances for commercial, drawing and structural quality coils and cut lengths (Hot-rolled substrate)**

Unit : mm

Specified width	Thickness tolerances <sup>(1)</sup> for specified thicknesses <sup>(2)</sup>				
	≤ 2.0	>2.0 ≤ 2.5	>2.5 ≤ 3.0	>3.0 ≤ 4.0	>4.0 ≤ 5.0
600 ≤ 1 200	±0.14	±0.15	±0.16	±0.18	±0.20
> 1 200 ≤ 1 500	±0.15	±0.16	±0.18	±0.19	±0.22
> 1 500 ≤ 1 800	±0.15	±0.18	±0.20	±0.22	±0.23

Notes <sup>(1)</sup> Thickness tolerances for sheet in coil form are the same as for sheets supplied in cut lengths, but in cases where welds are present the tolerances shall be double those given over a length of 15 m in the vicinity of the weld. For specified strength levels of  $R_e = 360 \text{ N/mm}^2$  and greater tolerances are increased by 10 %, applying normal rounding off procedures. Tolerances for grade 550 shall be as agreed upon between the purchaser and the manufacturer.

<sup>(2)</sup> Thickness is measured at any point on the sheet not less than 25 mm from a side edge.

NOTE : Where thickness tolerance is based on base metal thickness the value of 0.01 mm will be subtracted from the values in these tables.

**Annex 4 Table 9 Restricted thickness tolerances for commercial, drawing and structural quality coils and cut lengths (Cold-rolled substrate)**

Unit : mm

Specified width	Thickness tolerances <sup>(1)</sup> for specified thicknesses <sup>(2)</sup>									
	≤ 0.4	>0.4 ≤ 0.6	>0.6 ≤ 0.8	>0.8 ≤ 1.0	>1.0 ≤ 1.2	>1.2 ≤ 1.6	>1.6 ≤ 2.0	>2.0 ≤ 2.5	>2.5 ≤ 3.0	>3.0 ≤ 4.0
600 ≤ 1 200	±0.035	±0.045	±0.05	±0.055	±0.065	±0.08	±0.09	±0.11	±0.12	±0.13
> 1 200 ≤ 1 500	±0.045	±0.055	±0.06	±0.07	±0.08	±0.09	±0.10	±0.12	±0.13	±0.14
> 1 500 ≤ 1 800	—	±0.06	±0.07	±0.07	±0.08	±0.09	±0.10	±0.12	±0.13	±0.14

NOTE : Where thickness tolerance is based on base metal thickness the value of 0.01 mm will be subtracted from the values in these tables.

Notes <sup>(1)</sup> Thickness tolerances for sheet in coil form are the same as for sheets supplied in cut lengths, but in cases where welds are present the tolerances shall be double those given over a length of 15 m in the vicinity of the weld. For specified strength levels of  $R_e = 360 \text{ N/mm}^2$  and greater increase the thickness tolerances by 10 %, by applying normal rounding off procedures. Tolerances for grade 550 shall be as agreed upon between the purchaser and the manufacturer.

<sup>(2)</sup> Thickness is measured at any point on the sheet not less than 25 mm from a side edge.

**Annex 4 Table 10 Width tolerances for coils and cut lengths  
(not resquared)**

Unit: mm

Specified width	Tolerance
$\leq 1\ 500$	$\pm 7$ 0
$> 1\ 500 \leq 1\ 800$	$\pm 10$ 0

NOTE : For resquared material more restrictive tolerances are agreed by the purchaser and the manufacturer.

**Annex 4 Table 11 Length tolerances for cut lengths (not resquared)**

Unit: mm

Specified length	Tolerance
$\leq 3\ 000$	$\pm 20$ 0
$> 3\ 000 \leq 6\ 000$	$\pm 30$ 0
$> 6\ 000$	$+0.5\ \% \times \text{length}$ 0

NOTE : For resquared material more restrictive tolerances are agreed by the purchaser and the manufacturer.

**Annex 4 Table 12 Camber tolerances for coils and cut lengths  
(not resquared)**

Form	Camber tolerance
Coils	20 mm in any 5 000 mm length
Cut lengths	$0.4\ \% \times \text{length}$

NOTES 1 Camber is the greatest deviation of a side edge from a straight line, the measurement being taken on the concave side with a straight edge as shown in annex 4 figure 1.

2 For resquared material more restrictive tolerances are agreed by the purchaser and the manufacturer.

**Annex 4 Table 13 Out-of-square tolerance for cut lengths  
(not resquared)**

Dimensions	Out-of-square tolerance
All thickness and all sizes	$1.0\ \% \times \text{width}$

NOTE : Out-of-square is the greatest deviation of an end edge from a straight line at right angles to a side and touching one corner as shown in annex 4 figure 2. It can also be measured as one-half the difference between the diagonals of the cut length sheet.

**Annex 4 Table 14 Out-of-square tolerances (resquared material)**

Unit: mm

Specified length	Specified width	Out-of-square tolerance
≤ 3 000	≤ 1 200	+2 0
	> 1 200	+3 0
> 3 000	All widths	+3 0

NOTES 1 Out-of-square is the greatest deviation of an end edge from a straight line at right angles to a side and touching one corner as shown in annex 4 figure 2. It can also be measured as one-half the difference between the diagonals of the cut length sheet.

2 When measuring material ordered to resquared tolerances, consideration may have to be given to extreme variations in temperature.

**Annex 4 Table 15 Standard flatness tolerances for commercial and drawing quality in cut lengths<sup>(1)</sup>**

Unit: mm

Specified thickness	Specified width	Flatness tolerance
≤ 0.7	≤ 1 200	15 max.
	> 1 200 ≤ 1 500	18 max.
	> 1 500	22 max.
> 0.7 ≤ 1.2	≤ 1 200	12 max.
	> 1 200 ≤ 1 500	15 max.
	> 1 500	19 max.
> 1.2	≤ 1 200	10 max.
	> 1 200 ≤ 1 500	12 max.
	> 1 500	17 max.

NOTE : Maximum deviation from a flat horizontal surface: with the sheet lying under its own weight on a flat surface, the maximum distance between the lower surface of the sheet and the flat horizontal surface is the maximum deviation from flatness as shown in annex 4 figure 3.

Note <sup>(1)</sup> This table also applies to sheet cut to length from coils by the customer when agreed-upon flattening procedures are performed. For specified strength levels of  $R_{eL} = 360 \text{ N/mm}^2$  and greater increase the flatness tolerances by 25 %. These tolerances are only applicable to sheet ≤ 5 000 mm length when the thickness is 5 mm or less. Tolerances for sheet exceeding 5 000 mm in length shall be agreed by the purchaser and the manufacturer.

**Annex 4 Table 16 Restricted flatness tolerances for commercial and drawing quality in cut lengths<sup>(1)</sup>**

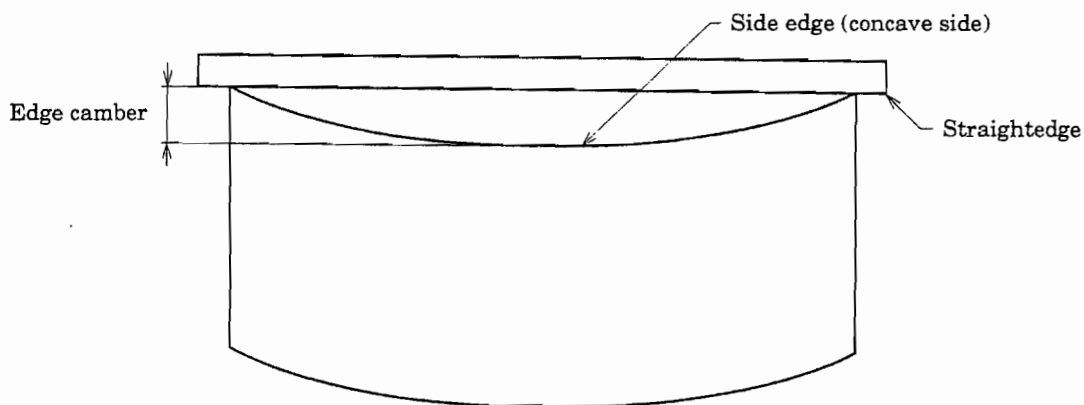
Unit: mm

Specified thickness	Specified width	Specified length	Flatness tolerance
≤ 2	≤ 1 200	≤ 2 500	9 max.
	> 1 200	> 2 500	15 max.
> 2 ≤ 5	≤ 1 200	≤ 2 500	8 max.
	> 1 200	> 2 500	13 max.
NOTE : Maximum deviation from a flat horizontal surface: with the sheet lying under its own weight on a flat surface, the maximum distance between the lower surface of the sheet and the flat horizontal surface is the maximum deviation from flatness as shown in annex 4 figure 3.			
Note <sup>(1)</sup> Tolerances for sheet > 5 000 mm in length shall be agreed by the purchaser and the manufacturer.			

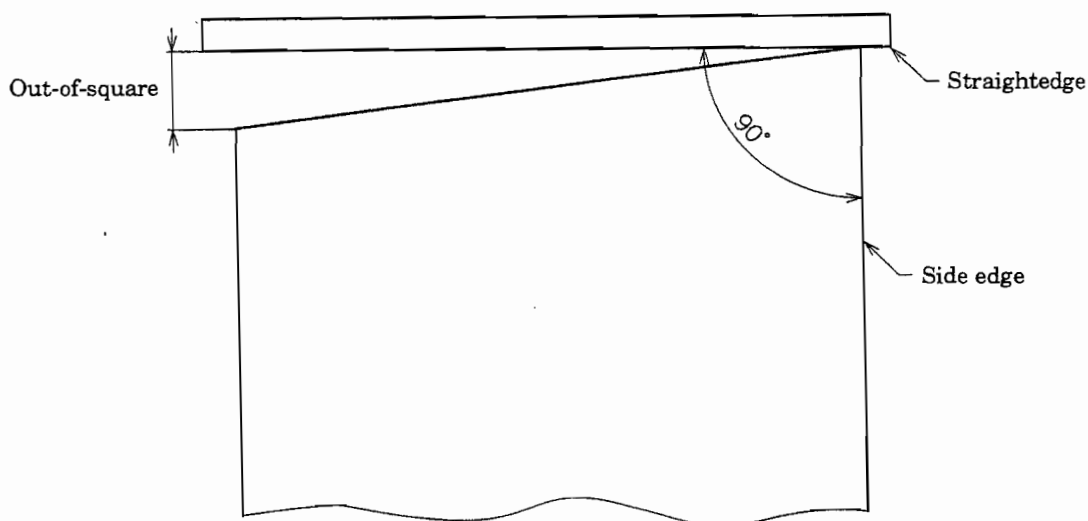
**Annex 4 Table 17 Standard flatness tolerances for structural quality cut lengths<sup>(1)</sup>**

Unit: mm

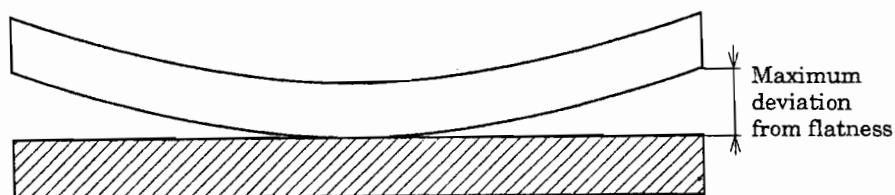
Specified thickness	Specified width	Flatness tolerance
≤ 0.7	≤ 1 200	23 max.
	> 1 200 ≤ 1 500	27 max.
	> 1 500	33 max.
> 0.7 ≤ 1.2	≤ 1 200	18 max.
	> 1 200 ≤ 1 500	23 max.
	> 1 500	29 max.
> 1.2	≤ 1 200	15 max.
	> 1 200 ≤ 1 500	18 max.
	> 1 500	26 max.
NOTE : Maximum deviation from a flat horizontal surface: with the sheet lying under its own weight on a flat surface, the maximum distance between the lower surface of the sheet and the flat horizontal surface is the maximum deviation from flatness as shown in annex 4 figure 3.		
Note <sup>(1)</sup> This table also applies to sheet cut to length from coils by the customer when agreed upon flattening procedures are performed. For specified strength levels of $R_{eL} = 360 \text{ N/mm}^2$ and greater increase the flatness tolerances by 25 %. These tolerances are only applicable to sheet ≤ 5 000 mm length when the thickness is 5 mm or less. Tolerances for sheet ≥ 5 000 mm in length shall be agreed by the purchaser and the manufacturer. This table does not apply to full hard sheet (grade 550).		



**Annex 4 Figure 1 Measurement of camber**



**Annex 4 Figure 2 Measurement of out-of-square**



**Annex 4 Figure 3 Measurement of flatness**

## 8 Sampling

**8.1 Sampling for mechanical tests** One representative sample for the tensile test required in annex 4 table 2 or table 5 shall be taken from each lot of steel for shipment. A lot consists of 50 t or less of sheet of the same grade rolled to the same thickness and condition.

## 8.2 Sampling for coating tests

**8.2.1 Mass of coating** Test specimens for coils and cut lengths coated in coils shall be taken from a sample piece approximately 300 mm in length only the as-coated width. The purchaser, in order to verify the mass of coating, shall use the following sampling method: three specimens shall be cut, one from the mid-width position and one from each side, no closer than 25 mm from the side edge. The minimum specimen area shall be 2 000 mm<sup>2</sup>.

**8.2.2 Coated bend test** One representative sample shall be taken from each lot of sheet for shipment, except that bent tests are not required for structural grades 350 and 550. The specimens for the coated bend test shall be taken no closer than 25 mm from the side edge. The minimum width shall be 50 mm.

## 9 Test methods

**9.1 Tensile test (base metal/structural grades)** The tensile test shall be carried out in accordance with **ISO 6892**. Longitudinal test piece shall be taken midway between the centre and edge of the sheet as-rolled. Since the tensile test is for the determination of properties of the base metal, ends of test pieces shall be stripped off the coating to measure base metal thickness for calculation of cross-sectional area.

### 9.2 Coating tests (mass and bend)

**9.2.1 General** The manufacturer shall make such tests and measurements as he deems necessary to ensure that the material produced complies with the values given in annex 4 table 1.

**9.2.2 Triple-spot test** The triple-spot test result shall be the average coating mass found on the three specimens taken according to **8.2.1**.

NOTE : The method given in **ISO 1460** may be used as a reference method.

**9.2.3 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.

**9.2.4 Estimated coating thickness and coating mass** Coating mass is determined by converting coating thickness measurements made with magnetic gauges (see **ISO 2178**) or by X-ray spectrometry (see **ISO 3497**). These test methods may be used as a basis for acceptance, but rejection shall be governed by the coating mass tests described in **9.2.2** and **9.2.3**.

**9.2.5 Bend test (coating)** For commercial and drawing qualities the coated sheet shall be capable of being bent 180° flat on itself in any direction without flaking of the coating on the outside of the bend.

For structural quality grades, coating bend test requirements are as shown in annex 4 table 2. Flaking of coating within 7 mm of the edge of the test piece shall not be cause for rejection.

## 10 Retests

**10.1 General** If a test does not give the specified results, two more test pieces shall be taken at random from the sample lot. Both retests shall conform to the requirements of this annex, otherwise the lot shall be rejected.

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

**10.3 Additional tests** If a test does not give the specified results, two additional tests shall be carried out on the same lot. Both retests shall conform to the requirements of this annex, otherwise, the lot may be rejected.

## 11 Resubmission

**11.1** 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, shall be indicated to the purchaser. In this case the tests shall be carried out as if they applied to a new batch.

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

**12 Workmanship** The aluminium/zinc-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 readily observe or to remove defective portions as can be carried out in the cut-length product.

## 13 Inspection and acceptance

**13.1** While not usually required for products covered by this annex, when the purchaser specifies that inspection and tests for acceptance 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 annex.

**13.2** 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. The supplier shall be notified in order that he may properly investigate.

**14 Coil size** When aluminium/zinc-coated steel sheet is ordered in coils, a minimum or range of acceptable inside diameter (I.D.) shall be specified. In addition, the maximum outside diameter (O.D.) and maximum acceptable coil mass shall be specified.

**15 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) the manufacturer's name or identifying brand;
- b) the number of the International Standard on which this annex is based, i.e. **ISO 9364**;
- c) the designation (coating, coating mass, coating condition, surface treatment and quality or grade of the base metal);
- d) the order number;
- e) the product dimensions;
- f) the lot number;
- g) the mass.

**16 Information to be supplied by the purchaser** To specify adequately requirements under this annex, inquiries and orders should include the following information:

- a) the number of the International Standard on which this annex is based, i.e. **ISO 9364**;
- b) the name and designation of the material, i.e. the letters AZ, coating mass designation, coating type, surface treatment, base metal quality; e.g. aluminium/zinc-coated steel sheet, commercial quality, normal spangle, passivated and oiled AZ165NC01B (see clause 4);
- c) coil or cut length, and the dimensions of the product in the sequence: thickness, width, length and bundle mass (for cut lengths) and the total quantity required. If the nominal thickness relates to the thickness before coating (refer to the note in each thickness tolerance table), it shall be agreed upon between the interested parties;
- d) the application (name of part), if possible;
- e) whether or not mill passivation is required (see 5.2);
- f) whether or not oiling is required (see 5.4);
- g) the coil size requirements (see clause 14);
- h) report of heat analysis and/or mechanical properties, if required (see 6.3.1 and clause 9);
- i) details of fabrication, special requirements or application [i.e. coating performance, non-fluting, paintability, weldability, exposure environment, etc. (see 6.7)];
- j) inspection and tests for acceptance prior to shipment from the producer's works, if required (see 13.1).

NOTE : A typical ordering description is as follows:

**ISO 9364**, aluminium/zinc-coated steel sheet, commercial quality, designation AZ165NC01, 1 × 1 200 mm × coil, 20 000 kg, exhaust pipe tubing, No. 6201.



**Annex 4 Attached Table 1 Total theoretical thickness for coating mass**

Coating designation	Coating mass limits and equivalent thickness <sup>(1)</sup> Single spot	
	g/m <sup>2</sup>	mm
AZ090	75	0.020
AZ100	85	0.023
AZ150	130	0.035
AZ165	140	0.038
AZ185	160	0.043
AZ200	170	0.046

Note <sup>(1)</sup> The equivalent thickness values in this table are for information only.

**Bibliography**

- [1] ISO 1460:1992 *Metallic coatings—Hot dip galvanized coatings on ferrous materials—Gravimetric determination of the mass per unit area*
- [2] ISO 7438:1985 *Metallic materials—Bend test*

Annex 5 (informative)

Comparison table between JIS and corresponding International Standards

JIS G 3321 : 2005 Hot-dip 55 % aluminium-zinc alloy-coated steel sheets and coils		ISO 9364 : 2001 <i>Continental steel sheets</i>	
(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard
Clause	Content	Clause	Content
1 Scope	The sheets and coils (including corrugated sheets) which are coated by the hot-dip process in a coating bath containing about 55 % aluminium and 1.6 % silicon, with the balance being zinc, as a standard composition are specified.	ISO 9364	1.1 The characteristics of steel of commercial, drawing, and structural qualities which are coated by the hot-dip process in a coating bath containing about 55 % aluminium and 1.6 % silicon, with the balance being zinc, as a standard composition are specified.
2 Normative references	12 standards in total, such as JIS Z 2201, JIS Z 2241, JIS G 0404.	2	ISO 6892, ISO 3497
	—		ISO 2178
			Classification by clause
			Detail of technical deviation
			In ISO Standard product application also explain
			Classification by clause
			MOD/alteration
			MOD/alteration
			MOD/deletion
			The matter referred to from JIS related to the matter concerned in corresponding national Standards
			—

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
3 Grade and symbol	Symbols of 5 grades for hot-rolled base metal used and 7 grades for cold-reduced base metal used are specified.	ISO 9364	1.3	Symbols of each grade are classified into commercial, drawing and structural qualities according to applications.	MOD/addition	In JIS classified by base metal.	Although the addition of division of base metal thickness was proposed to be adopted in ISO Standard, for the time being, it is difficult to unify.
	Range of thickness (0.25 mm to 2.3 mm)		1.4 1.5	Thickness: 5 mm or less Width: 600 mm or more	MOD/alteration	The range of thickness differs between both Standards.	
4 Chemical composition	The test method for the measurement of chemical composition of base metal of the sheet and coil and the upper limits of the cast analysis (C, Mn, P and S) for each type of base metal are specified.	6.2	The chemical composition (C, Mn, P and S) for every application and the upper limits of the added chemical composition (Cu, Ni, etc.) are specified.	MOD/alteration	The method for division differs between both Standards.	Although the addition of division of base metal thickness was proposed to be adopted in ISO Standard, for the time being, it is difficult to unify.  The upper limits of cast analysis were specified according to the actual circumstances of market.	
				MOD/deletion	The upper limits of cast analysis are altered.		The specification of added chemical composition was postponed owing to the difference of the technology base and commercial practice.

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation and the International Standard by clause	(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content		
5 Coating surface finishes	5.1 Normal spangle A coating having spangles as a result of the growth of alloy crystals.	ISO 9364	3.2.1	normal spangle coating	IDT	—
	5.2 Skin pass The purpose of skin pass is explained.		3.2.2 3.3	smooth finish The purpose of skin pass is described.		
6 Coating mass	The test method for the measurement of coating mass, and the minimum coating mass on both equally coated surfaces and coating mass symbols (7 symbols of AZ70 to AZ200) are specified.	ISO 9364	4.2	Coating mass for every coating mass symbol (6 symbols of AZ090 to AZ200) is specified.	MOD/ addition	The coating mass which has market needs in Japan was added. The addition to the ISO Standard is scheduled to be proposed.
			6.5	Coating mass is specified.		
7 Chemical treatment	The types of chemical treatment (chromate treatment, untreated) and their symbols are specified.	ISO 9364	4.4	The symbol of surface treatment (oiling, mill passivation plus oiling, mill passivation and no surface treatment) is specified.	IDT	Although the expression differs, there is no difference in technical contents.
			5.2	Effects of mill passivation are specified.		

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
8 Oiling	The discrimination of oiling and its symbol are specified (oiled, unoiled).	ISO 9364	4.4	The symbol of surface treatment (oiling, mill passivation plus oiling, mill passivation and no surface treatment) is specified.	IDT	—	Although the expression differs, there is no difference in technical contents.
			5.4	The effect of oiling and recommendations to the purchaser are specified.			
9 Mechanical properties	9.1 Applicable mechanical properties Applicable mechanical properties tested for every steel grade (bendability, tensile strength) are specified. 9.2 Bendability The test method to adhere to and specified values for bendability of the sheet and coil are specified.		6.8	Mechanical properties: Mechanical properties (yield stress, tensile strength and elongation) and bendability for every application are specified.			
				MOD/alteration	The applicable types of bend test (thickness of metal base, grade, division of hot-rolled base metal and cold-reduced base metal) and their specified values differ between both Standards.	The revision draft of ISO Standard in conformity with JIS was proposed by Japan, and was adopted at ISO/TC17/SC12 (June 2002).	

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation and the International Standard by clause	(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content		
9 Mechanical properties (concluded)	9.3 The test methods of yield point or proof stress, tensile strength, elongation are specified. The specified values for each item are specified by hot-rolled base metal, cold-reduced base metal, and steel type.	ISO 9364	6.8	Mechanical properties (yield stress, tensile strength and elongation) and bendability for every application are specified.	MOD/alteration	Although the addition of base metal division to the ISO Standard was proposed, for the time being, it is difficult to unify.
10 Presentation of dimensions	The dimensions of sheet and coil (thickness, width and length) are expressed in millimetre. The thickness is expressed by that of the base metal prior to coating.		7.1	The thickness is expressed by the total of the base metal and the coating.	MOD/alteration	
11 Standard dimensions	The standard dimensions of the sheet and coil (the standard nominal thickness, and standard width and length) are specified.	—	—	MOD/addition	—	The standard dimension is used in terms of the commercial practice of Japan.

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
12 Dimensional tolerances	Dimensional tolerances are specified.	ISO 9364	7	Almost identical with JIS.	MOD/alteration	Some specified values differ between both Standards.	The revision draft of ISO Standard which nearly conforms to JIS is scheduled to be proposed, and adopted.
13 Shapes	Shapes are specified.				MOD/alteration		
14 Mass and tolerances	Mass of sheet, mass of coil, the calculation method of mass, tolerances for theoretical mass of sheet are specified.	—	—	(Although not specified,) the measured mass is used.	MOD/addition	In JIS measured mass or theoretical mass is used.	For the time being, it is difficult to unify owing to the difference in the commercial practice.
15 Appearance	The sheet and coil shall be free from defects detrimental to practical use.	ISO 9364	12	Identical with JIS.	IDT	—	—
16 Tests	16.1 Analysis test of chemical composition General matter of analysis test and sampling method of analysis sample, and analytical method are specified.				6.3	6.3.1 Heat analysis 6.3.2 Product analysis	MOD/addition

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause	(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content		
16 Tests (concluded)	16.2 Coating mass test Sampling of test specimen, sampling of test piece, test method are specified. The test method shall be in accordance with either JIS H 0401 or annex 3.	ISO 9364	8.2	Sampling for coating tests	MOD/ addition	The specification of test method is required because of the JIS-designated product.
			9.2	Coating tests		
	16.3 Corrosion resistance test of coating		—	—	MOD/ addition	The addition of corrosion resistance test of coating to the ISO Standard is scheduled to be proposed.
	16.4 Bend test General requirements for test, sampling of test specimen, test piece and bending of test piece are specified.		9.2.5	Identical with JIS.	IDT	—
	16.5 Tensile test General requirements for test, sampling of test specimen, test piece and test method (JIS Z 2241) are specified.		8.1 9.1	Sampling of test specimen Tensile test (ISO 6892)	MOD/ alteration	Although the realization in ISO Standard of conformity of the tensile test specified in relevant national standard was proposed, the conclusion was that for the time being it was difficult to realize it.



(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
17 Inspection	17.1 Six inspection items of coating mass, mechanical properties, dimensions, shape, mass and appearance and their compatibility conditions are specified.	ISO 9364	13	Identical with JIS.	IDT	—	—
	17.2 Reinspection is specified (in accordance with JIS G 0404).		10 11	Retests Resubmission	IDT	—	—
18 Markings	Items to be marked for the sheet and coil that have passed inspection are specified.		15	Identical with JIS.	IDT	—	—
19 Items to be confirmed at the time of order	The information to be included in an inquiry sheet and an order sheet is described.		16	Identical with JIS.	IDT	—	—
20 Report	The inspection document to be submitted by a request of the purchaser is specified.		—	—	MOD/ addition	—	Added in consideration of commercial practice in Japan.
Annex 1 (normative)	Nominal thickness and coating mass symbols for sheets and coils for roofing and architectural siding.		—	—	MOD/ addition	—	The necessary specification in consideration of commercial practice in Japan.

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
Annex 2 (normative)	Nominal thickness, coating mass symbols and standard dimensions for corrugated sheets.	ISO 9364	—	—	MOD/addition	—	The necessary specification in consideration of commercial practice of Japan.
Annex 3 (normative)	Test method for the coating mass of hot-dip 55 % aluminium-zinc alloy-coated steel sheets and coils using fluorescent X-rays.		—	—	MOD/addition	—	One of the test method added in 16.2. The difference came out because the original test method of JIS was added in addition to the informative test method in ISO Standard.
Annex 4 (informative)	ISO 9364 Continuous hot-dip 55 % aluminium/zinc-coated steel sheet of commercial, drawing and structural qualities			Identical with JIS.	IDT	—	—

Designated degree of correspondence between JIS and International Standard: MOD

Remarks 1 Symbols in sub-columns of classification by clause in the above table indicate as follows:

- IDT: Identical in technical contents.
- MOD/deletion: Deletes specification item(s) or content(s) of International Standard.
- MOD/addition: Adds specification item(s) or content(s) which are not included in International Standard.
- MOD/alteration: Alters the specification content(s) which are included in International Standard.

2 Symbol in column of designated degree of correspondence between JIS and International Standard in the above table indicates as follows:

- MOD: Modifies International Standard.