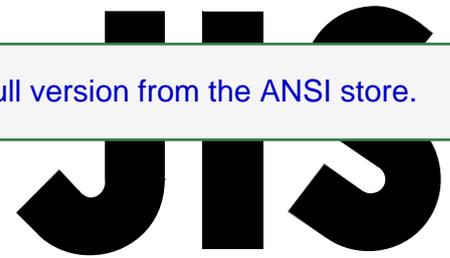


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JIS G 3302 : 2019

(JISF)

**Hot-dip zinc-coated steel sheet and strip**

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## Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by The Japan Iron and Steel Federation (JISF) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS G 3302:2017** is replaced with this Standard.

However, **JIS G 3302: 2017** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until March 19, 2020.

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Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

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# Hot-dip zinc-coated steel sheet and strip

## Introduction

This Japanese Industrial Standard has been prepared based on **ISO 3575** : 2016, Edition 5, and **ISO 4998** : 2014, Edition 6, with some modifications of the technical contents.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standards. A list of modifications with the explanations is given in Annex JF. Annex JA to Annex JE are unique to **JIS** and not given in the corresponding International Standards.

## 1 Scope

This Standard specifies requirements for hot-dip zinc-coated steel sheet (hereafter referred to as sheets), steel strip (hereafter referred to as coils), and corrugated sheet manufactured by processing sheets into the shapes and dimensions specified in **JIS G 3316** (hereafter referred to as corrugated sheets).

**NOTE** The International Standards corresponding to this Standard and the symbol of degree of correspondence are as follows.

**ISO 3575** : 2016 *Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of commercial and drawing qualities*

**ISO 4998** : 2014 *Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of structural quality*  
(Overall evaluation : MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standards and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

## 2 Normative references

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

JIS G 0320 *Standard test method 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 3316 *Shapes and dimensions of corrugated steel sheets*

JIS K 0119 *General rules for X-ray fluorescence analysis*

JIS K 8847 *Hexamethylenetetramine (Reagent)*

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JIS Z 2241 *Metallic materials — Tensile testing — Method of test at room temperature*

JIS Z 8401 *Guide to the rounding of numbers*

### 3 Symbol of grade and applicable nominal thickness <sup>1)</sup>

The symbol of grade and applicable nominal thickness shall be as follows.

Note <sup>1)</sup> The nominal thickness indicates the base metal thickness before coating [see 9.1.1 a)].

- a) The sheets and coils are classified into 6 grades of hot-rolled steel sheet and strip (hereafter referred to as hot-rolled base metal) and into 11 grades of cold-reduced steel sheet and strip (hereafter referred to as cold-reduced base metal). The symbols of grade and applicable nominal thicknesses shall be as given in Tables 1 and 2.
- b) The corrugated sheets are classified into 7 grades of commercial quality, commercial hard quality and high strength commercial quality among those given in Table 2. The symbols of grade and applicable nominal thicknesses shall be as given in Table 2.
- c) For sheets, coils and corrugated sheets used for roofing and architectural siding, the symbols shall be as given in Table 3.
- d) The classification of the shape of corrugated sheets and their symbols shall be as given in Table 4.

**Table 1 Symbol of grade and applicable nominal thickness (hot-rolled base metal)**

Unit: mm		
Symbol of grade	Applicable nominal thickness	Application
SGHC	1.6 or over up to and incl. 6.0	Commercial
SGH340		High strength commercial
SGH400		
SGH440		
SGH490		
SGH540		
For those with a nominal thickness of 1.6 mm or over up to and including 3.2 mm, unless the use of hot-rolled base metal is specifically required, the cold-reduced base metal which satisfies the specifications for hot-rolled base metal may be used.		

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**Table 2 Symbol of grade and applicable nominal thickness (cold-reduced base metal)**

Unit: mm

Symbol of grade	Applicable nominal thickness	Application
SGCC	0.19 or over up to and incl. 3.2	Commercial
SGCH	0.11 or over up to and incl. 1.0	Commercial hard
SGCD1	0.30 or over up to and incl. 2.3	Drawing, Class 1
SGCD2	0.40 or over up to and incl. 2.3	Drawing, Class 2
SGCD3	0.60 or over up to and incl. 2.3	Drawing, Class 3
SGCD4		Drawing, Class 4, non-ageing property <sup>a)</sup>
SGC340	0.25 or over up to and incl. 3.2	High strength commercial
SGC400		
SGC440		
SGC490		
SGC570	0.25 or over up to and incl. 2.0	

Note <sup>a)</sup> Non-ageing property indicates the property by which steels are free from the stretcher strain marks when being formed.

**Table 3 Symbol for roofing and architectural siding**

Application	Symbol
Roofing	R
Architectural siding	A

**Table 4 Classification and symbol of shape of corrugated sheet**

Shape of corrugated sheet	Symbol
Corrugated sheet No. 1 (long pitch) <sup>a)</sup>	W1
Corrugated sheet No. 2 (short pitch) <sup>a)</sup>	W2

Note <sup>a)</sup> The shapes and dimensions of long pitch and short pitch corrugated sheets shall be as specified in **JIS G 3316**.

#### 4 Chemical composition

The base metal of sheets, coils and corrugated sheets shall be tested for chemical composition in accordance with **13.1**, and the heat analysis values shall be as given in Table 5.

**Table 5 Chemical composition**

Symbol of grade	Unit: %			
	C	Mn	P	S
SGHC	0.15 max.	0.80 max.	0.05 max.	0.05 max.
SGH340	0.25 max.	1.70 max.	0.20 max.	0.05 max.
SGH400	0.25 max.	1.70 max.	0.20 max.	0.05 max.
SGH440	0.25 max.	2.00 max.	0.20 max.	0.05 max.
SGH490	0.30 max.	2.00 max.	0.20 max.	0.05 max.
SGH540	0.30 max.	2.50 max.	0.20 max.	0.05 max.
SGCC	0.15 max.	0.80 max.	0.05 max.	0.05 max.
SGCH	0.18 max.	1.20 max.	0.08 max.	0.05 max.
SGCD1	0.12 max.	0.60 max.	0.04 max.	0.04 max.
SGCD2	0.10 max.	0.45 max.	0.03 max.	0.03 max.
SGCD3	0.08 max.	0.45 max.	0.03 max.	0.03 max.
SGCD4	0.06 max.	0.45 max.	0.03 max.	0.03 max.
SGC340	0.25 max.	1.70 max.	0.20 max.	0.05 max.
SGC400	0.25 max.	1.70 max.	0.20 max.	0.05 max.
SGC440	0.25 max.	2.00 max.	0.20 max.	0.05 max.
SGC490	0.30 max.	2.00 max.	0.20 max.	0.05 max.
SGC570	0.30 max.	2.50 max.	0.20 max.	0.05 max.

Alloy elements other than those given in this table may be added as required.

## 5 Coating

### 5.1 Plating bath composition

Plating bath shall be tested for composition in accordance with 13.2 and shall be as given in Table 6.

**NOTE** In the hot-dip coating process, the base metal is immersed in a molten metal bath at a high temperature, and then cooled to form a coating on the base metal surface. This molten metal bath is called plating bath.

**Table 6 Plating bath composition**

Unit: %	
Elements other than Zn	Zn
1.0 max. <sup>a)</sup>	Remainder <sup>b)</sup>
Notes <sup>a)</sup> The figure indicates the total amount of elements which are added intentionally. <sup>b)</sup> The remainder may include elements which are mixed unavoidably.	

### 5.2 Type of coating

The coating is classified into two types: non-alloy coating and alloy coating <sup>2)</sup>.

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Note <sup>2)</sup> Alloy coating indicates the coating obtained in such a way that the entire coating comprises the alloy layer of zinc and iron by heating after coating.

### 5.3 Coating mass

#### 5.3.1 Symbol for coating mass

The coating applied shall be of equivalent thickness on both surfaces. The symbols for coating mass shall be as given in Table 7.

#### 5.3.2 Coating mass

The sheets, coils and corrugated sheets shall be tested for coating mass in accordance with **13.3.2** and shall satisfy the following requirements.

- a) The coating mass of sheets, coils and corrugated sheets shall be expressed by the total mass on both surfaces and shall meet the minimum triple-spot average coating mass value and the minimum single-spot coating mass value given in Table 7. The minimum triple-spot average coating mass shall apply to the average of the measured values of three test pieces taken from the sample, and the minimum single-spot coating mass shall apply to the smallest value among the measured values of the three test pieces of which the average value is obtained. When coating mass is measured in accordance with Annex JD, the minimum coating mass values in the table shall apply to the average coating mass and minimum coating mass obtained according to JD.6.5.

NOTE It is desirable that the coating mass on one side be not less than 40 % of the required value for the minimum single-spot coating mass (total mass on both surfaces).

**Table 7 Coating mass (total mass on both surfaces)**

Type of coating	Symbol for coating mass	Unit: g/m <sup>2</sup>	
		Minimum triple-spot average coating mass	Minimum single-spot coating mass
Non-alloy coating	Z06 <sup>a)</sup>	60	51
	Z08	80	68
	Z10	100	85
	Z12	120	102
	Z14	140	119
	Z18	180	153
	Z20	200	170
	Z22	220	187
	Z25	250	213
	Z27	275	234
	Z35	350	298
	Z37	370	315
	Z45	450	383
Z60	600	510	
Alloy coating	F04 <sup>a)</sup>	40	34
	F06	60	51
	F08	80	68
	F10	100	85
	F12	120	102
	F18 <sup>a)</sup>	180	153
<p>The coating masses corresponding to the designations Z35, Z37, Z45, Z60, F10, F12 and F18 shall not apply to SGCD1, SGCD2, SGCD3 and SGCD4.</p> <p>Note <sup>a)</sup> Applicable by agreement between the purchaser and the manufacturer</p>			

- b) For sheets and coils used for roofing and architectural siding, the coating mass shall be as given in Table JA.1.
- c) The coating mass for corrugated sheets shall apply to pre-corrugated sheets and shall be as given in Table JB.1.
- d) The upper limit value of the coating mass (total mass on both surfaces) of sheets, coils and corrugated sheets may be as agreed between the purchaser and the manufacturer.

## 5.4 Coating surface finishes

### 5.4.1 Classification and symbol of surface finish for non-alloy coating

The classification and symbols of the surface finish for non-alloy coating shall be as given in Table 8.

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**Table 8 Classification and symbol of surface finish for non-alloy coating**

Classification of coating surface finish	Symbol	Definition
Regular spangle	<u>R</u>	Surface finish with coating formed as a result of growth of zinc crystals (spangle)
Minimized spangle	<u>Z</u>	Surface finish with coating obtained by restricting normal spangle formation to a minimum

#### 5.4.2 Skin pass

When requested by the purchaser, skin-pass treatment, designated as S, shall be performed.

NOTE Skin-pass treatment is usually performed to produce smooth surfaces.

#### 5.5 Coating adherence

The coating adherence shall be as follows.

- Non-alloy coated sheets and coils, when tested for coating adherence in accordance with 13.3.3 under the bend test conditions given in Tables 9 and 10, shall be free from flaking of the coating on the external surface of the test piece (not less than 7 mm from both side edges of test piece).
- The requirements for coating adherence shall not apply to SGCH and SGC570.
- In the case of the non-alloy coated corrugated sheets, requirements in a) and b) shall apply to pre-corrugated sheets.
- The coating adherence may be evaluated by other evaluation test methods than that specified in 13.3.3, instead of fulfilling the requirement in a), at the discretion of the manufacturer. In this case, the evaluated coating adherence shall be at least equivalent to that obtained by the test method specified in 13.3.3.

**Table 9 Coating adherence and bendability (hot-rolled base metal)**

Symbol of grade	Bend angle	Internal spacing <sup>a)</sup> Number of sheets					
		Nominal thickness 1.6 mm or over to and excl. 3.0 mm			Nominal thickness 3.0 mm or over		
		Symbol for coating mass			Symbol for coating mass		
		Z06 to Z27	Z35, Z37	Z45, Z60	Z06 to Z27	Z35, Z37	Z45, Z60
SGHC	180°	1	2	2	2	2	2
SGH340		1	1	2	2	2	3
SGH400		2	2	2	3	3	3
SGH440		3	3	3	3	3	3
SGH490							
SGH540							

Note <sup>a)</sup> The figures indicate the number of sheets of nominal thickness. The test piece shall be bent with the internal spacing not more than the total layer thickness of indicated number of sheets.

**Table 10 Coating adherence and bendability (cold-reduced base metal)**

Symbol of grade	Bend angle	Internal spacing <sup>a)</sup> Number of sheets								
		Nominal thickness Under 1.6 mm			Nominal thickness 1.6 mm or over to and excl. 3.0 mm			Nominal thickness 3.0 mm or over		
		Symbol for coating mass			Symbol for coating mass			Symbol for coating mass		
		Z06 to Z27	Z35, Z37	Z45, Z60	Z06 to Z27	Z35, Z37	Z45, Z60	Z06 to Z27	Z35, Z37	Z45, Z60
SGCC	180°	1	1	2	1	2	2	2	2	2
SGCD1		1	—	—	1	—	—	—	—	—
SGCD2		0 (flat on it- self)	—	—	0 (flat on it- self)	—	—	—	—	—
SGCD3			—	—		—	—	—	—	
SGCD4		1	1	2	1	1	2	2	2	3
SGC340		2	2	2	2	2	2	3	3	3
SGC400		3	3	3	3	3	3	3	3	3
SGC440										
SGC490										

Note <sup>a)</sup> The figures indicate the number of sheets of nominal thickness. The test piece shall be bent with the internal spacing not more than the total layer thickness of indicated number of sheets.

## 6 Chemical treatment

The classification and symbols of chemical treatment for sheets, coils and corrugated sheets shall be as given in Table 11. Unless otherwise specified, the non-alloy coating shall be subjected to the chromate-free treatment <sup>3)</sup> and the alloy coating shall be untreated.

Note <sup>3)</sup> Chromate-free indicates that the coating formed by chemical treatment is free from hexavalent chromium.

**Table 11 Classification and symbols of chemical treatment**

Classification of chemical treatment	Symbol
Chromate-free treatment <sup>a)</sup>	<u>b)</u>
<u>Chromate treatment <sup>c)</sup></u>	<u>C</u>
Phosphate treatment <sup>c),d)</sup>	<u>P</u>
<u>Untreated</u>	<u>M</u>
<p>Notes <sup>a)</sup> <u>The term "chromate-free treatment" comprises both chromate-free treatment and chromate-free phosphate treatment that are specified in JIS G 3302 : 2012.</u></p> <p><sup>b)</sup> <u>The symbol of chromate-free treatment shall be as agreed between the purchaser and the manufacturer. The symbols NC and NP may be used for chromate-free treatment and chromate-free phosphate treatment, respectively, that are specified in JIS G 3302 : 2012.</u></p> <p><sup>c)</sup> <u>Requirements for chromate treatment and phosphate treatment are to be deleted in the next revision.</u></p> <p><sup>d)</sup> <u>In phosphate treatment, chromate treatment is generally applied to the phosphate-treated surface in order to improve the corrosion resistance.</u></p>	

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## 7 Oiling

The classification and symbols of oiling for sheets, coils and corrugated sheets shall be as given in Table 12. Unless otherwise specified, non-alloy coating shall be unoiled and the alloy coating shall be oiled.

**Table 12 Classification and symbol of oiling**

Classification of oiling	Symbol
Oiled	O
Unoiled	X

## 8 Mechanical properties

### 8.1 Applicable mechanical properties

Mechanical properties applicable to sheets and coils shall be as given in Table 13. The mechanical properties of the corrugated sheets shall apply to pre-corrugated sheets and shall be as given in Table 13.

**Table 13 Applicable mechanical properties**

Symbol of grade	Bendability <sup>a)</sup>	Tensile test characteristics <sup>b)</sup>
SGHC	○	—
SGH340	○	○
SGH400	○	○
SGH440	○	○
SGH490	○	○
SGH540	○	○
SGCC	○ <sup>c)</sup>	—
SGCH	—	—
SGCD1	○	○
SGCD2	○	○
SGCD3	○	○
SGCD4	○	○
SGC340	○	○
SGC400	○	○
SGC440	○	○
SGC490	○	○
SGC570	—	○

Notes <sup>a)</sup> Bendability applies to the non-alloy coating and not to the alloy coating.

<sup>b)</sup> For those under 0.25 mm in nominal thickness, the tensile test characteristics do not apply.

<sup>c)</sup> In the case of corrugated sheets, the bendability does not apply.

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## 8.2 Bendability

When non-alloy coated sheets, coils and pre-corrugated sheets are tested for bendability in accordance with 13.4.2, the external surface of the test piece (not less than 7 mm from both side edges of test piece) shall be free from cracks and breakage that are visible to the naked eye.

NOTE For the details of bend test, see 13.4.2.

## 8.3 Tensile test characteristics

The sheets, coils and pre-corrugated sheets shall be tested for tensile test characteristics in accordance with 13.4.3 and shall satisfy the requirements given in Table 14 or Table 15. The values given in Table 14 or Table 15 shall apply to those which undergo delivery inspection <sup>4)</sup>.

Note <sup>4)</sup> Age-hardening of sheets, coils and pre-corrugated sheets may cause an increase in yield point or proof stress and a decrease in elongation.

**Table 14 Tensile test characteristics (hot-rolled base metal)**

Symbol of grade	Yield point or proof stress  N/mm <sup>2</sup>	Tensile strength  N/mm <sup>2</sup>	Elongation %					Test piece and direction
			Nominal thickness mm					
			1.6 or over to and excl. 2.0	2.0 or over to and excl. 2.5	2.5 mm or over to and excl. 3.2	3.2 mm or over to and excl. 4.0	4.0 or over up to and incl. 6.0	
SGHC			—					
SGH340	245 min.	340 min.	20 min.	20 min.	20 min.	20 min.	20 min.	No. 5 in rolling direction or perpendicular to rolling direction
SGH400	295 min.	400 min.	18 min.	18 min.	18 min.	18 min.	18 min.	
SGH440	335 min.	440 min.						
SGH490	365 min.	490 min.						
SGH540	400 min.	540 min.	16 min.	16 min.	16 min.	16 min.	16 min.	
NOTE 1	For SGHC, a yield point or proof stress of 205 N/mm <sup>2</sup> or over and a tensile strength of 270 N/mm <sup>2</sup> or over may be used.							
NOTE 2	1 N/mm <sup>2</sup> = 1 MPa							

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**Table 15 Tensile test characteristics (cold-reduced base metal)**

Symbol of grade	Yield point or proof stress N/mm <sup>2</sup>	Tensile strength N/mm <sup>2</sup>	Elongation %						Test piece and direction
			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 to and excl. 2.5	2.5 or over	
SGCC			—						
SGCH			—						
SGCD1	—	270 min.	32 min.	34 min.	36 min.	37 min.	38 min.	—	No. 5 in rolling direction
SGCD2	—	270 min.	—	36 min.	38 min.	39 min.	40 min.	—	
SGCD3	—	270 min.	—	—	40 min.	41 min.	42 min.	—	
SGCD4 <sup>a)</sup>	—	270 min.	—	—	42 min.	43 min.	44 min.	—	
SGC340	245 min.	340 min.	20 min.	20 min.	20 min.	20 min.	20 min.	20 min.	No. 5 in rolling direction or perpendicular to rolling direction
SGC400	295 min.	400 min.	18 min.	18 min.	18 min.	18 min.	18 min.	18 min.	
SGC440	335 min.	440 min.	18 min.	18 min.	18 min.	18 min.	18 min.	18 min.	
SGC490	365 min.	490 min.	16 min.	16 min.	16 min.	16 min.	16 min.	16 min.	
SGC570	560 min.	570 min.	—						
NOTE 1 For SGCC, a yield point or proof stress of 205 N/mm <sup>2</sup> or over and a tensile strength of 270 N/mm <sup>2</sup> or over may be used.									
NOTE 2 SGCH, not subjected to annealing, usually have a Rockwell hardness of 85 HRBW or over, or a Vickers hardness of 170 HV or over.									
NOTE 3 1 N/mm <sup>2</sup> = 1 MPa									
Note <sup>a)</sup> The sheets and coils of SGCD4 shall be free from stretcher strain marks when being formed, for a period of six months after manufacture.									

## 9 Dimensions

### 9.1 Expression of dimensions

#### 9.1.1 Denomination of thickness

The denomination of thickness of sheets, coils and corrugated sheets shall be as follows. For corrugated sheets, the following denominations of thickness shall be applied to pre-corrugated sheets.

- The thickness of base metal before coating shall be taken as the nominal thickness.
- The thickness of base metal after coating shall be taken as the product thickness.

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The product thickness, which is the base of tolerances, shall be the nominal thickness plus the equivalent coating thickness and shall be obtained by adding the equivalent coating thickness given in Table 16 to the nominal thickness expressed to the third decimal place. The resultant value shall be rounded to the second decimal place according to Rule A of **JIS Z 8401**.

**Table 16 Equivalent coating thickness**

Non-alloy coating													Unit: mm	
Symbol for coating mass	Z06	Z08	Z10	Z12	Z14	Z18	Z20	Z22	Z25	Z27	Z35	Z37	Z45	Z60
Equivalent coating thickness	0.013	0.017	0.021	0.026	0.029	0.034	0.040	0.043	0.049	0.054	0.064	0.067	0.080	0.102

Alloy coating							Unit: mm
Symbol for coating mass	F04	F06	F08	F10	F12	F18	
Equivalent coating thickness	0.008	0.013	0.017	0.021	0.026	0.034	

### 9.1.2 Unit of dimensions

The unit of dimensions for sheets, coils and corrugated sheets shall be as follows.

- For sheets and corrugated sheets, the nominal thickness, width and length shall be expressed in millimetres.
- For coils, the nominal thickness and width shall be expressed in millimetres. If theoretical mass is used as the mass of coil, the length of the coil shall be expressed in metres.

## 9.2 Standard dimensions

### 9.2.1 Standard dimensions of sheets and coils

The standard dimensions of sheets and coils shall be as follows.

- Standard nominal thickness** The standard nominal thickness of sheets and coils shall be as given in Table 17.

**Table 17 Standard nominal thickness**

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	2.8	3.2	3.6	4.0	4.5	5.0	5.6	6.0

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- b) **Standard width and standard length of sheets** The standard width of sheets and coils and the standard length of sheets shall be as given in Table 18.

**Table 18 Standard width and standard length of sheet**

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				
1 524	3 048						
1 829	3 658						
For coils, a standard width of 610 mm is also permitted.							

### 9.2.2 Standard dimensions of corrugated sheets

The standard dimensions of corrugated sheets shall be as specified in JB.2.

## 9.3 Dimensional tolerances

### 9.3.1 Tolerances on product thickness

The tolerances on product thickness of sheets, coils and corrugated sheets shall be as follows.

- The tolerances on product thickness shall apply to the thickness specified in **9.1.1 b)**.
- The tolerances on product thickness shall be as given in Table 19, Table 20 or Table 21.
- The tolerances on product thickness shall apply to the thickness at a position not less than 25 mm inside from each edge (end part in the width direction).
- In the case of coils, the tolerances on thickness shall not apply to the irregular portions such as surface flaws and breaks.

**Table 19 Tolerances on product thickness (applicable to SGHC)**

Unit: mm

Nominal thickness	Width			
	Under 1 200	1 200 or over to and excl. 1 500	1 500 or over to and excl. 1 800	1 800 or over up to and incl. 2 300
1.60 or over to and excl. 2.00	±0.17	±0.18	±0.19	±0.22 <sup>a)</sup>
2.00 or over to and excl. 2.50	±0.18	±0.20	±0.22	±0.26 <sup>a)</sup>
2.50 or over to and excl. 3.15	±0.20	±0.22	±0.25	±0.27
3.15 or over to and excl. 4.00	±0.22	±0.24	±0.27	±0.28
4.00 or over to and excl. 5.00	±0.25	±0.27	—	—
5.00 or over to and excl. 6.00	±0.27	±0.29	—	—
6.00	±0.30	±0.31	—	—
Note <sup>a)</sup> Applicable to those of width under 2 000 mm				

**Table 20 Tolerances on product thickness (applicable to SGH340, SGH400, SGH440, SGH490 and SGH540)**

Nominal thickness	Unit: mm	
	Width	
	Under 1 600	1 600 or over to and excl. 2 000
1.60 or over to and excl. 2.00	±0.20	±0.24
2.00 or over to and excl. 2.50	±0.21	±0.26
2.50 or over to and excl. 3.15	±0.23	±0.30
3.15 or over to and excl. 4.00	±0.25	±0.35
4.00 or over to and excl. 5.00	±0.46	—
5.00 or over up to and incl. 6.00	±0.51	—

**Table 21 Tolerances on product thickness (applicable to symbols of grade given in Table 2)**

Nominal thickness	Unit: mm				
	Width				
	Under 630	630 or over to and excl. 1 000	1 000 or over to and excl. 1 250	1 250 or over to and excl. 1 600	1 600 or over
Under 0.25	±0.04	±0.04	±0.04	—	—
0.25 or over to and excl. 0.40	±0.05	±0.05	±0.05	±0.06	—
0.40 or over to and excl. 0.60	±0.06	±0.06	±0.06	±0.07	±0.08
0.60 or over to and excl. 0.80	±0.07	±0.07	±0.07	±0.07	±0.08
0.80 or over to and excl. 1.00	±0.07	±0.07	±0.08	±0.09	±0.10
1.00 or over to and excl. 1.25	±0.08	±0.08	±0.09	±0.10	±0.12
1.25 or over to and excl. 1.60	±0.09	±0.10	±0.11	±0.12	±0.14
1.60 or over to and excl. 2.00	±0.11	±0.12	±0.13	±0.14	±0.16
2.00 or over to and excl. 2.50	±0.13	±0.14	±0.15	±0.16	±0.18
2.50 or over to and excl. 3.15	±0.15	±0.16	±0.17	±0.18	±0.21
3.15 or over up to and incl. 3.20	±0.17	±0.18	±0.20	±0.21	—

### 9.3.2 Tolerances on width

The tolerances on width of sheets and coils shall be as follows.

- The tolerances on width shall be as given in Table 22, Table 23 or Table 24.
- The tolerances on width shall not apply to the irregular portions of coils.
- The tolerances on width given in Table 23 may be shifted to the minus side within the same range as the overall range of tolerances specified in Table 23 by agreement between the purchaser and the manufacturer. In this case, the upper limit value of agreed tolerance shall not be lower than zero.
- The tolerances on width of corrugated sheets shall be in accordance with 4.5 of JIS G 3316.

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**Table 22 Tolerances on width A**

Unit: mm

Width	Applicable symbol of grade		
	SGHC, SGH340, SGH400, SGH440, SGH490, SGH540		SGCC, SGCH, SGCD1, SGCD2, SGCD3, SGCD4, SGC340, SGC400, SGC440, SGC490, SGC570
	Tolerance 1	Tolerance 2	
1 500 or under	+25 0	+10 0	+7 0
over 1 500			+10 0

NOTE 1 This table generally applies to hot-rolled and cold-reduced base metals with mill edges or those cut by a regular method.

NOTE 2 Generally, Tolerance 1 applies to hot-rolled base metals with mill edges, and Tolerance 2 applies to those cut by a regular method.

**Table 23 Tolerances on width B**

Unit: mm

Width	
Under 1 250	1 250 or over
+3 0	+4 0
NOTE This table generally applies to hot-rolled and cold-reduced base metals recut or cut precisely.	

**Table 24 Tolerances on width C**

Unit: mm

Nominal thickness	Width			
	Under 160	160 or over to and excl. 250	250 or over to and excl. 400	400 or over to and excl. 630
Under 0.60	±0.15	±0.20	±0.25	±0.30
0.60 or over to and excl. 1.00	±0.20	±0.25	±0.25	±0.30
1.00 or over to and excl. 1.60	±0.20	±0.30	±0.30	±0.40
1.60 or over to and excl. 2.50	±0.25	±0.35	±0.40	±0.50
2.50 or over to and excl. 3.20	±0.30	±0.40	±0.45	±0.50
3.20 or over	±0.50	±0.50	±0.50	±0.50
NOTE This table generally applies to hot-rolled and cold-reduced base metals with a slit.				

### 9.3.3 Tolerances on length

The tolerances on length of sheets and corrugated sheets shall be as given in Table 25.

**Table 25 Tolerances on length**

Unit: mm

Tolerance on length
+15 0

10 Shape

10.1 Camber

The camber of sheets, coils and corrugated sheets shall be as follows.

- a) The measurement of camber shall be as shown in Figure 1.
- b) The camber shall be as given in Table 26 or Table 27. For corrugated sheets, these tables shall apply to pre-corrugated sheets.
- c) The requirements for camber shall not apply to the irregular portions of coils.
- d) The measurement of camber may be omitted <sup>5)</sup>; however, when specified by the purchaser, the measurement shall be performed.

Note <sup>5)</sup> The measurement of camber may be omitted at the discretion of the manufacturer provided that the products satisfy the requirements for camber.

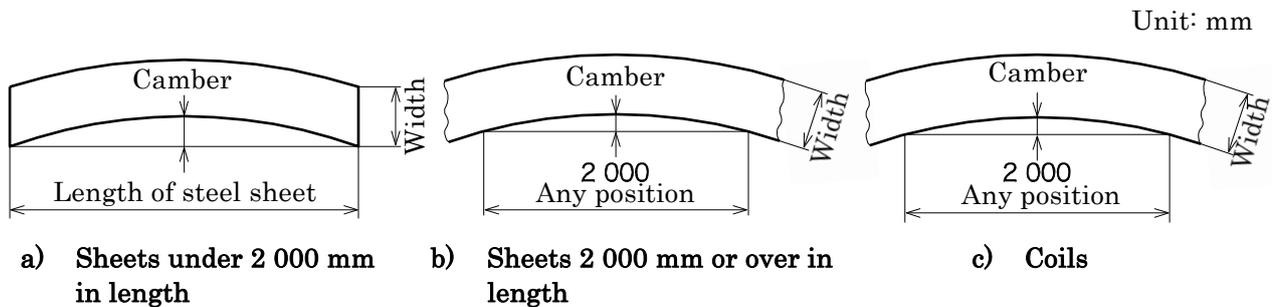


Figure 1 Measurement of camber

Table 26 Camber (applicable to symbols of grade given in Table 1)

Unit: mm

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

Table 27 Camber (applicable to symbols of grade given in Table 2)

Unit: mm

Width	Sheet and corrugated sheet		Coil
	Length		
	Under 2 000	2 000 or over	
Under 630	4 max.	4 max. in any 2 000 length	5 max. in any 2 000 length
630 or over	2 max.	2 max. in any 2 000 length	

## 10.2 Squareness

The squareness of sheets and corrugated sheets shall be in accordance with either of the following. For corrugated sheets, it applies to pre-corrugated sheets.

In the case of dispute, the method given in a) shall apply.

- a) **Method using perpendicular line** The squareness of sheets and corrugated sheets shall be expressed by the ratio  $(A/W)$ , where  $A$  indicates the distance between a perpendicular line from an edge drawn at a corner point and the corner point of the opposite edge, and  $W$  indicates the length of the perpendicular line, as shown in Figure 2, and this value shall not exceed 1.0 %.

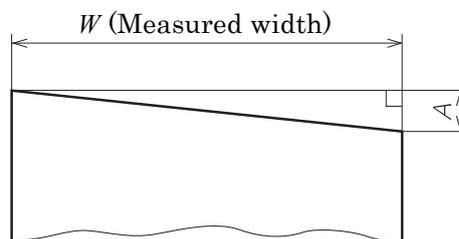


Figure 2 Squareness of sheets and corrugated sheets (using perpendicular line)

- b) **Method using diagonal lines** Half of the absolute value of the difference between the lengths of two diagonal lines ( $X_1$  and  $X_2$  in Figure 3) of the sheet and corrugated sheet shall be obtained, and this value  $(|X_1 - X_2| / 2)$  shall not exceed 0.7 % of the measured width  $W$  of the sheet and corrugated sheet.

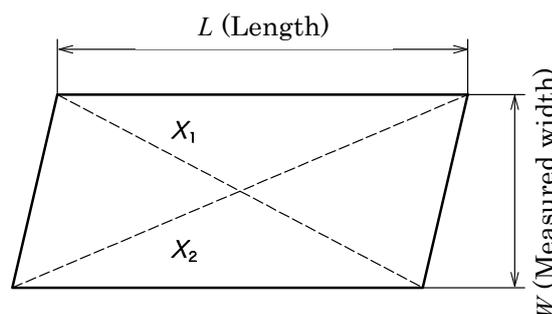


Figure 3 Squareness of sheets and corrugated sheets (method using diagonal lines)

## 10.3 Flatness

The flatness of sheets and coils shall be as follows.

- a) **Flatness of sheet** The flatness of sheets shall be as given in Table 28 or Table 29. The flatness shall be obtained as follows : place a sheet on a surface plate; measure the maximum strain of the sheet; from the measured value subtract the product thickness of the sheet, to take as the value for the top surface of sheet.

**Table 28 Flatness of sheet (applicable to symbols of grade given in Table 1)**

Unit: mm

Nominal thickness	Width			
	Under 1 250	1 250 or over to and excl. 1 600	1 600 or over to and excl. 2 000	2 000 or over to and excl. 2 300
1.60 or over to and excl. 3.15	16 max.	18 max.	20 max.	—
3.15 or over to and excl. 4.00	16 max.			—
4.00 or over to and excl. 6.00	14 max.			24 max.
6.00	13 max.			21 max.

**Table 29 Flatness of sheet (applicable to symbols of grade given in Table 2)**

Unit: mm

Width	Type of strain <sup>a)</sup>		
	Bow	Edge wave	Centre buckle
Under 1 000	12 max.	8 max.	6 max.
1 000 or over to and excl. 1 250	15 max.	9 max.	8 max.
1 250 or over to and excl. 1 600	15 max.	11 max.	8 max.
1 600 or over	20 max.	13 max.	9 max.

Note <sup>a)</sup> The strain is categorized as follows, according to its shape and location of occurrence.  
 Bow : curvature in the overall steel sheet, either in the rolling direction or in the direction perpendicular to the rolling direction  
 Edge wave : wave appearing on the edge of steel sheet (end part in the width direction)  
 Centre buckle : wave appearing at the centre of the steel sheet

- b) **Flatness of coil** The flatness of coils shall be as given in Table 28 or Table 29; however, the requirements for bow do not apply. In addition, the flatness of coils shall not apply to the irregular portions of coils. The flatness of coils shall be inspected on the inspection station installed on the production line. When the measured values are required to be reported, the measurement shall be performed after the purchaser and the manufacturer agree upon the measurement including the measurement method.

The measurement of flatness of coils may be omitted <sup>6)</sup>.

Note <sup>6)</sup> The measurement of flatness may be omitted at the discretion of the manufacturer provided that the coils satisfy the requirements for flatness.

## 11 Mass

### 11.1 Mass of sheet and corrugated sheet

Unless otherwise specified, the mass of sheets and corrugated sheets shall generally be given in the theoretical mass in kilogrammes.

### 11.2 Mass of coil

The mass of coils shall be given in either the actual mass or theoretical mass in kilo-

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grammes.

### 11.3 Calculation of mass

The calculation method of mass of sheets, coils and corrugated sheets shall be as given in Table 30.

**Table 30 Calculation of mass**

Items (calculated in the order given)		Calculation	Number of figures in resultant values <sup>a)</sup>
Basic mass of base metal kg/(mm·m <sup>2</sup> )		7.85 <sup>b)</sup>	—
Unit mass of base metal kg/m <sup>2</sup>		Basic mass of base metal [kg/(mm·m <sup>2</sup> )] × nominal thickness (mm)	Rounding 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 (kg/m <sup>2</sup> ) <sup>c)</sup>	Rounding off to 4 significant figures
Sheet and corrugated sheet	Area of sheet and corrugated sheet <sup>d)</sup> m <sup>2</sup>	Width (mm) × length (mm) × 10 <sup>-6</sup>	Rounding 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> )	Rounding off to 3 significant figures
	Mass of a single bundle <sup>e)</sup> kg	Mass of a single sheet (kg) × number of sheets of same dimensions in a single bundle	Rounding off to an integer in kg
	Total mass kg	Total mass of each bundle (kg)	An integer in kg
Coil	Unit mass of coil kg/m	Unit mass after coating (kg/m <sup>2</sup> ) × width (mm) × 10 <sup>-3</sup>	Rounding off to 3 significant figures
	Mass of a single coil kg	Unit mass of coil (kg/m) × length (m)	Rounding off to an integer in kg
	Total mass kg	Total mass of each coil (kg)	An integer in kg
Notes <sup>a)</sup> The rounding of numerical values shall be in accordance with Rule A of <b>JIS Z 8401</b> . <sup>b)</sup> Basic mass of base metal per thickness 1 mm × area 1 m <sup>2</sup> <sup>c)</sup> The coating mass constants shall be as given in Table 31. <sup>d)</sup> The width dimensions used for the calculation of the area of corrugated sheet shall be those before corrugation <sup>e)</sup> When the mass of a bundle is specified, the number of sheets 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 integer.			

**Table 31 Coating mass constant for mass calculation**

Non-alloy coating

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

Symbol for coating mass	Z06	Z08	Z10	Z12	Z14	Z18	Z20	Z22	Z25	Z27	Z35	Z37	Z45	Z60
Coating mass constant	0.090	0.120	0.150	0.183	0.203	0.244	0.285	0.305	0.350	0.381	0.458	0.481	0.565	0.722

Alloy coating

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

Symbol for coating mass	F04	F06	F08	F10	F12	F18
Coating mass constant	0.060	0.090	0.120	0.150	0.183	0.244

#### 11.4 Tolerances on theoretical mass of sheet and corrugated sheet

The tolerances on the theoretical mass of sheets and corrugated sheets, expressed as the percentage, shall be calculated by dividing the difference between the actual mass and the theoretical mass obtained in accordance with 11.3 by the theoretical mass, and shall be as given in Table 32.

**Table 32 Tolerances on theoretical mass**

Theoretical mass of a single lot <sup>a)</sup> kg	Tolerance %
Under 600	±10
600 or over to and excl. 2 000	±7.5
2 000 or over	±5
Note <sup>a)</sup> Sheets or corrugated sheets of the same quality, shape, dimensions and coating mass are considered as a single lot of sheets or corrugated sheets for the value of theoretical mass.	

## 12 Appearance

The sheets, coils and corrugated sheets shall be free from defects detrimental to use. Coils may contain some irregular portions or welds because the inspection usually does not afford the manufacturer the opportunity to readily detect and remove defective portions over the entire length. Treatment of coil defective portions, if necessary, may be agreed upon between the purchaser and the manufacturer.

The requirements for surface defects shall apply to one surface <sup>7)</sup> of sheets, coils and corrugated sheets, unless otherwise specified.

NOTE Defects include holes, laminations and surface flaws.

Note <sup>7)</sup> One surface generally refers to the upper surface of package for sheets and corrugated sheets, and the outside surface for coils.

## 13 Tests

### 13.1 Chemical analysis

#### 13.1.1 General requirements for chemical analysis and sampling method

The chemical composition of sheets, coils and corrugated sheets shall be determined by heat analysis, and the general requirements for chemical analysis and the sampling method shall be as given in Clause 8 of JIS G 0404.

#### 13.1.2 Analytical method

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

### 13.2 Plating bath composition test

The test method of plating bath composition shall be determined at the discretion of

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the manufacturer. The test of plating bath composition may be omitted <sup>8)</sup>; however, if requested by the purchaser, the test shall be performed by the method agreed upon between the purchaser and the manufacturer.

Note <sup>8)</sup> The test may be omitted at the discretion of the manufacturer provided that the requirements for plating bath composition are satisfied.

### 13.3 Coating test

#### 13.3.1 Sampling method

The sampling method for each product of same dimensions and coating mass shall be as follows.

For corrugated sheets, the sample shall be taken from the pre-corrugated sheet.

- a) For the continuously coated coils or their cut lengths, one sample shall be taken from every 50 t or its fraction.
- b) For the sheets prepared by applying coating to the base metal having been cut to specified lengths, one sample shall be taken from every 3 000 sheets or its fraction.

#### 13.3.2 Coating mass determination

The coating mass shall be determined as follows.

- a) **Test method** Coating mass shall be measured on both surfaces of the test piece, in accordance with either of Annex JC, Annex JD or Annex JE. In the case of dispute, Annex JE shall apply.

For the tests in accordance with Annex JD, the measurement shall be performed for every 50 t or its fraction of products of the same size and coating mass.

- b) **Sampling of test pieces** The test pieces shall be sampled as follows.
  - 1) For the tests in accordance with Annex JC, the sampling position, size and number of test pieces shall be as specified in **JC.5**.
  - 2) For the tests in accordance with Annex JD, the coating mass of the product shall be measured on the production line without sampling a test piece.
  - 3) For the tests in accordance with Annex JE, the sampling position and number of test pieces shall be as specified in **JC.5.2**. The size of the test piece shall be 1 200 mm<sup>2</sup> or over.

#### 13.3.3 Coating adherence determination

The coating adherence determination by the bend test shall be as follows.

- a) **Sampling position and size of test piece** The test piece shall be taken at any position of the sample. The test piece 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 taken from the sample in the direction parallel to the rolling direction of the base metal.
- b) **Test method** The test piece shall be bent manually using a vice at 180° in the lon-

itudinal direction of the test piece, as shown in Figure 4, with the specified number of sheets being sandwiched. The number of sheets is specified in Table 9 or Table 10 as the internal spacing of bend. When a vice is not available, testing by other suitable means may be adopted. After the bending, the test piece shall be examined for flaking of the coating.

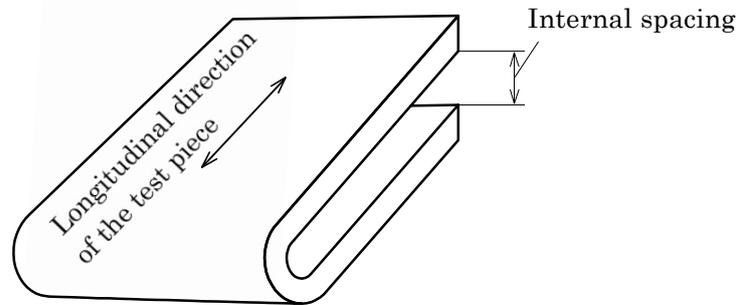


Figure 4 Direction of bend test

#### 13.3.4 Corrosion resistance test of coating

The corrosion resistance test of coating may be performed as agreed between the purchaser and the manufacturer. The acceptance criteria applied to the test results shall be as agreed between the purchaser and the manufacturer.

NOTE Examples of test methods of corrosion resistance of coating are as follows.

- Examples — JIS G 0594
- 7.3 of JIS H 8502
- 8 of JIS H 8502
- Annex 1 (Cycle D) of JIS K 5600-7-9
- Neutral salt spray test of JIS Z 2371
- Method B of ISO 16539

### 13.4 Mechanical test

#### 13.4.1 General requirements

General requirements for mechanical tests shall be as specified in Clauses 7 and 9 of JIS G 0404. In this case, the sampling method shall be that of Class A specified in 7.6 of JIS G 0404. For corrugated sheets, samples shall be taken from pre-corrugated sheets. The number of test pieces and sampling position shall be as follows.

- a) **Number of test pieces** One bend test piece and one tensile test piece shall be taken from every 50 t or its fraction of products of the same grade, thickness and coating mass.
- b) **Sampling position of test piece** The centre of the test piece shall be located at a quarter-width position or at a position closest possible to this.

#### 13.4.2 Bend test

The bend test shall be performed in accordance with 13.3.3. After the bending, the

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surface of the test piece shall be examined for cracks and breakage which are visible to the naked eye.

The bend test may be omitted <sup>9)</sup>. If specified by the purchaser, however, the test shall be performed.

Note <sup>9)</sup> The bend test may be omitted at the discretion of the manufacturer provided that the requirements for bendability are satisfied.

### 13.4.3 Tensile test

The tensile test shall be as follows.

- a) **Test piece** Take one Test piece No.5 specified in **JIS Z 2241** from the sample, in the direction given in Tables 14 and 15.
- b) **Test method** The test method shall be in accordance with **JIS Z 2241**.
- c) **Thickness used for calculation of yield point or proof stress, and tensile strength**  
The thickness used for calculation of yield point or proof stress, and tensile strength shall be either of the following.
  - Actual measured thickness after the removal of coating
  - Thickness obtained by subtracting the equivalent coating thickness from the actual measured thickness including the coating
  - Thickness obtained by subtracting the coating thickness obtained through conversion of the actual measured coating mass <sup>10)</sup> from the actual measured thickness including the coating

Note <sup>10)</sup> The converted coating thickness is obtained by dividing the actual measured coating mass by the density of coating (7.14 g/cm<sup>3</sup> for non-alloy coating and 7.21 g/cm<sup>3</sup> for alloy coating). The resultant value is rounded to three decimal places and expressed in millimetres.

## 14 Inspection and reinspection

### 14.1 Inspection

The inspection shall be as follows.

- a) Chemical composition shall conform to Clause 4.
- b) Plating bath composition shall conform to 5.1.
- c) Coating mass shall conform to 5.3.
- d) Coating adherence shall conform to 5.5.
- e) Mechanical properties shall conform to Clause 8.
- f) Dimensions shall conform to Clause 9.
- g) Shapes shall conform to Clause 10.
- h) Mass shall conform to Clause 11.
- i) Appearance shall conform to Clause 12.

## 14.2 Reinspection

The sheets, coils and corrugated sheets having failed the coating mass determination, coating adherence determination, bend test or tensile test, may be subjected to the re-test according to 9.8 of **JIS G 0404** for further acceptance judgement.

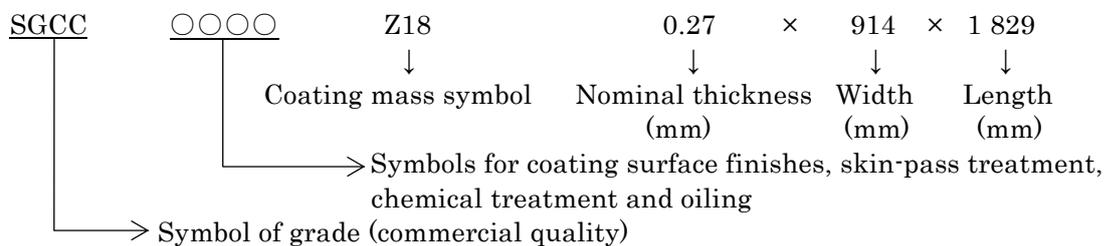
## 15 Marking

The sheets, coils and corrugated sheets having passed the inspection shall be marked with the following items by a suitable means on each package or bundle. When agreed between the purchaser and the supplier, the following items may be marked on each sheet or corrugated sheet by a suitable means.

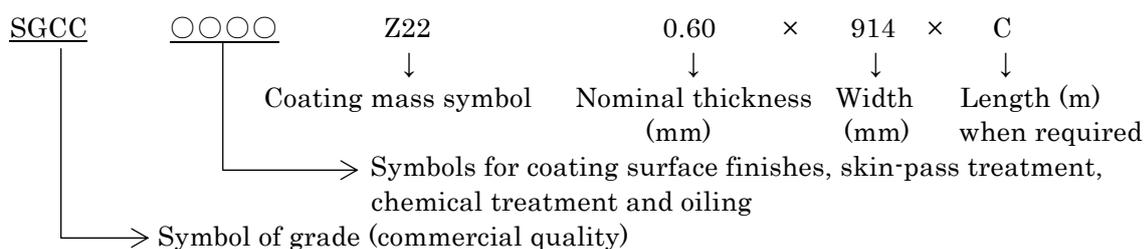
- a) Symbol of grade
- b) For those for roofing or architectural siding, the symbol given in Table 3 which is suffixed to the symbol of grade
- c) For corrugated sheets, the symbol given in Table 4 which is suffixed to the symbol of grade. For corrugated sheets for roofing or architectural siding, the symbol given in Table 4 is suffixed to the symbol given in Table 3.
- d) Symbol for surface finish; symbol for skin-pass treatment and/or symbol for chemical treatment; and symbol for oiling, all of which are marked when specified by the purchaser
- e) Symbol for coating mass
- f) Dimensions (See 9.1. For one sheet, only the nominal thickness is marked.)
- g) Product identification number
- h) Number of sheets or mass (For one sheet, this item may be omitted.)
- i) Manufacturer's name or its identifying brand

Marking examples are as follows.

### Example 1 Sheet

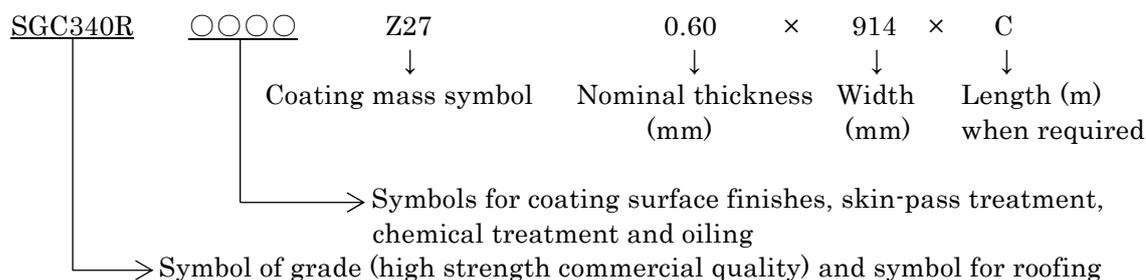


### Example 2 Coil

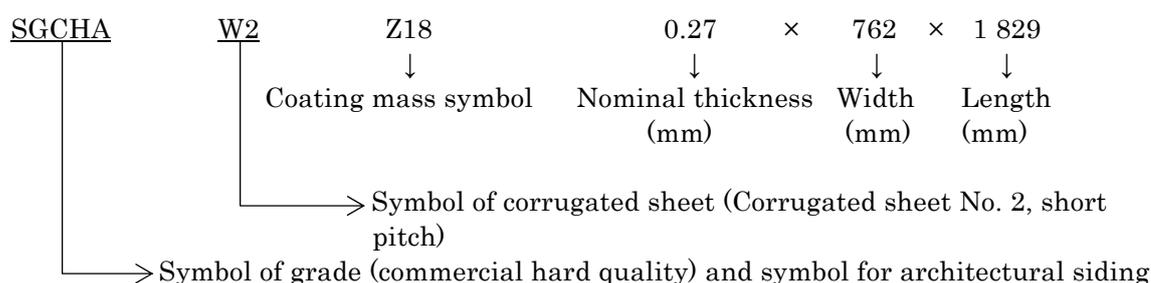


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### Example 3 Coil for roofing



### Example 4 Corrugated sheet for architectural siding using sheet of commercial hard quality



## 16 Items to be confirmed at the time of ordering

The purchaser and the manufacturer shall confirm the following items at the time of ordering so as to ensure that the supplied product is in conformance with this Standard.

- a) Symbol of grade (Tables 1 and 2)
- b) Dimensions (Clause 9)
- c) Classification or symbol of coating surface finish (Table 8)
- d) Necessity of skin-pass treatment or symbol (5.4.2)
- e) Symbol for coating mass (Table 7)
- f) Classification or symbol of chemical treatment (Table 11)
- g) Classification or symbol of oiling (Table 12)
- h) Tolerances on width (Table 22, Table 23 or Table 24)

## 17 Report

The manufacturer shall submit an inspection document to the purchaser when the document is previously requested by the purchaser. In this case, the report shall conform to the requirements in Clause 13 of JIS G 0404. The measured values of carbon, phosphor and sulfur among chemical compositions may be expressed to three decimal places in the report. Unless otherwise specified, the type of the inspection document to be submitted shall be in accordance with 5.1 of JIS G 0415.

## Annex JA (normative)

### Coating mass of sheet and coil for roofing and architectural siding

#### JA.1 Coating mass

Coating mass applied to sheets and coils for roofing and architectural siding varies depending on the nominal thickness. Classification of nominal thickness and the symbol for coating mass applied to the classification shall be as given in Table JA.1.

**Table JA.1 Nominal thickness and symbol for coating mass (applicable to symbols of grade given in Table 2)**

Application	Nominal thickness mm	Symbol for coating mass <sup>a)</sup>
Roofing	0.35 or over up to and incl. 1.0	Z25, Z27
	Over 1.0	Z27
Architectural siding	0.27 or over up to and incl. 0.50	Z18, Z22, Z25, Z27
	Over 0.50 up to and incl. 1.0	Z22, Z25, Z27
	Over 1.0	Z27
Note <sup>a)</sup> Z35, Z37 Z45 and Z60 may be applied if agreed between the purchaser and the manufacturer.		

## Annex JB (normative)

### Coating mass and standard dimensions of corrugated sheet

#### JB.1 Coating mass

Coating mass applied to corrugated sheets varies depending on the nominal thickness. Classification of nominal thickness and the symbol for coating mass applied to the classification shall be as given in Table JB.1.

**Table JB.1 Nominal thickness and symbol for coating mass (applicable to symbols of grade given in Table 2)**

Nominal thickness mm	Symbol for coating mass <sup>a)</sup>
0.11 or over to and excl. 0.16	Z12 <sup>b)</sup>
0.16 or over to and excl. 0.27	Z12
0.27 or over up to and incl. 0.30	Z12 <sup>b)</sup> , Z18, Z22, Z25, Z27
Over 0.30 up to and incl. 0.50	Z18, Z22, Z25, Z27
Over 0.50 up to and incl. 1.0	Z22, Z25, Z27
Notes <sup>a)</sup> Z35, Z37 Z45 and Z60 may be applied if agreed between the purchaser and the manufacturer.	
<sup>b)</sup> Application of Z12 to corrugated sheets with a nominal thickness of 0.11 mm or over to and excluding 0.16 mm and of 0.27 mm or over up to and including 0.30 mm shall be as agreed between the purchaser and the manufacturer.	

#### JB.2 Standard dimensions

##### JB.2.1 Standard nominal thickness

The standard nominal thickness of corrugated sheets shall be as given in Table JB.2.

**Table JB.2 Standard nominal thickness**

Standard nominal thickness									Unit: mm
0.11 <sup>a)</sup>	0.12 <sup>a)</sup>	0.13 <sup>a)</sup>	0.14 <sup>a)</sup>	0.15 <sup>a)</sup>	0.16	0.17	0.19	0.20	
0.25	0.27	0.30	0.35	0.40	0.50	0.60	0.80	1.0	
Note <sup>a)</sup> Applicable by agreement between the purchaser and the manufacturer									

##### JB.2.2 Standard width and length before corrugation

The standard width and length of pre-corrugated sheets shall be as given in Table JB.3.

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**Table JB.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						

### **JB.2.3 Standard width after corrugation**

The standard width of corrugated sheets shall be as specified in 4.3 of **JIS G 3316**.

## Annex JC (normative)

### Off-line coating mass determination of hot-dip zinc-coated steel sheet and strip by fluorescent X-ray method

#### JC.1 Outline

The coating mass of a test piece is determined using an off-line fluorescent X-ray test apparatus.

#### JC.2 Principle of measurement

The coating mass is obtained by measuring the intensity of fluorescent X-ray which is emitted from the coating when the specimen is irradiated by X-ray and by comparing this intensity with that of a test piece of known coating mass.

#### JC.3 Apparatus

The apparatus shall be as specified in Clause 5 of JIS K 0119.

#### JC.4 Fluorescent X-ray to be measured

The fluorescent X-ray to be measured shall be the primary ray of  $ZnK_{\alpha}$  (wavelength 0.143 5 nm).

#### JC.5 Test pieces

##### JD.5.1 Size of test pieces

The test piece shall be of such size that it can be installed in the sample chamber of the fluorescent X-ray test apparatus in which the area of the test piece irradiated by X-ray is controlled to be a minimum size of 314 mm<sup>2</sup>.

##### JC.5.2 Sampling position and number of test pieces

Take a test piece, from the sample obtained in accordance with 13.3.1, at each of the three points shown in Figure JC.1 or at a closest possible position to them in the case of continuous zinc-coating method, and in the case of a sheet-by-sheet zinc-coating method, at each of the three points shown in Figure JC.2 or at a closest possible position to them.

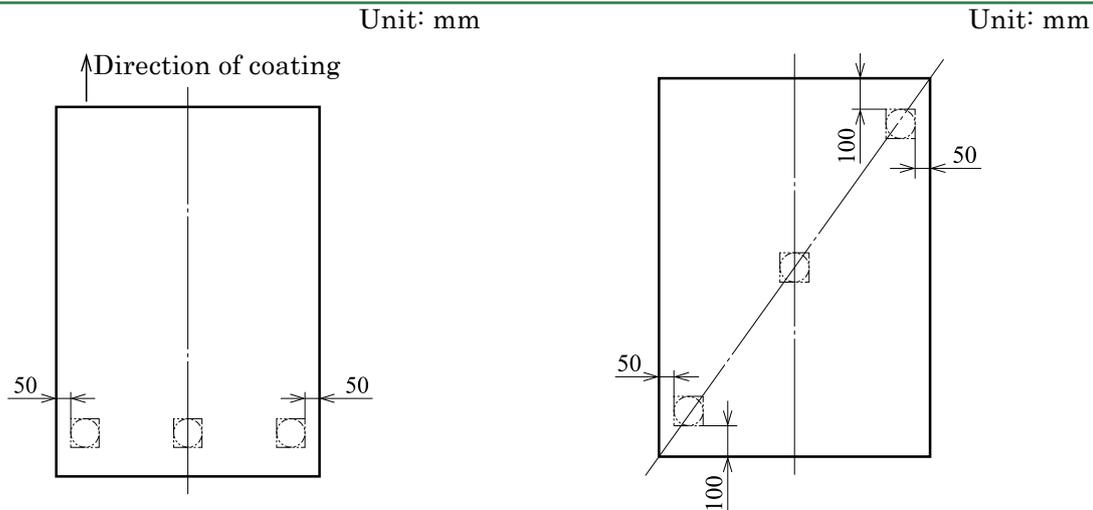


Figure JC.1 Sampling position of test pieces (continuous zinc-coating method)

Figure JC.2 Sampling position of test pieces (sheet-by-sheet zinc-coating method)

## JC.6 Preparation and correction of calibration curve

### JC.6.1 Preparation method of calibration curve

#### JC.6.1.1 General

The calibration curve shall be prepared by the triple-test-piece method or dual-test-piece method.

#### JC.6.1.2 Triple-test-piece method

The preparation of the calibration curve by the triple-test-piece method shall be as follows.

- a) **Test piece** Sample one test piece for fluorescent X-ray measurement (hereafter referred to as Test piece A), and two test pieces for coating mass determination (hereafter referred to as Test pieces B). Take each test piece from a sheet or coil of the same coating type as that of the measuring object. Take one Test piece A of such size that it fits in the sample chamber of the test apparatus. Take two Test pieces B of at least 1 200 mm<sup>2</sup> in size from each side of Test piece A.
- b) **Measurement of fluorescent X-ray intensity** Decide which surface of Test piece A to irradiate with fluorescent X-ray to take as the measurement surface. Irradiate the measurement surface of Test piece A with X-ray under the conditions specified in **JC.7 a)**, and measure the intensity of fluorescent X-ray.
- c) **Measurement of coating mass** Pretreat Test pieces B so as to prevent the elution of coating from other surfaces than the measurement surface. Prevent the elution of coating in such a way that, on the back of measurement surface, lacquer is applied and then dried, or a wide tape is applied. After pretreatment, measure the coating mass on the surfaces of two Test pieces B, according to Annex JE. Obtain

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the average coating mass of two Test pieces B to take as the coating mass on the measurement surface of Test piece A.

- d) **Preparation of calibration curve** Carry out procedures a) to c) on test pieces with at least three different levels of coating mass, and prepare the calibration curve based on the relation between the intensity of fluorescent X-ray and the coating mass.

#### JC.6.1.3 Dual-test-piece method

The preparation of the calibration curve by the dual-test-piece method shall be as follows.

- a) **Test piece** Take two test pieces of at least 1 200 mm<sup>2</sup> in size from the sample for preparing the calibration curve.
- b) **Measurement of fluorescent X-ray intensity** Decide which surface of the one test piece to irradiate with fluorescent X-ray to take as the measurement surface. Irradiate the measurement surface of the test piece with X-ray under the condition specified in **JC.7 a)**, and measure the intensity of fluorescent X-ray. Measure the intensity of fluorescent X-ray of the other test piece on the same surface in the same manner. Obtain the average intensity of fluorescent X-ray of the two test pieces to take as the intensity of fluorescent X-ray on the measurement surface.
- c) **Measurement of coating mass** Pretreat the test pieces so as to prevent the elution of coating from other surfaces than the measurement surface. Prevent the elution of coating in such a way that, on the back of measurement surface, lacquer is applied and then dried, or a wide tape is applied. After pretreatment, measure the coating mass on the surfaces of the two test pieces, according to Annex JE. Obtain the average coating mass of the two test pieces to take as the coating mass on the measurement surface.
- d) **Preparation of the calibration curve** Carry out procedures a) to c) on test pieces with at least three different levels of coating mass, and prepare a calibration curve based on the relation between the intensity of fluorescent X-ray and the coating mass.

#### JC.6.2 Correction of calibration curve

Mount the calibration test piece on the test apparatus, periodically <sup>1)</sup> measure the intensity of fluorescent X-ray or obtain the value converted to coating mass, and correct the calibration curve.

Note <sup>1)</sup> This calibration should be performed, for example, every 8 h or 24 h.

#### JC.7 Procedure

The procedure shall be as follows.

- a) Mount on the apparatus the test piece of symbol for the minimum coating mass among all measured coating mass values. Set the apparatus conditions under which the relative standard deviation <sup>2)</sup> after 10 consecutive measurements can be

within 1 %, and which the coating mass can be obtained to the nearest 0.1 g/m<sup>2</sup>. Repetitive measurements are not required when the X-ray intensity obtained by counting is 10 000 or more.

Note <sup>2)</sup> The term indicates the quotient obtained by dividing the standard deviation of measured values (absolute value of square root of variance) by the average value (see **3.10** of **JIS K 0211**).

When measuring a coating mass smaller than that of the symbol for coating mass used in setting the conditions, confirm that the above conditions are satisfied by using a test piece of the relevant symbol for coating mass. If the above conditions are not satisfied, new conditions shall be defined.

- b) Set the test piece properly in the sample chamber.
- c) Irradiate the test piece with X-ray under the specified conditions, and measure the intensity of fluorescent X-ray.
- d) Convert the intensity of fluorescent X-ray to coating mass per square metre (one side, g/m<sup>2</sup>), by using the calibration curve.
- e) Repeat procedures b) to d) on the rear surface of the test piece to determine the coating mass. Take the total of the coating masses on the front surface and rear surface as the coating mass of the test piece (both sides, g/m<sup>2</sup>).

#### **JC.8 Checks on apparatus**

The apparatus shall be subjected to adequate checks regarding the items listed in Clause **15** of **JIS K 0119**. In addition, the measured value of coating mass and the value obtained in accordance with Annex **JE** shall be compared to confirm that the measurement result obtained using the apparatus shows no abnormalities.

## Annex JD (normative)

### Online coating mass determination of hot-dip zinc-coated steel strip by fluorescent X-ray method

#### JD.1 Outline

Coating mass is measured by means of a fluorescent X-ray test apparatus installed on the production line without taking a test piece from coils.

**WARNING** Proper safety measures shall be taken in measurement and maintenance of a facility performed in accordance with this Annex. Thorough safety control shall be in place especially to avoid exposure to radiation.

**NOTE** Examples of laws and regulations regarding the installation and handling of the apparatus used in this test method are the Industrial Safety and Health Act and the Regulation on Prevention of Ionizing Radiation Hazards.

#### JD.2 Principle of measurement

The coating mass is obtained by measuring the intensity of fluorescent X-ray which is emitted from the coating when the coil is irradiated by the X-ray (including  $\gamma$  ray) and by comparing this intensity with that of a test piece of known coating mass.

#### JD.3 Apparatus

The apparatus shall be composed of an X-ray generating section; spectroscopy, light scanning and counting sections; and apparatus controlling and data processing sections; and shall be as follows. The apparatus shall be installed in a place where there is no variation of temperature or humidity that may significantly affect the measurement results.

**JD.3.1 X-ray generating section** The X-ray generating section shall be capable of directly irradiating the position of a coil specified in **JD.6.3** with X-ray (including  $\gamma$  ray).

**JD.3.2 Spectroscopy, light scanning and counting sections** The spectroscopy, light scanning and counting sections shall be capable of measuring the intensity of fluorescent X-ray generated at the measuring point specified in **JD.6.3**.

**JD.3.3 Apparatus controlling and data processing sections** The apparatus controlling and data processing sections shall be capable of controlling the X-ray generating section and the spectroscopy, light scanning and counting sections for irradiating the position specified in **JD.6.3** with X-ray (including  $\gamma$  ray) and measuring the intensity of the resultant emission of fluorescent X-ray, and shall be capable of keeping interrelated records of their irradiating points and the measurement results.

#### **JD.4 Fluorescent X-ray to be measured**

The fluorescent X-ray to be measured shall be the primary ray of  $ZnK_{\alpha}$  (wavelength 0.143 5 nm). X-ray of other wavelengths may be applied at the same time, for the correction of distance between the measurement surface and the apparatus or for other purposes.

#### **JD.5 Preparation and correction of calibration curve**

##### **JD.5.1 Preparation method of calibration curve**

The calibration curve shall be prepared in accordance with **JC.6.1**.

##### **JC.5.2 Correction of calibration curve**

The correction of calibration curve shall be as specified in **JC.6.2**.

#### **JD.6 Measurement method**

##### **JD.6.1 Measurement surface**

The surface of the coil on which the coating mass is measured shall be free from contamination and adhesion of metal powder which may significantly influence the measurement results. The distance and inclination between the surface to be measured and the apparatus shall be the same as the distance and inclination obtained at the time of the measurement of the test piece for X-ray measurement. A significant deviation in distance or inclination between the coil and the apparatus which may affect the measurement results shall be corrected, if applicable.

##### **JD.6.2 Measuring mode**

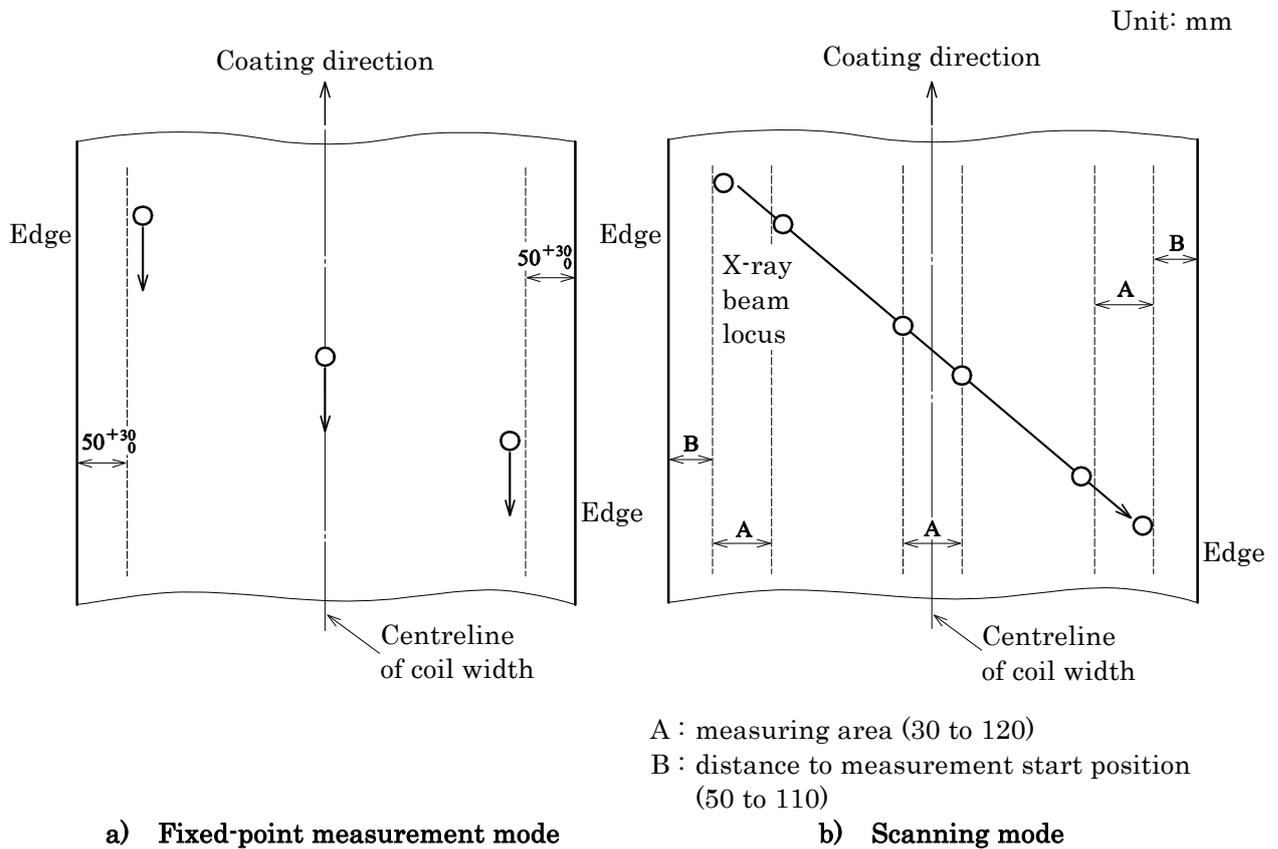
The measuring mode of the coating mass can be either that in which the apparatus is fixed on the specified position of the coil in the width direction (hereafter referred to as fixed-point measurement mode), or that in which the apparatus is moved at a constant speed in the width direction of the coil (hereafter referred to as scanning mode), while the coil is irradiated by the X-ray for the measurement of coating mass. Which of the measuring modes to apply shall be decided at the discretion of the manufacturer.

##### **JD.6.3 Measuring point of coating mass**

The measuring point of coating mass of coils in the width direction shall be as shown in Figure JD.1 a) for fixed-point measurement mode, and as shown in Figure JD.1 b) for scanning mode. In the fixed-point measurement mode, the apparatus shall be moved to three points at which the outer edges of the X-ray beam are  $50^{+30}_0$  mm from both edges of the coil (ends in width direction) and the centre of the X-ray beam is  $\pm 15$  mm from the centre of the coil width, and the coating mass shall be measured at each point. In the scanning mode, the apparatus shall be moved at a constant speed in the width direction of the coil, and the coating mass shall be measured at each of the three measuring areas (A) shown in Figure JD.1 b). In this case, side edge measuring areas indicate the positions of the outer edges of X-ray beam and the measuring area at the coil width centre indicates the position of the centre of X-ray beam.

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The coating mass shall be measured on both the front and rear surfaces of the coil. The measuring points of width direction shall be the same for both the front and rear surfaces of the coil, and measuring points of longitudinal directions of the front and rear surfaces of the coil shall be as close as possible.



**Figure JD.1 Measuring point of coating mass**

#### JD.6.4 Measurement

The measurement shall be as follows.

- a) The measuring time for one point shall be 4 s or less. Mount on the apparatus the test piece of symbol for the minimum coating mass among all coating mass values measured on the production line on which the apparatus is installed. Set the apparatus conditions under which the relative standard deviation after 10 consecutive measurements <sup>1)</sup> in the specified time can be within 1 %, and which the coating mass can be obtained to the nearest 0.1 g/m<sup>2</sup>. Repetitive measurements are not required when the X-ray intensity obtained by counting is 10 000 or more.

Note <sup>1)</sup> The term indicates the quotient obtained by dividing the standard deviation of measured values (absolute value of square root of variance) by the average value (see 3.10 of JIS K 0211).

When measuring a coating mass smaller than that of the symbol for coating mass used in setting the conditions, confirm that the above conditions are satisfied

by using a test piece of the relevant symbol for coating mass. If the above conditions are not satisfied, new conditions shall be defined.

- b) Irradiate the coil with X-ray under the set conditions and measure the fluorescent X-ray intensity.
- c) Convert the intensity of fluorescent X-ray to coating mass per square metre (one side,  $\text{g}/\text{m}^2$ ), by using the calibration curve.

When the coil area changes after measurement of the coating mass due to e.g. skin-pass treatment, correct the coating mass using the rate of change of area.

- d) Take the total of the coating masses on the front surface and rear surface as the coating mass at one point of the coil (both sides,  $\text{g}/\text{m}^2$ ).

#### **JD.6.5 Measured value of coating mass**

Obtain the average coating mass and the minimum coating mass using coating mass values at three points of arbitrary one pass <sup>2)</sup>. The measurement may be performed over more than one pass, in which case the average coating mass shall be the average of all measured coating mass values and the minimum coating mass shall be the minimum value among all measured coating mass values.

Note <sup>2)</sup> One pass means the measurement performed while the X-ray generating section is moved in one direction from a side edge at an arbitrary point of the coil to the other side edge.

#### **JD.7 Checks on apparatus**

The apparatus shall be subjected to adequate checks regarding the items listed in Clause 15 of **JIS K 0119** and the following items.

- a) The temperature and humidity at the place where the apparatus is installed do not influence the measurement.
- b) The distance and angle between the apparatus and the coil is kept constant at the time of measurement.
- c) The distance and angle between the test piece and the apparatus at the time of calibration are equivalent to those at the time of measurement of coil.
- d) Under scanning mode, the apparatus moves at a constant speed.
- e) The apparatus measures the coating mass of coil under the specified conditions.
- f) The contamination of the apparatus does not influence the measurement.
- g) The coating mass measured with the apparatus according to this method is compared with measurement results obtained by other methods (Annex JC or Annex JE), and the measurement result obtained using the apparatus shows no abnormalities.

## Annex JE (normative)

### Coating mass determination by gravimetric method

#### JE.1 Outline

The coated test piece is weighed and then the coating is dissolved in the test solution. The test piece is again weighed, and from the gap between the two masses obtained, the coating mass is determined.

#### JE.2 Test solution

Dissolve 3.5 g of hexamethylenetetramine specified in **JIS K 8847** in 500 ml of hydrochloric acid not less than 1.18 g/cm<sup>3</sup> in density [35 % (mass fraction)]. Dilute this solution with water twofold and take as a test solution.

#### JE.3 Cleaning of test piece

As necessary, degrease the test piece with an organic solvent and then dry. The organic solvent to be used shall be harmless to the coating.

#### JE.4 Procedure

The procedure shall be as follows.

- a) Measure the mass of test piece before dissolving the coating. The mass shall be measured to an accuracy within  $\pm 1$  % of the estimated coating mass (prospective coating mass).
- b) Select the volume of test solution so that at least 10 ml of solution is available for each 100 mm<sup>2</sup> of the coated surface area (one side) of test piece. The test solution may be reused as long as it is capable of easily removing the coating.
- c) Immerse the test piece completely in the test solution at ordinary temperature, and leave until the coating thoroughly dissolves. The cessation of originally brisk evolution of hydrogen in the test solution indicates the completion of dissolution. Rinse the test piece in running water, wipe well with cotton cloth and dry sufficiently, or alternatively immerse the test piece in alcohol and dry quickly. Then weigh the mass again. The mass shall be measured to an accuracy within  $\pm 1$  % of the estimated coating mass (prospective coating mass).
- d) After weighing, determine the area  $S$  (mm<sup>2</sup>) of the coated surface (one side) of test piece. Measure the surface area to an accuracy within  $\pm 1$  %.

In the case of known surface area, e.g. punching, the measurement may be omitted.

#### JE.5 Calculation of coating mass

The coating mass shall be calculated to one decimal place, and rounded to an integer

in accordance with Rule A of **JIS Z 8401**.

$$M = \frac{W_1 - W_2}{S} \times 10^6$$

where,  $M$  : coating mass (g/m<sup>2</sup>)  
 $W_1$  : mass of test piece before removal of coating (g)  
 $W_2$  : mass of test piece after removal of coating (g)  
 $S$  : coated surface area (one side) of test piece (mm<sup>2</sup>)

- 
- Bibliography
- JIS G 0594 *Methods of accelerated cyclic corrosion resistance tests for anodic coatings with exposure to salt spray, dry and wet conditions*
  - JIS H 8502 *Methods of corrosion resistance test for metallic coatings*
  - JIS K 0211 *Technical terms for analytical chemistry (General part)*
  - JIS K 5600-7-9 *Testing methods for paints — Part 7: Determination of resistance to cyclic corrosion conditions — Section 9: Salt fog/dry/humidity*
  - JIS Z 2371 *Methods of salt spray testing*
  - ISO 16539 *Corrosion of metals and alloys — Accelerated cyclic corrosion tests with exposure to synthetic ocean water salt-deposition process — “Dry” and “wet” conditions at constant absolute humidity*

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**Annex JF (informative)**  
**Comparison table between JIS and corresponding International Standards**

<b>JIS G 3302 : 2019 Hot-dip zinc-coated steel sheet and strip</b>		<b>ISO 3575 : 2016 Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of commercial and drawing qualities</b>		<b>ISO 4998 : 2014 Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of structural quality</b>					
(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	
				No. of clause	Content	Classification by clause	Detail of technical deviation		
1 Scope	Hot-dip zinc-coated steel sheet, strip and corrugated sheet	<b>ISO 3575</b>	Hot-dip zinc-coated steel sheet and strip of commercial and drawing qualities	Alteration	The scope in JIS covers specifications of the two ISO standards. Requirements for corrugated sheets have been added to JIS.	The difference arises due to the different market needs.			
		<b>ISO 4998</b>	Hot-dip zinc-coated steel sheet and strip of structural quality	Addition					
3 Symbol of grade and applicable nominal thickness	Applicable nominal thickness, and symbols of 3 grades of commercial quality, 4 grades of drawing quality and 10 grades of high strength commercial quality	<b>ISO 3575</b>	Applicable thickness, and symbols of 1 grade of commercial quality and 4 grades of drawing quality	Alteration	JIS specifies classification of hot-rolled and cold-reduced base metal. JIS specifies more numbers of grades than ISOs. The range of applicable thickness in JIS is wider than that in ISOs. Requirements for coating on steel sheets have been added to JIS.				
		<b>ISO 4998</b>	Applicable thickness, and symbols of seven grades of structural quality	Addition					

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(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
No. and title of clause	Content		No. of clause	Content	Classification by clause	Detail of technical deviation	
4 Chemical composition	Chemical composition (four elements) of base metal to be coated	<b>ISO 3575</b> <b>ISO 4998</b>	5.3	Chemical composition (four elements) of base metal, upper limit value of alloy elements not specified and permissible variation in product analysis	Alteration	Requirements for chemical composition differ between <b>JIS</b> and <b>ISOs</b> . <b>JIS</b> does not specify the upper limit value of alloy elements not specified and permissible variation in product analysis.	The difference arises due to the difference in specified mechanical properties between <b>JIS</b> and <b>ISOs</b> . <b>JIS</b> does not specify requirements for product analysis due to the lack of market demand.
5 Coating	5.1 Plating bath composition		—	—	Addition	Requirements for plating bath composition have been added to <b>JIS</b> .	Submission of a proposal regarding this addition to <b>ISOs</b> will be considered.
	5.3 Coating mass		5.5.1 5.3.1	Coating mass	Alteration	The requirements for coating mass specified in <b>JIS</b> are more detailed than that in <b>ISOs</b> .	The difference arises due to the different market needs.
	5.4 Coating surface finishes		8.4	Designation by a combination of spangle and skin-pass treatment	Alteration	<b>JIS</b> specifies separate symbols for the type of spangle and the application of skin-pass treatment.	<b>JIS</b> and <b>ISOs</b> have different standard structures.
	5.5 Coating adherence		5.5.2	Evaluation of coating adherence by the bend test	Addition	While <b>JIS</b> and <b>ISOs</b> specify the same requirements for the evaluation by the bend test, <b>JIS</b> also specifies requirements for the evaluation by other test methods.	Test methods common in Japan have been added to <b>JIS</b> .

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(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	
No. and title of clause	Content	No. of clause	Content	No. of clause	Content	Classification by clause	Detail of technical deviation		
6 Chemical treatment	Four types of chemical treatments	5.8.1 5.6.1	Two types of chemical treatments	5.8.1 5.6.1	Addition	Requirements for chemical treatment capable of supporting environmentally restricted substances (chromate-free treatment) has been added to JIS.	Submission of a proposal regarding this addition of chemical treatment (chromate-free treatment) to ISO will be considered.		
8 Mechanical properties	Bendability, tensile test characteristics (yield point or proof stress, tensile strength and elongation) as mechanical properties	5.2	Tensile test characteristics (yield point or proof stress, tensile strength and elongation)	5.2	Addition	Requirements for bendability have been added to JIS.	The bend test specified in JIS may be omitted. This item will be considered for exclusion from JIS in the future.		
9 Dimensions	9.1 Expression of dimensions	4.2 Annex A	The ordered thickness shall be either the product thickness or base metal thickness.	4.2 Annex A	Alteration	Requirements for tensile test characteristics differ between JIS and ISOs.	The difference arises due to the different market needs.	Base metal thickness has been conventionally used in Japan. Although ISOs used to specify the application of product thickness only, ISO then accepted the proposal of addition of the application of base metal thickness and made a modification in the 2005 revision.	

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(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
No. and title of clause	Content		No. of clause	Content	Classification by clause	Detail of technical deviation	
9 Dimensions (concluded)	9.2 Standard dimensions	<b>ISO 3575</b> <b>ISO 4998</b>	—	—	Addition	Requirements for standard dimensions have been added to <b>JIS</b> .	Requirements for standard dimensions is necessary in <b>JIS</b> due to business practices performed in Japan.
	9.3 Dimensional tolerances		5.7 Annex A	<b>ISOs</b> refer to <b>ISO 16163</b> for dimensional tolerances.	Alteration	<b>JIS</b> and <b>ISOs</b> specify different dimensional tolerances.	
10 Shape	Shape		5.7	Shape tolerances. <b>ISOs</b> refer to <b>ISO 16163</b> for shape tolerances.	Alteration	<b>JIS</b> specifies shape tolerances separately for hot-rolled and cold-reduced base metal. <b>JIS</b> and <b>ISOs</b> specify different values for shape.	<b>JIS</b> and <b>ISOs</b> have different standard structures.
11 Mass	Mass		—	—	Addition	Application of actual mass and theoretical mass are specified in <b>JIS</b> .	Requirements for mass are necessary in <b>JIS</b> due to business practices performed in Japan.
13 Tests	13.1 Chemical analysis		5.1	Heat analysis shall be performed by the manufacturer. Product analysis shall be performed by the purchaser, where necessary.	Alteration	<b>ISOs</b> do not specify concrete sampling method or analytical method. <b>JIS</b> specifies both concretely.	<b>JIS</b> and <b>ISOs</b> have different standard structures. Concrete specifications are required in <b>JIS</b> .

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(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
No. and title of clause	Content		No. of clause	Content	Classification by clause	Detail of technical deviation	
13 Tests (concluded)	13.2 Plating bath composition test	ISO 3575 ISO 4998	—	—	Addition	JIS specifies the test method of plating bath composition.	Submission of a proposal regarding this addition, along with the addition of specifications of plating bath composition, to ISO will be considered.
	13.3 Coating test		6.2 7.2	Coating mass determination and coating adherence determination	Addition  Alteration	Requirements for corrosion resistance test of coating, as agreed between the purchaser and the manufacturer, have been added to JIS. JIS states coating mass determination, which is specified in ISO, in Annex JC to Annex JE	The item has been added to JIS because the purchaser may request the submission of corrosion resistance test data. No technical deviation.
14 Inspection and reinspection	13.4 Mechanical test		6.1 7.1	Test pieces and test methods for bend test and tensile test	Alteration	Requirements for the shape of tensile test piece and the test method differ between JIS and ISOs.	The shape of tensile test piece specified is unique to JIS.
	14.1 Inspection		12	Inspection	Alteration	JIS specifies requirements for inspection for each item.	JIS and ISOs have different standard structures.
	14.2 Reinspection		9	Reinspection	Alteration	JIS specifies that the retest shall be performed in accordance with 9.8 of JIS G 0404.	No technical deviation.

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(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
No. and title of clause	Content		No. of clause	Content	Classification by clause	Detail of technical deviation	
15 Marking	Marking	ISO 3575 ISO 4998	8	Marking	Alteration	Symbols for roofing and architectural siding and symbols for corrugated sheets have been added to JIS.	JIS and ISOs have different standard structures.
16 Items to be confirmed at the time of ordering	Items to be confirmed at the time of ordering		15	Items to be confirmed at the time of ordering	Alteration	Requirements for corrugated sheets have been added to JIS.	JIS and ISOs have different standard structures.
17 Report	Report		—	—	Addition	Report requirements have been added to JIS.	Report requirements are necessary in JIS because reporting has been conventionally performed in Japan.
Annex JA (normative)	Nominal thickness and symbol for coating mass of sheet and coil for roofing and architectural siding		—	—	Addition	Requirements for sheets and coils for roofing and architectural siding have been added to JIS.	Requirements are necessary due to the particular uses.
Annex JB (normative)	Nominal thickness, symbol for coating mass and standard dimensions of corrugated sheets		—	—	Addition	Requirements for corrugated sheets have been added to JIS.	Requirements are necessary because corrugated sheet is unique to JIS.

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(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
No. and title of clause	Content		No. of clause	Content	Classification by clause	Detail of technical deviation	
Annex JC (normative)	Off-line coating mass determination by fluorescent X-ray method	ISO 3575 ISO 4998	7.2.1	Coating mass determination	Alteration	While JIS specifies requirements for coating mass determination in this Standard, ISOs refer to ISO 3497.	Requirements for coating mass determination are specified in Annexes in JIS for the convenience of users.
Annex JD (normative)	Online coating mass determination by fluorescent X-ray method		7.2.1	Coating mass determination	Alteration	While JIS specifies requirements for coating mass determination in this Standard, ISOs refer to ISO 3497.	Requirements for coating mass determination are specified in Annexes in JIS for the convenience of users.
Annex JE (normative)	Coating mass determination by gravimetric method		7.2.1	Coating mass determination	Alteration	While JIS specifies requirements for coating mass determination in this Standard, ISOs refer to ISO 1460.	Requirements for coating mass determination are specified in Annexes in JIS for the convenience of users.
—	—		3	Terms and definitions	Deletion	The clause has been deleted from JIS.	Terms are defined in JIS G 0203.
—	—		10	Resubmission for acceptance when products have been rejected during earlier inspection	Deletion	The clause has been deleted from JIS.	The item is specified in JIS G 0404.
—	—		12	Attendance inspection	Deletion	The clause has been deleted from JIS.	The item is specified in JIS G 0404.