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(JISF)

Steel bars for concrete  
reinforcement

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## Foreword

This translation has been made based on the original Japanese Industrial Standard 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 3112:2004** is replaced with this Standard.

In addition, **JIS G 3112:2004** is applicable until February 21st, 2011 in accordance with the JIS Mark Certification System based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

**Steel bars for concrete reinforcement****Introduction**

This Japanese Industrial Standard has been prepared based on the second editions **ISO 6935-1** and **ISO 6935-2** published in 2007 with some modifications of the technical contents.

The portions given continuous sidelines are dotted underlines are the matters in which the contents of the original International Standards have been modified.

A list of modifications, with the explanations is given in Annex JB.

**1 Scope**

This Standard specifies round steel bars<sup>1)</sup> and deformed steel bars<sup>1)</sup> produced by hot rolling to be used for concrete reinforcement. However, rerolled steel bars for concrete reinforcement specified in **JIS G 3117** are excluded.

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

ISO 6935-1:2007 *Steel for reinforcement of concrete—Part 1: Plain bars*

ISO 6935-2:2007 *Steel for reinforcement of concrete—Part 1: Ribbed bars*  
(Overall evaluation: MOD)

The 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**.

Note <sup>1)</sup> The steel bars in coil form are included.

**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 3117 *Rerolled steel bars for concrete reinforcement*

JIS G 3191 *Dimensions, mass and permissible variations of hot rolled steel bars and bar in coil*

JIS Z 2201 *Test pieces for tensile test for metallic materials*

JIS Z 2241 *Method of tensile test for metallic materials*

JIS Z 2248 *Metallic materials—Bend test*

JIS Z 8401 *Guide to the rounding of numbers*

### 3 Grade and symbol

The round and deformed steel bars shall be classified into two and five grades, respectively, and their symbols shall be as given in table 1.

**Table 1 Symbol of grade**

Division	Symbol of grade
Round steel bars	SR235
	SR295
Deformed steel bars	SD295A
	SD295B
	SD345
	SD390
	SD490

### 4 Manufacturing method

The round and deformed steel bars shall be produced by hot rolling from steel ingots (including semi-finished products produced by continuous casting).

### 5 Chemical composition

The round steel bars and deformed steel bars shall be tested in accordance with 9.1, and the heat analysis values shall conform to table 2.

**Table 2 Chemical composition <sup>a1</sup>**

Unit: %

Symbol of grade	C	Si	Mn	P	S	$C + \frac{Mn}{6}$
SR235	—	—	—	0.050 max.	0.050 max.	—
SR295	—	—	—	0.050 max.	0.050 max.	—
SD295A	—	—	—	0.050 max.	0.050 max.	—
SD295B	0.27 max.	0.55 max.	1.50 max.	0.040 max.	0.040 max.	—
SD345	0.27 max.	0.55 max.	1.60 max.	0.040 max.	0.040 max.	0.50 max.
SD390	0.29 max.	0.55 max.	1.80 max.	0.040 max.	0.040 max.	0.55 max.
SD490	0.32 max.	0.55 max.	1.80 max.	0.040 max.	0.040 max.	0.60 max.

Note <sup>a1</sup> Alloy elements other than those in the table may be added as required.

### 6 Mechanical properties

The round and deformed steel bars shall be tested in accordance with 9.2, and their yield point or proof stress, tensile strength, elongation and bendability shall conform to table 3.

Furthermore, in the case of bend test, it shall be free from crack on the outside of the bent portion.

**Table 3 Mechanical properties**

Symbol of grade	Yield point or proof stress N/mm <sup>2</sup>	Tensile strength N/mm <sup>2</sup>	Tensile test piece	Elongation <sup>a)</sup> %	Bendability	
					Bend angle	Inside radius
SR235	235 min.	380 to 520	No. 2	20 min.	180°	1.5 × Nominal diameter
			No. 14A	22 min.		
SR295	295 min.	440 to 600	No. 2	18 min.	180°	1.5 × Nominal diameter for diameter 16 mm or under
			No. 14A	19 min.		2.0 × Nominal diameter for diameter more than 16 mm
SD295A	295 min.	440 to 600	Equivalent to No. 2	16 min.	180°	1.5 × Nominal diameter for diameter D16 or under
			Equivalent to No. 14A	17 min.		2.0 × Nominal diameter for diameter over D16
SD295B	295 to 390	440 min.	Equivalent to No. 2	16 min.	180°	1.5 × Nominal diameter for diameter D16 or under
			Equivalent to No. 14A	17 min.		2.0 × Nominal diameter for diameter over D16
SD345	345 to 440	490 min.	Equivalent to No. 2	18 min.	180°	1.5 × Nominal diameter for diameter D16 or under
			Equivalent to No. 14A	19 min.		2.0 × Nominal diameter for diameter over D16 up to and incl. D41
2.5 × Nominal diameter for diameter D51						
SD390	390 to 510	560 min.	Equivalent to No. 2	16 min.	180°	2.5 × Nominal diameter
			Equivalent to No. 14A	17 min.		
SD490	490 to 625	620 min.	Equivalent to No. 2	12 min.	90°	2.5 × Nominal diameter for diameter D25 or under
			Equivalent to No. 14A	13 min.		3.0 × Nominal diameter for diameter over D25

NOTE : 1 N/mm<sup>2</sup> = 1 MPa

Note <sup>a)</sup> For the deformed steel bar exceeding designation D32, 2 shall be deducted from the elongation value of table 3 for each increase of 3 in the number of the elongation. However, the limit of reduction shall be 4.

## 7 Shape, dimension, mass and tolerances

### 7.1 Shape, dimension, mass and tolerances for round steel bars

The shape, dimension, mass and tolerances for round steel bars shall conform to **JIS G 3191**. However, the standard length and its tolerance shall conform to tables 6 and 7. The standard diameter of round steel bars shall be in the range of 5.5 mm to 50 mm shown in table 1 of **JIS G 3191**.

## **7.2 Shape, dimension, mass and tolerances for deformed steel bars**

### **7.2.1 Shape**

The shape shall be as the following.

- a) The deformed steel bar shall have protrusions on the surface.  
NOTE: Protrusions in axial direction are referred to "ribs", and those in other directions "knots".
- b) Knots of the deformed steel bar shall be distributed at about a fixed interval throughout the whole length and shall have the identical shapes and dimension. However, in the case where letters or the like are indicated in the form of raised mark, the knots in that part may be lacked.
- c) The root parts of the knots of the deformed steel bar of designation D16 or over shall be so shaped as to minimize the stress concentration.

### **7.2.2 Shape, dimension, mass and tolerances**

Shape, dimension, mass and tolerances of the deformed steel bars shall be as follows:

- a) Dimension of deformed steel bars shall be expressed with designation, and their dimension, unit mass and allowable limits of knot shall conform to table 4.

**Table 4 Dimension, unit mass and allowable limits of knot for deformed steel bars**

Designation	Nominal diameter ( <i>d</i> ) mm	Nominal peripheral length <sup>a)</sup> ( <i>l</i> ) cm	Nominal section area <sup>a)</sup> ( <i>S<sub>n</sub></i> ) cm <sup>2</sup>	Unit mass <sup>a)</sup> kg/m	Maximum value of mean interval between knots <sup>b)</sup> mm	Height of knot <sup>c)</sup>		Maximum value of sum of clearance between knots <sup>d)</sup> mm	Angle between knot and axial line
						Minimum value mm	Maximum value mm		
D4	4.23	1.3	0.140 5	0.110	3.0	0.2	0.4	3.3	45° min.
D5	5.29	1.7	0.219 8	0.173	3.7	0.2	0.4	4.3	
D6	6.35	2.0	0.316 7	0.249	4.4	0.3	0.6	5.0	
D8	7.94	2.5	0.495 1	0.389	5.6	0.3	0.6	6.3	
D10	9.53	3.0	0.713 3	0.560	6.7	0.4	0.8	7.5	
D13	12.7	4.0	1.267	0.995	8.9	0.5	1.0	10.0	
D16	15.9	5.0	1.986	1.56	11.1	0.7	1.4	12.5	
D19	19.1	6.0	2.865	2.25	13.4	1.0	2.0	15.0	
D22	22.2	7.0	3.871	3.04	15.5	1.1	2.2	17.5	
D25	25.4	8.0	5.067	3.98	17.8	1.3	2.6	20.0	
D29	28.6	9.0	6.424	5.04	20.0	1.4	2.8	22.5	
D32	31.8	10.0	7.942	6.23	22.3	1.6	3.2	25.0	
D35	34.9	11.0	9.566	7.51	24.4	1.7	3.4	27.5	
D38	38.1	12.0	11.40	8.95	26.7	1.9	3.8	30.0	
D41	41.3	13.0	13.40	10.5	28.9	2.1	4.2	32.5	
D51	50.8	16.0	20.27	15.9	35.6	2.5	5.0	40.0	

The rounding of numbers in Notes <sup>a)</sup> to <sup>d)</sup> shall be in accordance with rule A in JIS Z 8401.

Notes <sup>a)</sup> The method of calculating the nominal section area, nominal peripheral length and unit mass shall be as follows:

In addition, the nominal section area (*S*) shall be rounded off to 4 places of significant figures, the nominal peripheral length (*l*) to 1 place of decimal, and the unit mass to 3 places of significant figures.

$$\text{Nominal section area } (S) = \frac{0.7854 \times d^2}{100}$$

$$\text{Nominal peripheral length } (l) = 0.3142 \times d$$

$$\text{Unit mass} = 0.785 \times S$$

- <sup>b)</sup> The maximum value of mean interval between the knots shall be 70 % of the nominal diameter (*d*) and the calculated value shall be rounded off to 1 place of decimal.
- <sup>c)</sup> The height of knot shall conform to table 5, and the calculated value shall be rounded off to 1 place of decimal.
- <sup>d)</sup> The maximum sum of clearances between knots shall be 25 % of the nominal peripheral length (*l*), and the calculated value shall be rounded off to 1 place of decimal. Clearances between knots shall be, in the case where a rib and knot are separated from each other, or where no rib is provided, the width of the position devoid of knots and, where a knot and rib are connected, shall be the width of the rib.



**Table 5 Height of knot of deformed steel bar**

Designation	Height of knot	
	Minimum	Maximum
Designation D13 or under	4.0 % of nominal diameter	Twice the minimum value
Designation over D13 to and excl. D19	4.5 % of nominal diameter	Twice the minimum value
Designation D19 or over	5.0 % of nominal diameter	Twice the minimum value

- b) The standard length for the deformed steel bar shall conform to table 6. This table shall not apply to coils.

**Table 6 Standard length**

Unit: m

3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0	9.0	10.0	11.0	12.0
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- c) The tolerances on length for the deformed steel bar shall conform to table 7. This table shall not apply to coils.

**Table 7 Tolerances on length**

Length	Tolerances
7 m or under	+40 mm 0
Over 7 m	For each increase of 1 m in length or its fraction, further 5 mm shall be added to the tolerances on the plus side given above. The maximum value, however, shall be limited to 120 mm.
The purchaser may designate the tolerances other than given above.	

- d) The tolerances on mass for one piece of the deformed steel bar shall conform to table 8.

**Table 8 Tolerances on mass for one piece**

Designation	Tolerances	Remarks
Designation under D10	+ not specified - 8 %	The sampling methods of samples and calculation of tolerances shall be in accordance with <b>9.3.2 b) 1)</b> .
Designation D10 or over to and excl. D16	± 6 %	
Designation D16 or over to and excl. D29	± 5 %	
Designation D29 or over	+ 4 % *	

- e) The tolerances on mass for one set of the deformed steel bar shall conform to table 9. However, this table shall be applied only when designated by the purchaser in advance.

**Table 9 Tolerances on mass for one set**

Designation	Tolerances	Remarks
Designation under D10	± 7 %	The sampling methods of samples and calculation of tolerances shall be in accordance with 9.3.2 b) 2).
Designation D10 or over to and excl. D16	± 5 %	
Designation D16 or over to and excl. D29	± 4 %	
Designation D29 or over	± 3.5 %	

**8 Appearance**

The round and deformed steel bars shall be free from defects that are detrimental to practical use.

**9 Tests****9.1 Chemical analysis**

The chemical analysis shall be as the following:

- a) The general requirements for chemical analysis and sampling method of specimens shall be in accordance with clause 8 of **JIS G 0404**.
- b) The analytical method shall be in accordance with **JIS G 0320**.

**9.2 Mechanical test****9.2.1 Test in general**

The general requirements for mechanical test shall be in accordance with clause 7 of **JIS G 0404**. In this case, sampling method of samples shall be in accordance with Class A, and test pieces shall be as follows:

- a) The number of tensile test pieces and bend test pieces shall be each one piece taken from each lot of the same heat and several sizes where the difference of diameter or nominal diameter among them falls less than 10 mm. However, respective two pieces shall be taken from a lot exceeding 50 t.
- b) Any test pieces shall be as product without mechanical finishing.

**9.2.2 Tensile test**

The tensile test shall be as follows.

- a) The test piece for tensile test shall be No. 2 test piece (for the deformed steel bar, the applicable size shall be under designation D25) or No. 14A test piece (for the deformed steel bar, the applicable size shall be designation D25 or over) specified in **JIS Z 2201** and the gauge length and length of parallel portion of the deformed steel bar shall be determined according to the nominal diameter.
- b) The method of tensile test shall be in accordance with **JIS Z 2241**. However, the cross section area to obtain yield point or proof stress and tensile strength of deformed steel bars shall apply the nominal section area as shown in table 4.

