

CÔNG TY THÉP MIỀN NAM  
TÀI LIỆU KIỂM SOÁT

# JIS

JAPANESE  
INDUSTRIAL  
STANDARD

Translated and Published by  
Japanese Standards Association

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JIS G 3112 : 2010

(JISF)

Steel bars for concrete  
reinforcement

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International Organization for Standardization  
The ISO Standards, Technology and Quality

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ICS 77.140.15; 91.080.40

Reference number : JIS G 3112 : 2010 (E)

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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.

### 9.2.3 Bend test

The bend test shall be as follows.

- a) The test piece for bend test shall be No. 2 test piece specified in JIS Z 2248.
- b) The method of bend test shall be in accordance with JIS Z 2248.

### 9.2.4 Rebend test

For deformed steel bars of designation D32 or under in size of SD295B and SD345, the purchaser may designate the rebend test in stead of the bend test if specially required. In this case, the sampling method of test pieces, test method and acceptance criteria shall be agreed between the purchaser and the manufacturer beforehand.

NOTE : The rebend test is used to verify the ageing properties of the bent bars. After heating the test piece bent at the specified angle and aging artificially, it shall be rebent at the specified angle and examined the existence of cracks on the surface to verify.

## 9.3 Measurement of shape, dimension and mass

### 9.3.1 Sampling method for measurement of shape, dimension and mass for round steel bars

One sample of 0.5 m or over in length shall be taken from every lot of products rolled to the same shape and dimension within an identical roll chance. In the case of coil form, however, it shall be subjected to tests after being straightened at an ordinary temperature.

### 9.3.2 Sampling and measurement methods of shape, dimension and mass for deformed steel bar

The sampling method and measuring method shall be as follows.

- a) For the deformed steel bar, the measuring method of the shape of knot and dimension and sampling method shall be as follows.
  - 1) One sample of 0.5 m or over in length shall be taken from every lot of products rolled to the same shape and dimension within an identical roll chance. In the case of coil form, however, it shall be subjected to tests after being straightened at an ordinary temperature.
  - 2) The angle formed by the knot and the axial line of the deformed steel bar shall be measured with the development figure<sup>2)</sup> of surface of the deformed steel bar. However, in the case where the angle formed by the knot and the axial line is designed to be 90°, the measurement with the development figure may be omitted.

Note <sup>2)</sup> The development figure may be obtained, for example, by rolling a deformed steel bar on a sheet of oil clay.

- 3) The mean interval between knots shall be obtained by dividing into 10 equal parts either the sum of ten consecutive knot intervals measured on the centre line of knots, or a length corresponding to this measured on another line in the axial direction.

- 4) The height of a piece of knot shall be obtained by averaging the values of three heights measured at points dividing the knot into four equal parts.
  - 5) The clearance between knots shall be determined either by measuring the distance between the end lines of confronting knots of the product itself as well as vertical to the end line using vernier callipers and the like, or by measuring the development figure<sup>2)</sup> of the surface of the deformed steel bar. However, in the case where these distances are not uniform, the mean value shall be obtained by measuring the distance covering the consecutive ten knots.
- b) As to measurement of mass for the deformed steel bar, the sampling method and calculation method of tolerance on mass shall be as follows.
- 1) The sampling method for measurement of mass of one piece shall be in accordance with 1) of 9.3.2 a). As to calculation method of tolerance on mass in this case, it shall be expressed in percentage of quotient of the difference between the theoretical mass, that is a product of the unit mass given in table 4 and the length, and actually measured mass divided by the said theoretical mass.
  - 2) As to the sample for measurement of mass of one set of products, one sample shall be taken from a lot of products of the identical shape and dimension, and of 1 t or more in mass. When the number of pieces corresponding to 1 t does not amount to 10 pieces, however, 10 pieces or more shall be taken to be one set. Further, as to calculation method of tolerance on mass in this case, it shall be expressed in percentage of quotient of the difference between the theoretical mass, this is a product of the unit mass given in table 4, the length and the number of pieces of one set and the actually measured mass divided by the said theoretical mass.

## 10 Inspection

### 10.1 Inspection

The inspection shall be as follows.

- a) The general matters for inspection shall be in accordance with **JIS G 0404**.
- b) The chemical composition shall conform to clause 5.
- c) The mechanical properties shall conform to clause 6.
- d) The shape, dimensions, mass and tolerances shall conform to clause 7.
- e) The appearance shall conform to clause 8.
- f) If the supplementary quality requirements in Annex JA are applied under the agreement between the purchaser and the manufacturer, test pieces shall conform to JA.1.

### 10.2 Reinspection

The reinspection shall be as follows.

- a) The round and deformed steel bars which have not passed the tensile test or bend test shall be retested for acceptance in accordance with **9.8 in JIS G 0404**.
- b) In the case of sampling inspection where the mass of one piece of deformed steel bar sampled has failed to conform to **7.2.2 d)**, two additional samples shall be taken. When the test results for both meet the requirements, the lot shall be deemed as acceptable.

## 11 Marking

### 11.1 Marking on each piece

Each piece of the round and deformed steel bars shall be marked as follows. However, the markings of the coil of the round steel bar and the coil of the deformed steel bar of designation **D4, D5, D6 and D8** shall be in accordance with **11.2**.

- a) The round and deformed steel bars shall be marked to identify the grade in accordance with table 10. However, the markings identifying the grade of the deformed steel bar shall employ the rolling mark method with exception of SD295A, and only the deformed steel bar of designation **D4, D5, D6 and D8** and the deformed steel bar having screw-thread-shaped knots may be identified by colouring.
- b) The deformed steel bar shall be marked by rolling to denote the name of manufacturer or its abbreviation. However, the deformed steel bar of designation **D4, D5, D6 and D8** in size (except for coils) and those of which manufacturer's name is self-evident due to the shape of the rolled mark, these indications may be omitted.

**Table 10 Marking method for grade identification**

Symbol of grade	Marking method for grade identification	
	Marking by rolling mark	Marking by colouring
SR 235	Not applied	Red (on one side section)
SR 295		White (on one side section)
SD 295 A	Without rolling mark	Not applied
SD 295 B	1 or	White (on one side section)
SD 345	Number of protrusions, one piece ( • )	Yellow (on one side section)
SD 390	Number of protrusions, two pieces ( •• )	Green (on one side section)
SD 490	Number of protrusions, three pieces ( ••• )	Blue (on one side section)

### 11.2 Marking on each bundle

The round and deformed steel bars shall be marked the following details by appropriate means.

- a) Symbol of grade
- b) Heat number or inspection number
- c) Diameter, nominal diameter or designation

d) Manufacturer's name or abbreviation

**12 Report**

The report shall comply with the requirements in clause 13 of JIS G 0404. However, unless otherwise specified, the type of inspection document shall comply with either standard designation 2.3 or 3.1.B in table 1 of JIS G 0415.

For chemical compositions, if Note <sup>a)</sup> in table 2 is applicable, the content rate of the added element shall be described in the report.

## **Annex JA (normative)**

### **Supplementary quality requirements**

This Annex specifies the supplementary quality requirements. These are applied by the agreement between the purchaser and the manufacturer.

#### **JA.1 Yield ratio**

The application of the following yield ratio<sup>1)</sup> to round and deformed steel bars may be designated by the agreement between the purchaser and the manufacturer. However, SD490 is excluded.

$$\text{Yield ratio} \leq 0.80$$

Note <sup>1)</sup> Yield ratio is expressed by the ratio of yield point or proof stress to tensile strength (yield point or proof stress is divided by tensile strength).

**Annex JB (informative)**

**Comparison table between JIS and corresponding International Standards**

JIS G 3112:2010 <i>Steel bars for concrete reinforcement</i>		ISO 6935-1:2007 <i>Steel for the reinforcement of concrete—Part 1: Plain bars</i> ISO 6935-2:2007 <i>Steel for the reinforcement of concrete—Part 2: Ribbed bars</i>					
(I) Requirements in JIS		(II) International Standard numbers	(III) Requirements in International Standards		(IV) Classification and details of technical deviation between JIS and the International Standards by clause		(V) Justification for the technical deviation and future measures
No. and title of clause	Content		Clause No.	Content	Classification by clause	Detail of technical deviation	
1 Scope	Round steel bars and deformed steel bars produced by hot rolling to be used for concrete reinforcement.	ISO 6935-1 ISO 6935-2	1	Round steel bars and deformed steel bars produced by hot rolling to be used for concrete reinforcement. For deformed steel bars, those produced by cold working are included.	Alteration	JIS specifies only hot rolled products. In ISO deformed steel bars produced by cold working are included.	Since in ISO cold formed products are allowed as deformed bars, TS/YP is 1.1 or over which is lower than TS/YP of hot rolled products and different from design criterion in JIS. The grades of JIS used in the earthquake-prone country like Japan have been proposed to be added to ISO and accepted. Therefore, ISO covers products specified in JIS, those having low yield ratio specified in ASTM and those having high yield ratio specified in EN together.
2 Normative references							

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(I) Requirements in JIS		(II) International Standard numbers	(III) Requirements in International Standards		(IV) Classification and details of technical deviation between JIS and the International Standards by clause		(V) Justification for the technical deviation and future measures
No. and title of clause	Content		Clause No.	Content	Classification by clause	Detail of technical deviation	
3	Grade and symbol Two grades of round steel bars Five grades of deformed steel bars		1, 7  1, 8	Ten grades of plain bars (those having three different yield strength are classified into four grades A to D according to ductility class)  21 grades of ribbed bars (those having five different yield strength are classified into four grades A to D according to ductility class)	Deletion	While in JIS two grades of round steel bars are specified, in ISO they are classified into 10 grades according to ductility class A to D (expressed in reciprocal of yield ratio). Similarly, in JIS five grades of ribbed bars are specified, on the other hand, in ISO they are classified into 21 grades according to four ductility classes.	The proposal of addition of high TS/YP products of JIS to ISO was accepted, as a result, the ductility class is divided into four grades A to D and in class D (yield ratio of max. 0.80) the grades of JIS G 3112 and ASTM A 706 are added.
4	Manufacturing method The round and deformed steel bars are produced by hot rolling from steel ingots.		1 1	Described in scope.	Alteration	ISO covers deformed steel bars produced by cold working.	See 1 Scope.
5	Chemical composition Round steel bars: P and S are specified. Deformed steel bars: only P and S are specified for some grades. Five elements and five elements + carbon equivalent are specified.		6 7	In ductility class D which ensures the weldability, five elements + N + carbon equivalent (for welding) are specified for round and deformed steel bars. For other grades P and S are specified.	Deletion	The chemical compositions are almost the same. However, for deformed steel bars of higher strength, the maximum value for N is specified in ISO.	The chemical composition for grade of ductility class D is the same as the one specified in JIS G 3112 and ASTM A 706. The stipulation of the maximum value for N is the countermeasure against aging. In Japan the actual value for N is within the maximum value in ISO.

(I) Requirements in JIS		(II) International Standard numbers	(III) Requirements in International Standards		(IV) Classification and details of technical deviation between JIS and the International Standards by clause		(V) Justification for the technical deviation and future measures
No. and title of clause	Content	Clause No.	Content	Classification by clause	Detail of technical deviation		
6 Mechanical properties	Tensile properties (tensile strength, yield point and elongation) and bending properties are specified.	7 8	Round steel bars: Tensile test, bend test Deformed steel bars: Tensile test, bend test + rebend test (higher strength products) (+ fatigue test if required)	Alteration	In ISO for deformed steel bars of yield point min. 400 N/mm <sup>2</sup> the rebend test is carried out. In JIS for deformed steel bars of SD295B and SD345 of size designation D32 or under the rebend test may be designated by the purchaser instead of the bend test.	In JIS aging is not a big issue. As shown in the left column the rebend test may be carried out corresponding to aging. Therefore, it almost corresponds to ISO.	
7 Shape, dimensions, mass and tolerances	7.1 Shape, dimension, mass and tolerances for round steel bars 7.2 Shape, dimension, mass and tolerances for deformed steel bars (including ribbed bars)	5 5 6	Round steel bars: Shape, dimension, mass and tolerance Deformed steel bars: Shape, dimension, mass and tolerance Ribbed bars	Alteration	Dimension mm JIS ISO Round steel bars: 5.5 to 50 6 to 22 Deformed steel bars: 4 to 51 6 to 50	Shapes of rib are different between JIS and ISO. It is difficult to change the shape of rib to conform to ISO. The proposal of addition of "Requirements for rib parameters may be specified by the relative rib area, by agreement between the manufacturer and purchaser." was submitted to ISO and accepted.	
8 Appearance	Steel bars shall be free from defects that are detrimental to practical use.	—	Not specified.	Addition	Specification is required.	The proposal will be submitted to ISO.	

(I) Requirements in JIS		(II) International Standard numbers	(III) Requirements in International Standards		(IV) Classification and details of technical deviation between JIS and the International Standards by clause		(V) Justification for the technical deviation and future measures
No. and title of clause	Content		Clause No.	Content	Classification by clause	Detail of technical deviation	
9 Tests	9.1 Chemical analysis 9.2 Mechanical test 9.3 Measurement of shape, dimension and mass		8	Mechanical test	Alteration	In ISO, shape and dimension are not described. However mass per unit length and permissible deviation are specified in table 2. For tensile test even if bars with the same YP (yield point), TS (tensile strength) are different between JIS and ISO. The bending radiuses for bend test are different.	Since ductility class D in ISO is specified based on JIS, specified values of tensile test are the same as those in JIS. For the bend test, test conditions are almost the same.
			11.3	Evaluation of characteristic values— Chemical composition			
			9 12.3	Mechanical test Evaluation of characteristic values— Chemical composition			
10 Inspection	Requirements for inspection and reinspection are specified.		11	Certification and inspection	Deletion	In ISO the certification testing method is also specified.	Conditions for inspection are almost the same.
			12	Certification and inspection			
Annex JA	Yield ratio of 0.80 or under is specified as a supplementary quality requirement.		7 8	Mechanical properties Mechanical properties	Alteration	Since in ISO bars produced by cold working are allowed, a large number of bars have higher yield ratio. On the other hand, the grades in JIS have lower yield ratio (corresponding to ductility class D in ISO) which suits in the earthquake-prone country.	Since the grades corresponding to JIS are added in ISO, the supplementary quality requirement is added to describe the grades with yield ratio of 0.80 or under which corresponds to ductility class D. As a result, grade of ductility class D of ISO and one in JIS are equivalent.

Overall degree of correspondence between JIS and International Standards (ISO 6935-1:2007, ISO 6935-2:2007): MOD

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

- Deletion: Deletes the specification item(s) or content(s) of International Standards.
- Addition: Adds the specification item(s) or content(s) which are not included in International Standards.
- Alteration: Alters the specification content(s) which are included in International Standards.

NOTE 2 Symbol in column of overall degree of correspondence between **JIS** and International Standards in the comparison table indicates as follows:

- MOD: Modifies International Standards.

G 3112 : 2010

Date of Establishment: 1964-07-01

Date of Revision: 2010-02-22

Date of Public Notice in Official Gazette: 2010-02-22

Investigated by: Japanese Industrial Standards Committee  
Standards Board  
Technical Committee on Iron and Steel

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JIS G 3112:2010, First English edition published in 2010-06

Translated and published by: Japanese Standards Association  
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

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In the event of any doubts arising as to the contents,  
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Printed in Japan

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