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(JISF)

**Carbon steel and molybdenum alloy
steel plates for boilers and pressure
vessels**

ICS 27.060.01;77.140.30;77.140.50

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the original JIS is to be the final authority.

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Contents

	Page
Introduction.....	1
1 Scope.....	1
2 Normative references	1
3 Classification, symbol and applicable thickness	2
4 Manufacturing method and heat treatment.....	2
4.1 Manufacturing method	2
4.2 Heat treatment and symbol of heat treatment.....	2
5 Chemical composition	3
5.1 Heat analysis value.....	3
5.2 Product analysis value.....	4
6 Mechanical properties.....	5
7 Shapes, dimensions, mass and tolerances thereof	7
8 Appearance	7
9 Tests	7
9.1 Chemical analysis.....	7
9.2 Mechanical test	8
10 Inspection	8
11 Re-inspection	9
12 Marking.....	9
13 Report.....	9
Annex JA (normative) Upper limits of alloy elements not specified in table 2	10
Annex JB (informative) Comparison table between JIS and corresponding International Standards	11

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 3103:2007** is replaced with this Standard.

However, **JIS G 3103:2007** 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 April 19th, 2013.

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 or utility model right. 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 or utility model right.

Carbon steel and molybdenum alloy steel plates for boilers and pressure vessels

Introduction

This Japanese Industrial Standard was established in 1953 according to the chemical composition, etc. of **ASTM A 515** and **ASTM A 204**, and has gone through seven revisions to this day. At this time, the specification of chemical composition has been revised to correspond to the revision of **ASTM A 515**.

The corresponding International Standards are **ISO 9328-1** and **ISO 9328-2**. Initially, they were incompatible with **JIS** and **ASTM** in some points; therefore, the revisions of **ISO 9328-1** and **ISO 9328-2** have been promoted. The second editions of **ISO 9328-1** and **ISO 9328-2** were published in 2003 and 2004, in which the specifications of **JIS** and **ASTM** were incorporated and harmonized with **ISO**. This Standard has been prepared based on the third editions of **ISO 9328-1** and **ISO 9328-2** published in 2011 with some modifications of the technical contents to meet the actual dealings in the market.

The portions given side lines or dotted underlines are the matters in which the contents of the corresponding International Standard have been modified. A list of modifications with the explanations is given in Annex JB.

1 Scope

This Standard specifies the hot-rolled steel plates of carbon steel and molybdenum alloy steel (hereafter referred to as “steel plates”) to be used in boilers and pressure vessels for intermediate and elevated temperature services.

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

ISO 9328-1:2011 *Steel flat products for pressure purposes—Technical delivery conditions—Part 1: General requirements*

ISO 9328-2:2011 *Steel flat products for pressure purposes—Technical delivery conditions—Part 2: Non-alloy and alloy steels with specified elevated temperature properties* (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 0321 *Product analysis and its tolerance for wrought steel*

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

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

NOTE : Corresponding International Standard: ISO 10474 *Steel and steel products—Inspection documents* (IDT)

JIS G 3193 *Dimensions, mass and permissible variations of hot rolled steel plates, sheets and strips*

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

JIS Z 2248 *Metallic materials—Bend test*

3 Classification, symbol and applicable thickness

Steel plates shall be classified into five types, and their symbols and applicable thicknesses shall be as given in table 1.

Table 1 Classification symbol and applicable thickness

Unit: mm

Classification symbol	Applicable thickness
SB410	6 or over up to and incl. 200
SB450	
SB480	
SB450M	6 or over up to and incl. 150
SB480M	

4 Manufacturing method and heat treatment

4.1 Manufacturing method

Steel plates shall be manufactured from killed steel.

4.2 Heat treatment and symbol of heat treatment

4.2.1 Heat treatment

4.2.1.1 Heat treatment of steel plates

The heat treatment of steel plates shall be as follows.

- Steel plates SB410, SB450 and SB480 of 50 mm or under in thickness, and SB450M and SB480M of 38 mm or under in thickness shall be as rolled. However, the heat treatment of normalizing or stress relieving may be performed as required.
- Steel plates SB410, SB450 and SB480 of over 50 mm in thickness, and SB450M and SB480M of over 38 mm in thickness shall be normalized or uniformly heat-treated during the hot-forming process at a temperature that ensures the effect similar to the above.

- c) When the heat treatment of **4.2.1.1 b)** is performed by the purchaser, steel plates shall be as rolled upon the agreement between the purchaser and the manufacturer, or heat-treated of normalizing or stress relieving by the manufacturer.

4.2.1.2 Designation of heat treatment

The designation of the heat treatment shall be as follows.

- a) The purchaser shall clearly specify the heat treatment of steel plates to be performed by the manufacturer and also, if necessary, the conditions and the number of times of the heat treatment on test pieces in the order sheet.
- b) When the purchaser performs the heat treatment according to **4.2.1.1 c)**, the purchaser shall designate to that effect in the order sheet and clearly specify the conditions of the heat treatment on test pieces to be performed by the manufacturer.

4.2.1.3 Heat treatment on test pieces

The heat treatment on test pieces shall be performed in a state of the samples taken from steel plates, and the test pieces shall be taken from the samples after the heat treatment.

4.2.2 Symbol of heat treatment

The symbol of heat treatment to be stated in the order sheet shall be as follows.

- a) When steel plates are subject to normalizing: N
- b) When steel plates are subject to stress relieving: P
- c) When the test pieces only are subject to normalizing: TN
- d) When the test pieces are subject to heat treatment corresponding to post-weld heat treatment: SR

Example: SB450N:	Steel plates are subject to normalizing
SB480NSR:	Steel plates are subject to normalizing and test pieces are subject to heat treatment corresponding to post-weld heat treatment
SB480PTN:	Steel plates are subject to stress relieving and test pieces are subject to normalizing
SB480TNSR:	Test pieces only are subject to normalizing and heat treatment corresponding to post-weld heat treatment
SB480TN3SR:	Test pieces only are subject to normalizing and three times of heat treatment corresponding to post-weld heat treatment

5 Chemical composition

5.1 Heat analysis value

Steel plates shall be tested in accordance with **9.1**, and the heat analysis values shall be as given in table 2. The upper limits of alloy elements not specified in table 2 shall be in accordance with Annex JA.

5.2 Product analysis value

When required by the purchaser, the product analysis of steel plates shall be tested in accordance with 9.1, and the values shall be as given in table 2. The upper limits of alloy elements not specified in table 2 shall be in accordance with Annex JA.

Table 2 Chemical composition

Unit: %

Classification symbol	Thickness	C ^{a)}	Si	Mn	P ^{a)}	S ^{a)}	Mo
SB410	25 mm or under	0.24 max. ^{b)}	Heat analysis value 0.15 to 0.40 Product analysis value 0.13 to 0.45	Heat analysis value 0.90 max. ^{b)} Product analysis value 0.98 max. ^{b)}	0.020 max.	0.020 max.	—
	Over 25 mm up to and incl. 50 mm	0.27 max. ^{b)}					
	Over 50 mm up to and incl. 100 mm	0.29 max. ^{b)}					
	Over 100 mm up to and incl. 200 mm	0.30 max. ^{b)}					
SB450	25 mm or under	0.28 max. ^{b)}	Heat analysis value 0.15 to 0.40 Product analysis value 0.13 to 0.45	Heat analysis value 0.90 max. ^{b)} Product analysis value 0.98 max. ^{b)}	0.020 max.	0.020 max.	—
	Over 25 mm up to and incl. 50 mm	0.31 max. ^{b)}					
	Over 50 mm up to and incl. 200 mm	0.33 max. ^{b)}					
SB480	25 mm or under	0.31 max. ^{b)}	Heat analysis value 0.15 to 0.40 Product analysis value 0.13 to 0.45	Heat analysis value 1.20 max. ^{b)} Product analysis value 1.30 max. ^{b)}	0.020 max.	0.020 max.	—
	Over 25 mm up to and incl. 50 mm	0.33 max. ^{b)}					
	Over 50 mm up to and incl. 200 mm	0.35 max. ^{b)}					
SB450M	25 mm or under	0.18 max.	Heat analysis value 0.15 to 0.40 Product analysis value 0.13 to 0.45	Heat analysis value 0.90 max. Product analysis value 0.98 max.	0.020 max.	0.020 max.	Heat analysis value 0.45 to 0.60 Product analysis value 0.41 to 0.64
	Over 25 mm up to and incl. 50 mm	0.21 max.					
	Over 50 mm up to and incl. 100 mm	0.23 max.					
	Over 100 mm up to and incl. 150 mm	0.25 max.					
SB480M	25 mm or under	0.20 max.	Heat analysis value 0.15 to 0.40 Product analysis value 0.13 to 0.45	Heat analysis value 0.90 max. Product analysis value 0.98 max.	0.020 max.	0.020 max.	Heat analysis value 0.45 to 0.60 Product analysis value 0.41 to 0.64
	Over 25 mm up to and incl. 50 mm	0.23 max.					
	Over 50 mm up to and incl. 100 mm	0.25 max.					
	Over 100 mm up to and incl. 150 mm	0.27 max.					
Notes ^{a)} Applicable to heat analysis values, and product analysis values (when requested by the purchaser).							
^{b)} The specified value of Mn may be increased by 0.06 % on each reduction of the specified value of C by 0.01 %, provided that the upper limit of the specified value of Mn is 1.50 % for the heat analysis value and 1.60 % for the product analysis value.							

6 Mechanical properties

Steel plates shall be tested in accordance with **9.2** and the yield point or proof stress, tensile strength, elongation and bendability shall be as given in table 3.

For the bendability, there shall not be any crack on the outside of the bend of the test piece.

NOTE : See **9.2.1** for the bendability test.

Table 3 Mechanical properties

Classifi- cation symbol	Yield point or proof stress N/mm ²	Tensile strength N/mm ²	Elonga- tion ^{a) b) c)} %	Tensile test piece ^{d)}	Bendability		
					Bend angle	Thickness	Inside radius
SB410	225 min.	410 to 550	21 min.	No. 1A	180°	25 mm or under	0.50 times the thickness
			25 min.	No. 10		Over 25 mm up to and incl. 50 mm	0.75 times the thickness
						Over 50 mm up to and incl. 100 mm	1.00 times the thickness
						Over 100 mm up to and incl. 200 mm	1.25 times the thickness
SB450	245 min.	450 to 590	19 min.	No. 1A	180°	25 mm or under	0.75 times the thickness
			23 min.	No. 10		Over 25 mm up to and incl. 100 mm	1.00 times the thickness
						Over 100 mm up to and incl. 200 mm	1.25 times the thickness
SB480	265 min.	480 to 620	17 min.	No. 1A	180°	25 mm or under	1.00 times the thickness
			21 min.	No. 10		Over 25 mm up to and incl. 50 mm	1.00 times the thickness
						Over 50 mm up to and incl. 100 mm	1.25 times the thickness
						Over 100 mm up to and incl. 200 mm	1.50 times the thickness
SB450M	255 min.	450 to 590	19 min.	No. 1A	180°	25 mm or under	0.50 times the thickness
			23 min.	No. 10		Over 25 mm up to and incl. 100 mm	0.75 times the thickness
						Over 100 mm up to and incl. 150 mm	1.00 times the thickness
SB480M	275 min.	480 to 620	17 min.	No. 1A	180°	25 mm or under	0.75 times the thickness
			21 min.	No. 10		Over 25 mm up to and incl. 100 mm	1.00 times the thickness
						Over 100 mm up to and incl. 150 mm	1.25 times the thickness

NOTE : 1 N/mm² = 1 MPa

Notes ^{a)} For the elongation of No. 1A test piece of steel plates under 8 mm in thickness, deduct 1 from the elongation values given in the above table for each decrement of 1 mm or its fraction in thickness.

^{b)} For the elongation of No. 10 test piece for steel plates over 90 mm in thickness, deduct 0.5 from the elongation values given in the above table for each increment of 12.5 mm or its fraction in thickness. However, the deduction shall not exceed 3.

^{c)} When the elongation of No. 1A test piece of SB450M and SB480M steel plates of over 6 mm to and excluding 20 mm in thickness is more than the value (%) specified in this table subtracted by 3, the test piece shall be accepted despite the above specification provided that the value of elongation in the gauge length of 50 mm including the broken part is 25 % or over.

^{d)} For the tensile test piece, No. 1A test piece shall be used for the steel plates of 50 mm or under in thickness and No. 10 test piece for those of over 50 mm in thickness. However, for the steel plates of over 40 mm in thickness, No. 10 test piece may be used.

7 Shapes, dimensions, mass and tolerances thereof

Shapes, dimensions, mass and tolerances thereof for steel plates shall be as specified in **JIS G 3193**. Tolerances on the length and cut-edge width of steel plates shall be as specified in tolerance A of **JIS G 3193** unless otherwise specified, and the tolerances on thickness shall be as given in table 4.

Table 4 Tolerances on thickness ^{a) b) c)}

Unit: mm

Thickness	Width					
	Under 1 600	1 600 or over to and excl. 2 000	2 000 or over to and excl. 2 500	2 500 or over to and excl. 3 150	3 150 or over to and excl. 4 000	4 000 or over to and excl. 5 000
6.00 or over to and excl. 6.30	+0.75	+0.95	+0.95	+1.25	+1.25	—
6.30 or over to and excl. 10.0	+0.85	+1.05	+1.05	+1.35	+1.35	+1.55
10.0 or over to and excl. 16.0	+0.85	+1.05	+1.05	+1.35	+1.35	+1.75
16.0 or over to and excl. 25.0	+1.05	+1.25	+1.25	+1.65	+1.65	+1.95
25.0 or over to and excl. 40.0	+1.15	+1.35	+1.35	+1.75	+1.75	+2.15
40.0 or over to and excl. 63.0	+1.35	+1.65	+1.65	+1.95	+1.95	+2.35
63.0 or over to and excl. 100	+1.55	+1.95	+1.95	+2.35	+2.35	+2.75
100 or over to and excl. 160	+2.35	+2.75	+2.75	+3.15	+3.15	+3.55
160 or over	+2.95	+3.35	+3.35	+3.55	+3.55	+3.95
Notes ^{a)} The minus side tolerance on thickness shall be 0.25 mm. ^{b)} Tolerances on width of 5 000 mm or over shall be upon the agreement between the purchaser and the manufacturer. ^{c)} When the minus side tolerance is designated as 0 mm upon the agreement between the purchaser and the manufacturer, the plus side tolerance shall be the numerical value given in this table plus 0.25.						

8 Appearance

The appearance of steel plates shall be as specified in clause 7 of **JIS G 3193**, provided that repair by welding shall be approved by the purchaser.

9 Tests

9.1 Chemical analysis

The chemical analysis shall be as follows.

- General requirements for chemical analysis and the sampling method for heat analysis shall be as specified in clause 8 of **JIS G 0404**.
- The sampling method for product analysis shall be as specified in clause 4 of **JIS G 0321**. However, the tensile test piece after rupture may be used as the sample.
- The method for heat analysis shall be as specified in **JIS G 0320**. The method for product analysis shall be as specified in **JIS G 0321**.

9.2 Mechanical test

9.2.1 General

General requirements for mechanical test shall be as specified in clause 7 and clause 9 of **JIS G 0404**. The sampling method shall be according to Class A in 7.6 of **JIS G 0404**, and the number of test pieces and their sampling position shall be as follows.

The bend test may be omitted¹⁾. However, specially designated by the purchaser, the test shall be performed.

Note ¹⁾ It refers that although the test may be omitted according to the judgment of the manufacturer, the bendability shall satisfy the requirements.

- a) **Number of test pieces for tensile test and bend test and sampling direction** One test piece shall be taken in perpendicular to the final rolling direction from the steel plate as directly rolled from the identical slab or the identical ingot under the same heat treatment conditions, if heat treatment is performed.
- b) **Sampling position of test pieces for tensile test and bend test** The sampling position shall be such that the centre of the test piece is at a quarter-width from either end of steel plate or at a position close to it. When No. 10 test piece is used as a tensile test piece, the axis of the test piece shall be at a quarter-thickness from the surface of steel plate. If it is unable, the test piece shall be taken at a position close to it.

9.2.2 Test piece

The tensile test piece and the bend test piece shall be as follows.

- a) The tensile test piece shall be No. 1A or No. 10 test piece specified in **JIS Z 2241**.
- b) The bend test piece shall be No. 1 test piece specified in **JIS Z 2248**.

9.2.3 Test method

The methods for tensile test and bend test shall be as follows.

- a) The method for tensile test shall be as specified in **JIS Z 2241**.
- b) The method for bend test shall be as specified in **JIS Z 2248**.

NOTE : The purchaser may designate the sulfur print examination in **JIS G 0560**, nondestructive test in **JIS G 0801** and so on upon the agreement between the purchaser and the manufacturer as other tests specified in this Standard. In this case, the method of sampling, test method, acceptance criteria and others are preliminarily agreed between the purchaser and the manufacturer.

10 Inspection

The inspection shall be as follows.

- a) General requirements of inspection shall be as specified in **JIS G 0404**.
- b) The chemical composition shall comply with clause 5.

- c) The mechanical properties shall comply with clause **6**.
- d) The shapes, dimensions and mass shall comply with clause **7**.
- e) The appearance shall comply with clause **8**.

11 Re-inspection

The re-inspection shall be as follows.

- a) For steel plates having failed to meet the requirements of tensile test and bend test, retests may be performed for acceptance as specified in **9.8** of **JIS G 0404**.
- b) For steel plates having failed to meet the requirements of the test, retests may be performed again for acceptance after heat treatment or re-heat treatment.

12 Marking

For each steel plate that has passed the inspection, the following items shall be marked by suitable means.

- a) Classification symbol and symbol of heat treatment in **4.2.2**
- b) Heat number or inspection number
- c) Dimensions, whose expression is as specified in clause **3** of **JIS G 3193**
- d) Manufacturer's name or its identifying brand

13 Report

The manufacturer shall submit the inspection document to the purchaser. The report shall conform to the requirements of clause **13** of **JIS G 0404**. However, unless otherwise specified at the time of ordering, the type of inspection document shall conform to either standard designation 2.3 or 3.1.B in table 1 of **JIS G 0415**.

The chemical composition shall be reported for all elements specified in table 2 and table JA.1.

Annex JA (normative)

Upper limits of alloy elements not specified in table 2

JA.1 Scope

This Annex specifies upper limits of alloy elements not specified in table 2.

JA.2 Upper limits of alloy elements not specified in table 2

The upper limits of alloy elements not specified in table 2 shall be as given in table JA.1. However, the product analysis shall apply upon the request by the purchaser.

Table JA.1 Upper limits of alloy elements not specified in table 2

Unit: %

Classification symbol	Analysis type	Chemical composition							
		Cu	Ni	Cr	Mo	Nb ^{e)}	V ^{e)}	Ti ^{e)}	B
SB410 ^{a) b)}	Heat analysis	0.40	0.40	0.30	0.12	0.02	0.03	0.03	0.001 0
	Product analysis	0.43	0.43	0.34	0.13	0.03	0.04	0.04	0.001 5
SB450 ^{a) b) d)}	Heat analysis	0.40	0.40	0.30	0.12	0.02	0.03	0.03	0.001 0
	Product analysis	0.43	0.43	0.34	0.13	0.03	0.04	0.04	0.001 5
SB480 ^{a) b) d)}	Heat analysis	0.40	0.40	0.30	0.12	0.02	0.03	0.03	0.001 0
	Product analysis	0.43	0.43	0.34	0.13	0.03	0.04	0.04	0.001 5
SB450M	Heat analysis	0.40	0.40	0.30	—	0.02	0.03	0.03	0.001 0
	Product analysis	0.43	0.43	0.34	—	0.03	0.04	0.04	0.001 5
SB480M	Heat analysis	0.40	0.40	0.30	—	0.02	0.03	0.03	0.001 0
	Product analysis	0.43	0.43	0.34	—	0.03	0.04	0.04	0.001 5
Notes ^{a)} For SB410, SB450 and SB480, the total of Cu, Ni, Cr and Mo shall be 1.00 % or under for the heat analysis. ^{b)} For SB410, SB450 and SB480, the total of Cr and Mo shall be 0.32 % or under for the heat analysis. ^{c)} Upon the agreement between the purchaser and the manufacturer, Nb may be 0.05 % or under for the heat analysis and 0.06 % or under for the product analysis, V may be 0.10 % or under for the heat analysis and 0.11 % or under for the product analysis, and Ti may be 0.05 % or under for both heat analysis and product analysis. ^{d)} Upon the agreement between the purchaser and the manufacturer, Mo may be 0.30 % or under for the heat analysis and 0.35 % or under for the product analysis for SB450 and SB480.									

Bibliography

JIS G 0560 *Method of sulphur print for steel*

JIS G 0801 *Ultrasonic testing of steel plates for pressure vessels*

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

JIS G 3103:2012 <i>Carbon steel and molybdenum alloy steel plates for boilers and pressure vessels</i>				ISO 9328-1:2011 <i>Steel flat products for pressure purposes—Technical delivery conditions—Part 1: General requirements</i> ISO 9328-2:2011 <i>Steel flat products for pressure purposes—Technical delivery conditions—Part 2: Non-alloy and alloy steels with specified elevated temperature properties</i>			
(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	
1 Scope	Steel plates of carbon steel and molybdenum alloy steel to be used for boilers and pressure vessels for intermediate and elevated temperature services.	ISO 9328-1 ISO 9328-2	1	Steel plates of carbon steel and alloy steel to be used for pressure vessels for intermediate and elevated temperature services.	Alteration	For the use, the boiler is included in JIS . For the applicable steel grades, many steel grades concerning alloy steels are specified in ISO Standard. In JIS , only molybdenum alloy steel is specified in this Standard.	Difference in the standard system. The standard system in Japan is the same as that of ASME in USA. Since this is not substantial difference and the alteration of this system significantly affects laws and regulations and technical standards, a wait-and-see stance is taken for the time being.
2 Normative references							
3 Classification, symbol and applicable thickness	Five types are specified.	ISO 9328-2	4.2	16 types of European design codes and 15 types of ASME design codes are specified.	Deletion	In ISO Standard, 31 types including steel grades specified in JIS are specified.	For the technical standard of pressure vessels, two standards of ASME design codes and European design codes are in the mainstream worldwide. ISO Standard is made to be a coexistence standard capable of corresponding to both standards.

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
No. and title of clause	Content		No. of clause	Content	Classification by clause	Detail of technical deviation	
4 Manufacturing method and heat treatment	Killed steel. For heat treatment, as rolled, normalizing.	ISO 9328-1	6.1	Killed steel	Identical	Steel grades in JIS are equivalent to those in ISO Standards.	For the manufacturing method, killed steel is specified to make JIS conform to ISO Standards. For the heat treatment, JIS is made to be clearer by specifying the division of plate thickness, etc.
		ISO 9328-2	6.2	As rolled or normalizing is selected.	Addition	In JIS , the division of plate thickness for heat treatment is specified.	
5 Chemical composition	The heat analysis value and the product analysis value are specified.	ISO 9328-2	6.3	The cast analysis value and the product analysis value are specified.	Alteration	The specification of ISO Standard subsumes that of JIS .	In JIS , the specification of chemical composition is available for boilers. The specification is not severe. The current standard is followed.
6 Mechanical properties	Tensile properties at ordinary temperature and bendability are specified.	ISO 9328-2	6.4	For steel plates of European design codes, tensile properties at ordinary temperature, tensile properties at elevated temperature and impact properties, and for steel plates of ASME design codes, tensile properties at ordinary temperature are specified.	Addition	When compared with respect to corresponding steel grades, bendability also is specified in JIS .	Although in JIS , the requirement for bendability has been conventionally specified based on the needs of the user, the required performance is quite general. The current standard is followed according to the market needs.
7 Shapes, dimensions, mass and tolerances thereof	As specified in JIS G 3193 . The minus side tolerance on plate thickness is 0.25 mm.	ISO 9328-1	6.7	As agreed between the purchaser and the manufacturer with reference to ISO 7452 .	Deletion	JIS G 3193 conforms to ISO 7452 . The minus side tolerance on plate thickness differs because it is 0.30 mm in ISO Standard.	For the minus side tolerance on plate thickness, efforts will be made by watching the trend of actual track records and laws and regulations and technical standards in Japan.

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
No. and title of clause	Content		No. of clause	Content	Classification by clause	Detail of technical deviation	
8 Appearance	As specified in JIS G 3193 .	ISO 9328-1	6.5	As specified in ISO 7788 .	Alteration	Although the local shortage of plate thickness of the location in which surface flaws are removed is permitted as a choice in ISO Standard, it is not permitted in JIS .	The current standard in which shortage of plate thickness is not permitted based on the requirements of laws and regulations is followed.
9 Tests	Chemical analysis and mechanical test are specified.	ISO 9328-1	9	Chemical analysis, mechanical test and tensile test at elevated temperature are specified.	Deletion	In JIS , the tensile test at elevated temperature is not specified. JIS conforms to steels in Annex B to which this test is not applied.	
10 Inspection	The specified test items are inspected.	ISO 9328-1	7	The specified test items are inspected.	Deletion	In JIS , the inspection of tensile test at elevated temperature is not specified.	
11 Re-inspection	As specified in JIS G 0404 .	ISO 9328-1	7.3	As specified in ISO 404 .	Addition	JIS G 0404 conforms to ISO 404 . In JIS , the bend test is added.	
12 Marking	Classification symbol, heat number, dimensions, manufacturer's name, etc. are marked.	ISO 9328-1	10	Symbol of classification and manufacturer's name are marked. Items except these are as agreed or at the option of the manufacturer.	Addition	In JIS , heat number and dimensions also are marked.	

(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 Report	The type of report shall be standard designation 2.3 or 3.1B in JIS G 0415 unless otherwise designated at the time of order.	ISO 9328-1	7.1	Inspection documents (3.1A, 3.1B, 3.1C or 3.2) based on the designation by the purchaser.	Identical	Both of them are based on the designation of the purchaser.	
Annex JA	Alloy elements not specified in the text are specified in Annex.	ISO 9328-2	6.3	Specified in the text.	Alteration	For the specification, it is equivalent to ISO Standard, Annex B.	

Overall degree of correspondence between **JIS** and International Standards (**ISO 9328-1**:2011, **ISO 9328-2**:2011): MOD

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

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

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

- MOD: Modifies International Standards.

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