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Alloy steel pipes

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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 3458:1988** is replaced with this Standard.

This revision has been made based on **ISO 9329-2:1997** *Seamless steel tubes for pressure purposes—Technical delivery conditions—Part 2: Unalloyed and alloyed steels with specified elevated temperature properties* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

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.

Editor's notice: New **JIS** Mark Scheme went into effect on October 1st, 2005 according to the revision of the Industrial Standardization Law, so old **JIS** mark indication is omitted from this English version.

Up-to-date information including list of **JIS** subject to new **JIS** Marking System is issued on the website of JISC (<http://www.jisc.go.jp>).

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Alloy steel pipes

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 9329-2** *Seamless steel tubes for pressure purposes—Technical delivery conditions—Part 2: Unalloyed and alloyed steels with specified elevated temperature properties* published in 1997 with some modifications of the technical contents.

The portions given sidelines are the matters in which the contents of the original International Standard have been modified. A list of modifications with the explanations is given in Annex 2 (informative).

1 Scope This Standard specifies the alloy steel pipes (hereafter referred to as “pipes”) mainly used for piping at elevated temperature.

Remarks 1 The purchaser may designate in addition to the items specified in the text, by prior agreement with the manufacturer, part or all of the items in the supplementary quality requirements given in Annex 1 (normative).

2 The International Standard corresponding to this Standard is as follows.

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

ISO 9329-2:1997 *Seamless steel tubes for pressure purposes—Technical delivery conditions—Part 2: Unalloyed and alloyed steels with specified elevated temperature properties* (MOD)

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 methods 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*

JIS G 0567 *Method of elevated temperature tensile test for steels and heat-resisting alloys*

JIS G 0582 *Ultrasonic examination for steel pipes and tubes*

JIS G 0583 *Eddy current examination of steel pipes and tubes by encircling coil technique*

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

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

JIS Z 8401 *Guide to the rounding of numbers*



3 Classification and symbol Pipes shall be classified into 7 grades, and their symbols and symbols indicating the manufacturing method shall be as given in table 1.

Table 1 Symbol of grade and symbol indicating manufacturing method

Symbol of grade		Symbol indicating manufacturing method		
		Manufacturing method of pipes	Finishing method	Marking
Molybdenum steel pipe	STPA 12	Seamless: S	Hot finished: H Cold finished: C	The marking of symbol indicating manufacturing method shall be in accordance with 12 b) .
Chromium-molybdenum steel pipe	STPA 20			
	STPA 22			
	STPA 23			
	STPA 24			
	STPA 25			
	STPA 26			

4 Manufacturing method The manufacturing method shall be as follows:

- The pipe shall be manufactured by the combination of the manufacturing method of pipe and the finishing method given in table 1.
- The pipe shall be subjected to the heat treatment given in table 2. The heat treatment not given in table 2 shall be as agreed between the purchaser and the manufacturer.

Table 2 Heat treatment

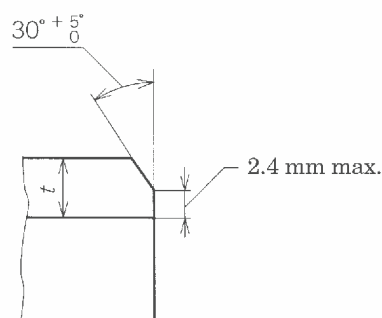
Symbol of grade	Heat treatment
STPA 12	Low temperature annealing, isothermal annealing, full annealing, normalizing or normalizing followed by tempering
STPA 20	Low temperature annealing, isothermal annealing, full annealing or normalizing followed by tempering
STPA 22	
STPA 23	Isothermal annealing, full annealing or normalizing followed by tempering
STPA 24	
STPA 25	
STPA 26	

Remarks : The tempering temperature for grade STPA 23, STPA 24, STPA 25 and STPA 26 shall be 650 °C or higher.

- Upon request of the purchaser, the pipe may be furnished with the bevel end⁽¹⁾.

Note ⁽¹⁾ The shape of the bevel end shall be as agreed between the purchaser and the manufacturer. The pipe of not more than 22 mm in wall thickness, unless otherwise specified, shall be as shown in figure 1.





t : Wall thickness, 22 mm max.

Figure 1 Shape of bevel end

5 Chemical composition The pipe shall be tested in accordance with 10.1 and the resulting cast analysis shall be as given in table 3.

Table 3 Chemical composition

Unit: %

Symbol of grade	C	Si	Mn	P	S	Cr	Mo
STPA 12	0.10 to 0.20	0.10 to 0.50	0.30 to 0.80	0.035 max.	0.035 max.	—	0.45 to 0.65
STPA 20	0.10 to 0.20	0.10 to 0.50	0.30 to 0.60	0.035 max.	0.035 max.	0.50 to 0.80	0.40 to 0.65
STPA 22	0.15 max.	0.50 max.	0.30 to 0.60	0.035 max.	0.035 max.	0.80 to 1.25	0.45 to 0.65
STPA 23	0.15 max.	0.50 to 1.00	0.30 to 0.60	0.030 max.	0.030 max.	1.00 to 1.50	0.45 to 0.65
STPA 24	0.15 max.	0.50 max.	0.30 to 0.60	0.030 max.	0.030 max.	1.90 to 2.60	0.87 to 1.13
STPA 25	0.15 max.	0.50 max.	0.30 to 0.60	0.030 max.	0.030 max.	4.00 to 6.00	0.45 to 0.65
STPA 26	0.15 max.	0.25 to 1.00	0.30 to 0.60	0.030 max.	0.030 max.	8.00 to 10.00	0.90 to 1.10

Remarks : When the product analysis is requested by the purchaser, the test shall be performed in accordance with 10.1, and the resulting values shall be as given in table 3.

6 Mechanical properties

6.1 Tensile strength, yield point or proof stress, and elongation The pipe shall be tested in accordance with 10.2.2 and the resulting tensile strength, yield point or proof stress and elongation shall be as given in table 4. The minimum value of elongation in the case where tensile test is performed on No. 12 or No. 5 test piece for the pipe under 8 mm in wall thickness shall be as given in table 5.

**Table 4 Tensile strength, yield point or proof stress, and elongation**

Symbol of grade	Tensile strength N/mm ²	Yield point or proof stress N/mm ²	Elongation %			
			Test piece for tensile test and test direction			
			No. 11 or No. 12 test piece	No. 5 test piece	No. 4 test piece	
			Longitudinal	Transverse	Longitudinal	Transverse
STPA 12	380 min.	205 min.	30 min.	25 min.	24 min.	19 min.
STPA 20	410 min.	205 min.	30 min.	25 min.	24 min.	19 min.
STPA 22	410 min.	205 min.	30 min.	25 min.	24 min.	19 min.
STPA 23	410 min.	205 min.	30 min.	25 min.	24 min.	19 min.
STPA 24	410 min.	205 min.	30 min.	25 min.	24 min.	19 min.
STPA 25	410 min.	205 min.	30 min.	25 min.	24 min.	19 min.
STPA 26	410 min.	205 min.	30 min.	25 min.	24 min.	19 min.

Remarks 1 The value of elongation given in table 4 shall not be applied to the pipe of which outside diameter is under 40 mm. However, the value of elongation shall be re-corded.

2 1 N/mm² = 1 MPa

Table 5 Minimum value of elongation in the case of No. 12 test piece (longitudinal) and No. 5 test piece (transverse) of pipe under 8 mm in wall thickness

Unit: %

Symbol of grade	Shape of test piece	Wall thickness						
		Over 1 mm up to and incl. 2 mm	Over 2 mm up to and incl. 3 mm	Over 3 mm up to and incl. 4 mm	Over 4 mm up to and incl. 5 mm	Over 5 mm up to and incl. 6 mm	Over 6 mm up to and incl. 7 mm	Over 7 mm up to and incl. 8 mm
Each grade	No. 12 test piece	21	22	24	26	27	28	30
	No. 5 test piece	16	18	19	20	22	24	25

Remarks : For the values given in table 5, the value calculated by subtracting 1.5 from the value of elongation given in table 4 for each 1 mm decrease in wall thickness shall be rounded to an integer in accordance with the rule A in **JIS Z 8401**.

6.2 Flattening resistance The pipe shall be tested in accordance with **10.2.3** and the pipe shall be free from cracks in the test piece. In this case, the distance between flat plates shall be as follows.

$$H = \frac{(1+e)t}{e + \frac{t}{D}}$$

where, H : distance between flattening plates (mm)



t : wall thickness of pipe (mm)

D : outside diameter of pipe (mm)

e : constant 0.08

7 Hydraulic characteristics or non-destructive characteristics The pipe shall be tested in accordance with 10.3 and the resulting hydraulic characteristics or non-destructive characteristics shall conform to either of the following two. The preference shall be in accordance with the designation made by the purchaser. Unless otherwise designated, the preference shall be left to the discretion of the manufacturer.

a) **Hydraulic characteristics** When the hydraulic pressure is not designated, the hydraulic test of the pipe shall be performed at the pressure given in table 6 (called "specified pressure"). When the hydraulic pressure is designated by the purchaser, the test shall be performed according to the designated pressure. When the designated pressure exceeds either the pressure P calculated by the following formula, or 20 MPa, the pressure of the hydraulic test shall be as agreed between the purchaser and the manufacturer.

When the test hydraulic pressure is applied, the pipe shall withstand it without leakage.

The value of the hydraulic test pressure shall be rounded to the nearest 0.5 MPa for the pressure of under 10 MPa, to the nearest 1 MPa for the pressure of 10 MPa or over.

$$P = \frac{2st}{D}$$

where, P : test pressure (MPa)

t : wall thickness of pipe (mm)

D : outside diameter of pipe (mm)

s : 60 % of the specified minimum value of yield point or proof stress given in table 4 (N/mm²)

Table 6 Hydraulic test pressure

Unit: MPa

Schedule number Sch	10	20	30	40	60	80	100	120	140	160
Hydraulic test pressure	2.0	3.5	5.0	6.0	9.0	12	15	18	20	20

Remarks 1 For the pipe of which dimension is not given in table 8, the hydraulic test pressure shall be as given in table 7 by division of the ratio of wall thickness to outside diameter of the pipe (t/D).

2 The schedule number given in table 6 refers to the number divided by the ratio of wall thickness to outside diameter of the pipe (t/D) and is used as an index of the proof-pressure performance of the steel pipe. In dealings of the steel pipe, when the size of steel pipe is designated, besides the marking of outside diameter \times thickness, the combination of outside diameter and schedule number may be used (The schedule number is used instead of the wall thickness of pipe.). The correspondence of the nominal wall thickness, outside diameter (nominal diameter), and schedule number of pipe shall be given in table 8.

**Table 7 Hydraulic test pressure** (pipes of dimension which is not given in table 8)

Unit: MPa

t/D (%)	Over 0.80 up to and incl. 1.60	Over 1.60 up to and incl. 2.40	Over 2.40 up to and incl. 3.20	Over 3.20 up to and incl. 4.00	Over 4.00 up to and incl. 4.80	Over 4.80 up to and incl. 5.60	Over 5.60 up to and incl. 6.30	Over 6.30 up to and incl. 7.10	Over 7.10 up to and incl. 7.90	Over 7.90
Hydraulic test pressure	2.0	4.0	6.0	8.0	10	12	14	16	18	20

- b) **Non-destructive characteristics** For the pipe, the non-destructive examination of either of ultrasonic examination or eddy current examination shall be performed, and there shall be no signal greater than those produced by the artificial defects of the reference test block of the working sensitivity division UD specified in **JIS G 0582** or the working sensitivity division EY specified in **JIS G 0583**. However, the said non-destructive examination may be replaced by the non-destructive examination other than those mentioned above according to the agreement between the purchaser and the manufacturer.

8 Dimension, mass, and dimensional tolerances

8.1 Outside diameter, wall thickness, and unit mass The outside diameter, wall thickness and unit mass of the pipe shall be as given in table 8.

8.2 Dimensional tolerances The tolerance on the outside diameter of pipe, wall thickness, and deviation in wall thickness of the pipe shall be as given in table 9.

In addition, unless otherwise specified, the tolerances of the pipe length shall be on the plus side.



Table 8 Dimensions and unit mass of alloy steel pipes for piping

Nominal diameter	Out-side diameter	Nominal wall thickness											
		Schedule 10		Schedule 20		Schedule 30		Schedule 40		Schedule 60		Schedule 80	
A	B	Wall thickness mm	Unit mass kg/m	Wall thickness mm	Unit mass kg/m	Wall thickness mm	Unit mass kg/m	Wall thickness mm	Unit mass kg/m	Wall thickness mm	Unit mass kg/m	Wall thickness mm	Unit mass kg/m
6	1/8	—	—	—	—	—	—	1.7	0.369	—	—	2.4	0.479
8	1/4	—	—	—	—	—	—	2.2	0.629	—	—	3.0	0.799
10	3/8	—	—	—	—	—	—	2.3	0.851	—	—	3.2	1.11
15	1/2	—	—	—	—	—	—	2.8	1.31	—	—	3.7	1.64
20	3/4	—	—	—	—	—	—	2.9	1.74	—	—	3.9	2.24
25	1	—	—	—	—	—	—	3.4	2.57	—	—	4.5	3.27
32	1 1/4	—	—	—	—	—	—	3.6	3.47	—	—	4.9	4.57
40	1 1/2	—	—	—	—	—	—	3.7	4.10	—	—	5.1	5.47
50	2	—	—	—	—	—	—	3.9	5.44	—	—	5.5	7.46
65	2 1/2	—	—	—	—	—	—	5.2	9.12	—	—	7.0	12.0
80	3	—	—	—	—	—	—	5.5	11.3	—	—	7.6	15.3
90	3 1/2	—	—	—	—	—	—	5.7	13.5	—	—	8.1	18.7
100	4	—	—	—	—	—	—	6.0	16.0	—	—	8.6	22.4
125	5	—	—	—	—	—	—	6.6	21.7	—	—	9.5	30.5
150	6	—	—	—	—	—	—	7.1	27.7	—	—	11.0	41.8
200	8	—	—	6.4	33.1	7.0	36.1	8.2	42.1	10.3	52.3	12.7	63.8
250	10	—	—	6.4	41.2	7.8	49.9	9.3	59.2	12.7	79.8	15.1	93.9
300	12	—	—	6.4	49.3	8.4	64.2	10.3	78.3	14.3	107	17.4	129
350	14	6.4	55.1	7.9	67.7	9.5	81.1	11.1	94.3	15.1	127	19.0	158
400	16	6.4	63.1	7.9	77.6	9.5	93.0	12.7	123	16.7	160	21.4	203
450	18	6.4	71.1	7.9	87.5	11.1	122	14.3	156	19.0	205	23.8	254
500	20	6.4	79.2	9.5	117.0	12.7	155	15.1	184	20.6	248	26.2	311
550	22	—	—	—	—	—	—	15.9	213	22.2	294	28.6	374
600	24	—	—	—	—	—	—	17.5	256	24.6	355	31.0	442
650	26	—	—	—	—	—	—	18.9	299	26.4	413	34.0	525

Remarks 1 The designation of the pipe shall be based on the nominal diameter and the nominal wall thickness (schedule number: Sch). However, for the nominal diameter, either A or B shall be used, and the letter A or B shall be suffixed to the figures of nominal diameter, respectively, for identification.

2 Calculate the value of mass from the following formula assuming 1 cm³ of steel to be 7.85 g and round off the result to 3 significant figures in accordance with the rule A in JIS Z 8401. However, the values in excess of 1 000 kg/m shall be rounded to integers in kg/m.

$$W = 0.024 66t (D - t)$$

where, W : unit mass of pipe (kg/m)

t : wall thickness of pipe (mm)

D : outside diameter of pipe (mm)

3 When dimensions other than those given in table 8 are necessary, agreement shall be made between the purchaser and the manufacturer.





Table 9 Tolerances on outside diameter, wall thickness and deviation in wall thickness

Division	Tolerances on outside diameter		Tolerances on wall thickness	Tolerance on deviation in wall thickness
	Outside diameter	Tolerances		
Hot finished seamless steel pipe	Under 50 mm	± 0.5 mm	Under 4 mm: ± 0.5 mm 4 mm or over: ± 12.5 %	20 % or under of wall thickness
	50 mm or over to and excl. 160 mm	± 1 %		
	160 mm or over to and excl. 200 mm	± 1.6 mm		
	200 mm or over	± 0.8 % However, for pipes 350 mm or over in outside diameter, the length of circumference may substitute as a basis for the tolerances. In this case, the tolerances shall be ± 0.5 %.		
Cold finished seamless steel pipe	Under 40 mm	± 0.3 mm	Under 2 mm: ± 0.2 mm 2 mm or over: ± 10 %	—
	40 mm or over	± 0.8 % However, for pipes 350 mm or over in outside diameter, the length of circumference may substitute as a basis for the tolerances. In this case, the tolerances shall be ± 0.5 %.		

Remarks 1 The term “deviation in wall thickness” means the ratio of the difference between the maximum and the minimum of the measured wall thickness in the same section to the ordered wall thickness and this shall not be applicable to the pipe under 5.6 mm in wall thickness.

2 When the length of circumference is used as a basis for the tolerances, either the measured value of the length of circumference itself or the outside diameter derived from the measured value may be used as the criteria. In both cases, the same value (± 0.5 %) shall be applied as the tolerances. The diameter (D) and the length of circumference (l) shall be calculated reversibly from the following formula.

$$l = \pi \times D$$

where, $\pi = 3.141\ 6$

3 In the case where compliance with the tolerances on wall thickness in table 9 is clearly confirmed in such a local portion as under repair, the tolerances on the outside diameter in table 9 shall not be applied.

9 Appearance Appearance shall be as follows:

- The pipe shall be practically straight, and its both ends shall be at right angles to its axis.
- The inside and outside surfaces of the pipe shall be well-finished and free from defects detrimental to use.



- c) Although when the surface repair is performed, it may be performed by a grinder or machining, etc., the wall thickness of the product after repair shall be within tolerances on wall thickness.

In addition, the welding repair shall not be performed.

- d) The repair shall smoothly remain along the shape of the pipe.

10 Test

10.1 Chemical analysis

10.1.1 General matter of chemical analysis and method of sampling specimen for analysis The general matter of heat analysis of steel and the method of sampling specimens for analysis shall be in accordance with clause 8 of **JIS G 0404**. The method of sampling specimens in the case where the product analysis is requested by the purchaser shall be in accordance with clause 4 of **JIS G 0321**.

10.1.2 Analytical method The method of heat analysis of steel shall be in accordance with **JIS G 0320**. The method of product analysis shall be in accordance with **JIS G 0321**.

10.2 Mechanical test

10.2.1 Method of sampling specimens for analysis and number of test pieces For the method of sampling specimens for analysis and the number of test pieces for the tensile test and flattening test, one specimen for analysis from every 50 pipes and fractions of those of the same dimension⁽²⁾ and the simultaneous heat treatment, respectively, shall be sampled, and one test piece for tensile test and one test piece for flattening test from the respective specimen for analysis shall be sampled.

Note ⁽²⁾ The same dimension refers to the same outside diameter and the same wall thickness.

10.2.2 Tensile test The test piece and the test method for tensile test shall be as follows:

- a) **Test piece** The test specimen shall be No. 11, No. 12A, No. 12B, No. 12C, No. 4 or No. 5 test piece specified in **JIS Z 2201** and shall be cut off from the end of a pipe. In this case, No. 4 test piece shall be only the test piece with 14 mm in diameter (the gauge length of 50 mm).
- b) **Test method** The test method shall be in accordance with **JIS Z 2241**.

10.2.3 Flattening test The test piece and the test method for flattening test shall be as follows:

- a) **Test piece** A test piece of 50 mm or over in length shall be cut off from the end of a pipe. For the pipe of which wall thickness is 15 % or over of its outside diameter, C-shape test piece made by removing part of circumference of a whole test piece may be used.



- b) **Test method** The test piece shall be placed between two flat plates and flattened by compression in ordinary temperature until the distance between the plates comes to the specified value, and checked for the occurrence of cracks on its wall surface. The C-shape test piece shall be placed as shown in figure 2.

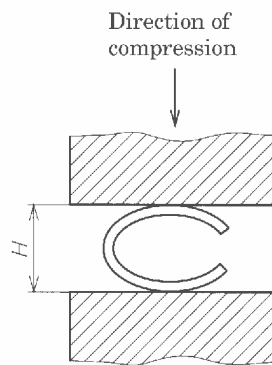


Figure 2 Flattening test (for C-shape test piece)

10.3 Hydraulic test or non-destructive examination

10.3.1 Frequency of test Either the hydraulic test or the non-destructive examination shall be performed for every one pipe.

10.3.2 Test method The method of hydraulic test or non-destructive examination shall be in accordance with either of the following:

- a) **Hydraulic test** The pipe shall be subjected to hydraulic pressure and kept at the designated pressure or at the specified pressure for at least 5 s to see if it withstands the pressure without leakage.
- b) **Non-destructive examination** The test method of non-destructive examination shall be in accordance with either **JIS G 0582** or **JIS G 0583**. The test method in the case where other non-destructive examinations are performed shall be as agreed between the purchaser and the manufacturer.

11 Inspection

11.1 Inspection The inspection shall be as follows:

- a) The general matter of inspection shall be as specified in **JIS G 0404**.
- b) The chemical composition shall conform to clause 5.
- c) The mechanical properties shall conform to clause 6.
- d) Hydraulic characteristics or non-destructive characteristics shall conform to clause 7.
- e) The dimension shall conform to clause 8.
- f) The appearance shall conform to clause 9.



- g) When the supplementary quality requirements given in Annex 1 are specified by agreement between the purchaser and the manufacturer, the results of inspection shall conform to the relevant requirements specified in clause 1, clause 2 and clause 3 of Annex 1.

11.2 Reinspection The pipe which became a reject product may be retested in accordance with 9.8 in JIS G 0404 for final acceptance.

12 Marking Each pipe having passed the inspection shall be marked with the following items. In the case of either smaller pipes or a request from the purchaser, the pipes may be bundled together and marked for each bundle by suitable means. In both cases, the order of arranging the items is not specified. When approved by the purchaser, part of the items may be omitted.

- a) Symbol of grade
- b) Symbol indicating the manufacturing method⁽³⁾
- c) Dimensions⁽⁴⁾
- d) Manufacturer's name or its abbreviation
- e) Symbol indicating the designation of the supplementary quality requirements, Z (when designated)

Notes ⁽³⁾ The symbol indicating the manufacturing method shall be as follows. The dash may be replaced by a blank.

Hot finished seamless steel pipe: —S—H

Cold finished seamless steel pipe: —S—C

- ⁽⁴⁾ The dimensions shall be expressed as follows:

Nominal diameter × nominal wall thickness or outside diameter × wall thickness

Example : 50A × Sch40 or 60.5 × 3.9

13 Report The report shall comply with the requirements of clause 13 of JIS G 0404. However, unless otherwise specified at the time of order, the classification of inspection document shall be symbol 2.3 or 3.1.B in table 1 of JIS G 0415.



Annex 1 (normative)

Supplementary quality requirements

The supplementary quality requirements shall apply only when requested by the purchaser, and shall be executed by the manufacturer on the designated items.

1 Elevated temperature yield point or proof stress (Z2)⁽¹⁾ Elevated temperature yield point or proof stress shall be as follows:

- a) The value of elevated temperature yield point or proof stress and the testing temperature of the pipe shall be agreed upon by the purchaser and the manufacturer.
- b) The test piece and the test method shall be as specified **JIS G 0567**.

In addition, when it is practically difficult to take the test piece of the shape specified in **JIS G 0567**, the shape of the test piece shall be agreed upon by the purchaser and the manufacturer.

- c) The method of sampling the test specimens and the number of test pieces shall be as follows. Take one test specimen for each lot of the same heat, and then from one test specimen, take one test piece for each lot of the same testing temperature.

Note ⁽¹⁾ In dealings of pipes, the designated requirements of elevated temperature yield point or proof stress may be indicated as **Z2**.

2 Ultrasonic examination (Z3)⁽²⁾ Ultrasonic examination shall be as follows:

- a) The criteria of the working sensitivity in the ultrasonic examination shall be the division UB or UC specified in **JIS G 0582**, and there shall be no signal greater than those produced by the artificial defects of the reference test block.
- b) The test method of the ultrasonic examination shall be as specified in **JIS G 0582**.
- c) The ultrasonic examination shall be performed for each pipe and the results shall conform to the requirements specified in **a**).

Note ⁽²⁾ In dealings of pipes, the designated requirements of ultrasonic examination may be indicated as **Z3**.

3 Eddy current examination (Z4)⁽³⁾ Eddy current examination shall be as follows:

- a) The criteria of the working sensitivity in the eddy current examination shall be the division EU, EV or EX specified in **JIS G 0583**, and there shall be no signal greater than those produced by the artificial defects of the reference test block.
- b) The test method of the eddy current examination shall be as specified in **JIS G 0583**.





- c) The eddy current examination shall be performed for each pipe and the results shall conform to the requirements specified in **a)**.

Note ⁽³⁾ In dealings of pipes, the designated requirements of eddy current examination may be indicated as **Z4**.





Annex 2 (informative)
Comparison table between JIS and corresponding International Standard

JIS G 3458 : 2005 Alloy steel pipes		ISO 9329-2 : 1997 Seamless steel tubes for pressure purposes— Technical delivery conditions—Part 2: Unalloyed and alloyed steels with specified elevated temperature properties	
(I) Requirements in JIS		(II) Inter- national Standard number	(III) Requirements in Inter- national Standard
Clause	Content		
1 Scope	Alloy steel pipes, seamless steel pipes for piping at elevated temperature	ISO 9329-2	1 Carbon steel pipes and alloy steel pipes used under elevated temperature and pressure
2 Normative references	10 grades		2 Attached table 1 28 grades
3 Classification and symbol	7 grades including STPA 12 and others		4.1 Carbon steel pipes, alloyed steel pipes, 18 grades in total
4 Manufacturing method	Seamless, heat treatment, shapes of pipe end, marking method		5 Heat treatment, seamless tubes
			<div> <div>(IV) Classification and details of technical deviation between JIS and the International Standard by clause Location of deviation: text, annex Indication method: continuous sidelines</div> <div> <div>Classification by clause</div> <div>Detail of technical deviation</div> </div> </div>
			<div> <div>(V) Justification for the technical deviation and future measures</div> <div> <p>1 It was difficult to harmonize the JIS concerned since its standard system (JIS by application/ISO by manufacturing method) and dimension system are different from those of the corresponding ISO Standard, and it is referred to the compulsory laws and regulations.</p> <p>2 As the measures for that mentioned above, not only the harmonization with International Standard was encouraged by preparing the JIS in agreement with ISO Standard through the translation of the corresponding ISO Standard as the translated JIS (JIS G 7220) but also the spread of products which conform to ISO Standard was promoted.</p> </div> </div>



(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 Location of deviation: text, annex Indication method: continuous sidelines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
5 Chemical composition	7 grades including STPA 12 and others		6.1	Carbon steel pipes, alloyed steel pipes, 18 grades in total	MOD/deletion and MOD/addition	Japanese original pipes are added.	3 On the other hand, the JIS concerned is required as the standard for specific application separately from ISO Standard.
6 Mechanical properties	Tensile test, flattening resistance		6.2	Room temperature test (tensile test, flattening test, expanding test, impact test) Elevated temperature test	MOD/deletion and MOD/addition	Japanese original pipes are added.	4 Therefore, the JIS concerned has ensured stability of the market through the conventional JIS being followed. 5 Future subjects: • The improvement of harmonization shall be enhanced by adopting the content of specification of the corresponding ISO Standard (the translated JIS) into the JIS concerned as much as possible. • The improvement of harmonization shall be enhanced by proposing the content of specification of the JIS which ISO Standard does not contain to ISO based on the demand of the market.
7 Hydraulic characteristics or non-destructive characteristics	Hydraulic test or non-destructive examination		9.5	Hydraulic test or non-destructive test	MOD/alteration	Japanese original pipes are added.	
8 Dimension, mass, and dimensional tolerances	Dimension, mass, dimensional tolerances		7.1	The outside diameters, wall thickness and masses of the pipes are selected from ISO 4200 and ISO 1129 .	MOD/deletion and MOD/addition	Japanese original pipes are added.	



(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
9 Appearance	Practically straight, the inside and outside surfaces shall be free from defects detrimental to use.		8.1	Appearance and soundness	MOD/ addition	—	
10 Test	Chemical analysis, tensile test, flattening test, hydraulic test, non-destructive examination		9.3, 9.4	Chemical analysis, flattening test, hydraulic test, non-destructive test	MOD/ addition	Equivalent	
11 Inspection	Inspection, reinspection		9.10, 9.12	Test, retest	MOD/ addition	Equivalent	
12 Marking	Content of marking		10	Content of marking	MOD/ addition	Equivalent	
13 Report	Content of report		12	Content of report	MOD/ addition	Equivalent	
Annex 1	Supplementary quality requirements	—	—	—	MOD/ addition	Japanese original pipes are added.	

Designated degree of correspondence between JIS and International Standard: MOD



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

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

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

- MOD: Modifies International Standard.





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