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Stainless 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 3459** : 1997 is replaced with this Standard.

This revision has been made based on **ISO 9330-6** : 1997 *Welded steel tubes for pressure purposes—Technical delivery conditions—Part 6 : Longitudinally welded austenitic stainless steel tubes* and **ISO 9329-4** : 1997 *Seamless steel tubes for pressure purposes—Technical delivery conditions—Part 4 : Austenitic stainless steels* for the purposes of making it easier to compare this Standard with International Standards; to prepare Japanese Industrial Standard conforming with International Standards; 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.

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

Contents

Stainless steel pipes

Introduction In this revision, the addition of steel grades which have usage track records for hot water piping, the review to make the table of dimensions and mass of welded steel pipes agree with the actual condition, the modification of the value of chemical component P to be in a conformity with **JIS G 4304** and **JIS G 4305** and the alteration of number of specimens for the hydraulic test and non-destructive examination were made.

This Japanese Industrial Standard has been prepared based on each first edition of **ISO 9330-6** *Welded steel tubes for pressure purposes—Technical delivery conditions—Part 6 : Longitudinally welded austenitic stainless steel tubes* and **ISO 9329-4** *Seamless steel tubes for pressure purposes—Technical delivery conditions—Part 4 : Austenitic stainless steels* published in 1997 with modifying some technical contents.

Portions sidelined or underlined with dots are the matters modified from the original International Standards.

The list of modification with its explanation is given in annex 2 (informative).

1 Scope This Standard specifies the stainless steel pipes (hereafter referred to as "pipes") used for the piping for corrosion resistance, low temperature service, high temperature service, etc.

Remarks 1 The purchaser may designate in addition to the items specified in this text, by prior agreement with the manufacturer, part or all of the items in the special quality requirements specified 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 9330-6 : 1997 *Welded steel tubes for pressure purposes—Technical delivery conditions—Part 6 : Longitudinally welded austenitic stainless steel tubes* (MOD)

ISO 9329-4 : 1997 *Seamless steel tubes for pressure purposes—Technical delivery conditions—Part 4 : Austenitic stainless steels* (MOD)

2 Normative references The standards listed in attached table 1 contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards, only the edition of the indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply. The normative references without the indication of the year of coming into effect apply only to the most recent edition (including amendments).

3 Classification and symbol Pipes shall be classified into 31 grades and their symbols shall be as given in table 1.

Table 1 Symbol of grade and heat treatment

Classification	Symbol of grade	Solution treatment °C	Classification	Symbol of grade	Solution treatment °C
Austenitic pipes	SUS304TP	1 010 min., rapid cooling	Austenitic pipes	SUS321TP	920 min., rapid cooling
	SUS304HTP	1 040 min., rapid cooling		SUS321HTP	Cold-finished 1 095 min, rapid cooling
	SUS304LTP	1 010 min., rapid cooling			Hot-finished 1 050 min, rapid cooling
	SUS309TP	1 030 min., rapid cooling		SUS347TP	980 min., rapid cooling
	SUS309STP	1 030 min., rapid cooling		SUS347HTP	Cold-finished 1 095 min, rapid cooling
	SUS310TP	1 030 min., rapid cooling			Hot-finished 1 050 min, rapid cooling
	SUS310STP	1 030 min., rapid cooling	Austenitic ferritic pipes	SUS329J1TP	950 min., rapid cooling
	SUS315J1TP	1 010 min., rapid cooling		SUS329J3LTP	950 min., rapid cooling
	SUS315J2TP	1 010 min., rapid cooling			
	SUS316TP	1 010 min., rapid cooling		SUS329J4LTP	950 min., rapid cooling
	SUS316HTP	1 040 min., rapid cooling	Ferritic pipes	SUS405TP	Annealing 700 min., air cooling or slow cooling
	SUS316LTP	1 010 min., rapid cooling		SUS409LTP	Annealing 700 min., air cooling or slow cooling
	SUS316TiTP	920 min., rapid cooling		SUS430TP	Annealing 700 min., air cooling or slow cooling
	SUS317TP	1 010 min., rapid cooling		SUS430LXTP	Annealing 700 min., air cooling or slow cooling
	SUS317LTP	1 010 min., rapid cooling		SUS430J1LTP	Annealing 720 min., air cooling or slow cooling
	SUS836LTP	1 030 min., rapid cooling		SUS436LTP	Annealing 720 min., air cooling or slow cooling
	SUS890LTP	1 030 min., rapid cooling		SUS444TP	Annealing 700 min., air cooling or slow cooling

Remarks : For the pipes of SUS321TP, SUS316TiTP and SUS347TP, stabilizing treatment may be specified. In this case, the temperature of heat treatment shall be from 850 °C to 930 °C.

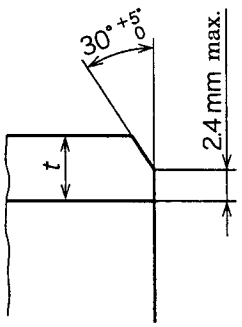
4 Manufacturing method The manufacturing method of pipes shall be as follows:

a) Pipes shall be manufactured by a seamless process, an automatic arc welding process, a laser welding process, or an electric resistance welding process.

b) The pipes shall be subjected to the solution treatment or annealing specified in table 1 and then pickled or similarly treated. However, heat treatments not specified in table 1 shall be made as agreed upon between the purchaser and the manufacturer.

c) When required by the purchaser, the pipes may be fabricated to the bevelled end(1).

Note (1) Unless otherwise specified, the shape of the bevelled end shall be as shown in figure 1.



t: 22 mm max. in thickness

Figure 1 Shape of bevelled end

5 Chemical composition Pipes shall be tested in accordance with **13.1** and the cast analysis shall be as given in table 2.

Table 2 Chemical composition

Unit: %

Symbol of grade	C	Si	Mn	P	S	Ni	Cr	Mo	Others
SUS304TP	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	8.00 to 11.00	18.00 to 20.00		
SUS304HTP	0.04 to 0.10	0.75 max.	2.00 max.	0.040 max.	0.030 max.	8.00 to 11.00	18.00 to 20.00	—	—
SUS304LTP	0.030 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	9.00 to 13.00	18.00 to 20.00	—	—
SUS309TP	0.15 max.	1.00 max.	2.00 max.	0.040 max.	0.030 max.	12.00 to 15.00	22.00 to 24.00	—	—
SUS309STP	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	12.00 to 15.00	22.00 to 24.00	—	—
SUS310TP	0.15 max.	1.50 max.	2.00 max.	0.040 max.	0.030 max.	19.00 to 22.00	24.00 to 26.00	—	—
SUS310STP	0.08 max.	1.50 max.	2.00 max.	0.045 max.	0.030 max.	19.00 to 22.00	24.00 to 26.00	—	—
SUS315J1TP	0.08 max.	0.50 to 2.50	2.00 max.	0.045 max.	0.030 max.	8.50 to 11.50	17.00 to 20.50	0.50 to 1.50	Cu 0.50 to 3.50
SUS315J2TP	0.08 max.	2.50 to 4.00	2.00 max.	0.045 max.	0.030 max.	11.00 to 14.00	17.00 to 20.50	0.50 to 1.50	Cu 0.50 to 3.50
SUS316TP	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	10.00 to 14.00	16.00 to 18.00	2.00 to 3.00	—
SUS316HTP	0.04 to 0.10	0.75 max.	2.00 max.	0.030 max.	0.030 max.	11.00 to 14.00	16.00 to 18.00	2.00 to 3.00	—
SUS316LTP	0.030 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	12.00 to 16.00	16.00 to 18.00	2.00 to 3.00	—
SUS316TiTP	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	10.00 to 14.00	16.00 to 18.00	2.00 to 3.00	Ti 5 × C % min.
SUS317TP	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	11.00 to 15.00	18.00 to 20.00	3.00 to 4.00	—
SUS317LTP	0.030 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	11.00 to 15.00	18.00 to 20.00	3.00 to 4.00	—
SUS836LTP	0.030 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	24.00 to 26.00	19.00 to 24.00	5.00 to 7.00	N 0.25 max.
SUS890LTP	0.020 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	23.00 to 28.00	19.00 to 23.00	4.00 to 5.00	Cu1.00 to 2.00
SUS321TP	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	9.00 to 13.00	17.00 to 19.00	—	Ti 5×C % min.
SUS321HTP	0.04 to 0.10	0.75 min.	2.00 max.	0.030 max.	0.030 max.	9.00 to 13.00	17.00 to 20.00	—	Ti 4×C % to 0.60
SUS347TP	0.08 max.	1.00 max.	2.00 max.	0.045 max.	0.030 max.	9.00 to 13.00	17.00 to 19.00	—	Nb 10×C % min.
SUS347HTP	0.04 to 0.10	1.00 max.	2.00 max.	0.030 max.	0.030 max.	9.00 to 13.00	17.00 to 20.00	—	Nb 8×C % to 1.00
SUS329J1TP	0.08 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	3.00 to 6.00	23.00 to 28.00	1.00 to 3.00	—
SUS329J3LTP	0.030 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	4.50 to 6.50	21.00 to 24.00	2.50 to 3.50	N 0.08 to 0.20
SUS329J4LTP	0.030 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	5.50 to 7.50	24.00 to 26.00	2.50 to 3.50	N 0.08 to 0.30

Table 2 (concluded)

Unit: %

Symbol of grade	C	Si	Mn	P	S	Ni	Cr	Mo	Others
SUS405TP	0.08 max.	1.00 max.	1.00 max.	0.040 max.	0.030 max.	—	11.50 to 14.50	—	Al 0.10 to 0.30
SUS409LTP	0.030 max.	1.00 max.	1.00 max.	0.040 max.	0.030 max.	—	10.50 to 11.75	—	Ti 6 × C % to 0.75
SUS430TP	0.12 max.	0.75 max.	1.00 max.	0.040 max.	0.030 max.	—	16.00 to 18.00	—	—
SUS430LXTP	0.030 max.	0.75 max.	1.00 max.	0.040 max.	0.030 max.	—	16.00 to 19.00	—	Ti or Nb 0.10 to 1.00
SUS430J1LTP	0.025 max.	1.00 max.	1.00 max.	0.040 max.	0.030 max.	—	16.00 to 20.00	—	N 0.025 max. Nb 8×(C %+N %) to 0.80 Cu 0.30 to 0.80
SUS436LTP	0.025 max.	1.00 max.	1.00 max.	0.040 max.	0.030 max.	—	16.00 to 19.00	0.75 to 1.25	N 0.025 max. Ti, Nb, Zr or their combination 8×(C %+N %) to 0.80
SUS444TP	0.025 max.	1.00 max.	1.00 max.	0.040 max.	0.030 max.	—	17.00 to 20.00	1.75 to 2.50	N 0.025 max. Ti, Nb, Zr or their combination 8×(C %+N %) to 0.80

Remarks 1 Even when a product analysis is required by the purchaser, the chemical composition given in table 2 shall be applied. However, the carbon content for SUS304LTP, SUS316LTP, SUS317LTP, SUS836LTP, SUS329J3LTP, SUS329J4LTP, SUS409LTP and SUS430LXTP shall be 0.035 % or under. The carbon content for SUS430J1LTP, SUS436LTP and SUS444TP shall be 0.030 % or under. The carbon content for SUS890LTP shall be 0.025 % or under.

2 To SUS329J1TP, SUS329J3LTP, SUS329J4LTP and SUS430J1LTP, alloying elements other than those given in table 2 may be added, if necessary.

3 SUS405TP, SUS430TP, SUS430LXTP, SUS430J1LTP, SUS436LTP and SUS444TP may contain Ni 0.60 % or under.

6 Mechanical properties

6.1 Tensile strength, proof stress and elongation Pipes shall be tested in accordance with **13.2** and their tensile strength, proof stress, and elongation shall be as given in table 3.

Table 3 Mechanical properties

Symbol of grade	Tensile strength	Proof stress	Elongation %			
			No. 11 test piece No. 12 test piece	No. 5 test piece	No. 4 test piece	
	N/mm²	N/mm²	Longitudinal direction	Transverse direction	Longitudinal direction	Transverse direction
SUS304TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS304HTP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS304LTP	480 min.	175 min.	35 min.	25 min.	30 min.	22 min.
SUS309TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS309STP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS310TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS310STP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS315J1TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS315J2TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS316TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS316HTP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS316LTP	480 min.	175 min.	35 min.	25 min.	30 min.	22 min.
SUS316TiTP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS317TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS317LTP	480 min.	175 min.	35 min.	25 min.	30 min.	22 min.
SUS836LTP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS890LTP	490 min.	215 min.	35 min.	25 min.	30 min.	22 min.
SUS321TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS321HTP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS347TP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS347HTP	520 min.	205 min.	35 min.	25 min.	30 min.	22 min.
SUS329J1TP	590 min.	390 min.	18 min.	13 min.	14 min.	10 min.
SUS329J3LTP	620 min.	450 min.	18 min.	13 min.	14 min.	10 min.
SUS329J4LTP	620 min.	450 min.	18 min.	13 min.	14 min.	10 min.
SUS405TP	410 min.	205 min.	20 min.	14 min.	16 min.	11 min.
SUS409LTP	360 min.	175 min.	20 min.	14 min.	16 min.	11 min.
SUS430TP	410 min.	245 min.	20 min.	14 min.	16 min.	11 min.
SUS430LXTP	360 min.	175 min.	20 min.	14 min.	16 min.	11 min.
SUS430J1LTP	390 min.	205 min.	20 min.	14 min.	16 min.	11 min.
SUS436LTP	410 min.	245 min.	20 min.	14 min.	16 min.	11 min.
SUS444TP	410 min.	245 min.	20 min.	14 min.	16 min.	11 min.

Remarks 1 When a tensile test is carried out with No. 12 or No. 5 test piece for pipes of under 8 mm in wall thickness, the minimum elongation shall be calculated by subtracting 1.5 % from the elongation given in table 3 for each decrease of 1 mm from 8 mm in wall thickness, and rounded off to integers in accordance with Rule A of **JIS Z 8401**. Examples of calculation are given in Informative table 1.

2 The elongation given in table 3 shall not be applied to pipes of under 40 mm in outside diameter. However, the value of elongation shall be recorded.

3 In the case where a tensile test piece is taken from automatic arc welded pipes, laser welded pipes, or electric resistance welded pipes, No. 12 or No. 5 test piece shall be taken from the portion having no welded seams.

Informative Table 1 Calculation examples of elongation for No. 12 (longitudinal) and No. 5 (transverse) test pieces for pipes of under 3 mm in wall thickness

Classification	Shape of test piece	Elongation for each wall thickness division %						
		Over 7 mm to and excl. 8 mm	Over 6 mm up to and incl. 7 mm	Over 5 mm up to and incl. 6 mm	Over 4 mm up to and incl. 5 mm	Over 3 mm up to and incl. 4 mm	Over 2 mm up to and incl. 3 mm	Over 1 mm up to and incl. 2 mm
Austenitic pipes	No. 12 test piece	35	34	32	30	29	28	26
	No. 5 test piece	25	24	22	20	19	18	16
Austenitic ferritic pipes	No. 12 test piece	18	16	15	14	12	10	9
	No. 5 test piece	13	12	10	8	7	6	4
Ferritic pipes	No. 12 test piece	20	18	17	16	14	12	11
	No. 5 test piece	14	12	11	10	8	6	5

6.2 Flattening or guide bend resistance weld zone

6.2.1 Flattening Pipes shall be tested in accordance with **13.3** and the results shall be free from flaws and cracks on the wall of pipes. In this case, the distance between the two platens shall be calculated according to the following formula:

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

where, H : distance between platens (mm)

t : wall thickness of pipe (mm)

D : outside diameter of pipe (mm)

e : constant which differs according to the grade of pipe, 0.09 for austenitic pipes, 0.07 for austenitic-ferritic pipes and ferritic pipes

6.2.2 Guide bend resistance of weld zone For welded pipes 200A or over, the guide bend resistance of weld zone may be tested instead of the flattening of **6.2.1**. Preference is left to the specification by the purchaser or to the discretion of the manufacturer.

The guide bend resistance of weld zone shall be subjected to the test of **13.4** and the results shall conform to the following requirements:

a) No cracks of 3 mm or over in length shall develop on the outside of the weld zone (except for small cracks created on the edge or corner).

b) For cracks of under 3 mm in length, the total lengths of cracks shall not exceed 7 mm.

c) Total number of cracks and blowholes shall not exceed 10.

7 Austenitic grain size Pipes of SUS321HTP shall be tested in accordance with **13.5** and the resulting mean austenitic gain size shall be grain size No. 7 or coarser.

8 Hydraulic test characteristic or non-destructive examination characteristic Pipes shall be tested in accordance with **13.6** and the resulted hydraulic test characteristic or non-destructive examination characteristic shall conform to either of the following requirements. Though the preference is subjected to the indication of the purchaser, when not indicated, the preference shall be subjected to the selection by the manufacturer.

a) For hydraulic test characteristic, pipes shall withstand, without leakage, the hydraulic pressure designated, if any, by the purchaser, or in absence of it the hydraulic pressure specified in attached table 2. In this case, the purchaser may specify a hydraulic pressure higher or lower than those in attached table 2.

In the case where the hydraulic test is conducted by the specification of the purchaser and the test pressure exceeds either of the value P calculated from the following formula or 20 MPa, the test pressure shall be as agreed upon between the purchaser and the manufacturer. The specified hydraulic pressure shall be graduated in 0.5 MPa for under 10 MPa and in 1 MPa for 10 MPa or over. In calculation, the value P in the following formula shall be obtained and rounded off to 0.5 MPa or 1 MPa.

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

where, P : test pressure (MPa)

t : wall thickness of pipe (mm)

D : outside diameter of pipe (mm)

s : 60 % of the minimum value of proof stress specified in table 3 (N/mm^2)

b) For non-destructive examination characteristic, pipes shall be subjected to any non-destructive examination of the ultrasonic examination, eddy current examination, or radiographic examination, and the resulted non-destructive examination characteristic shall conform to any one of the following requirements:

1) There shall be no signal equal to or greater than the signals produced by the artificial flaws of the reference test piece of the working sensitivity division UD specified in **JIS G 0582**.

2) There shall be no signal equal to or greater than the signals produced by the artificial flaws of the reference test piece of the working sensitivity division EY specified in **JIS G 0583**.

3) The grade 3 specified in **JIS Z 3106** or better shall be met.

9 Pressure resistance performance Pipes, when subjected to the test of **13.7**, shall withstand that and be free from leakage. The pressure resistance performance shall be applied in accordance with agreement between the purchaser and the manufacturer.

Information : The Water Works Law stipulates the pressure resistance performance test applied to the pipe used as feed water system

10 Leaching performance Pipes, when subjected to the test of **13.8**, shall be as given in table 4. The leaching performance shall be applied in accordance with agreement between the purchaser and the manufacturer.

Table 4 Leaching performance

Item		Acceptance criterion
Taste		No abnormalities
Odour		No abnormalities
Chromaticity	degree	5 max.
Turbidity	degree	2 max.
Hexavalent chromium	mg/L	0.05 max.
Iron	mg/L	0.3 max.

Information : The Water Works Law stipulates the leaching performance test applied to the pipe used as feed water system

11 Dimensions, mass and dimensional tolerances

11.1 Dimensions and mass The outside diameter, wall thickness and mass of the pipe shall be as specified in table 5. However, for the welded pipes, table 6 may be applied.

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Table 5 Dimensions and ma

Nominal diameter A	Nominal diameter B	Outside diameter	Schedule 5S								Schedule 10S							
			Thick-ness	Unit mass kg/m							Thick-ness	Unit mass kg/m						
				Grade								Grade						
				304 304H 304L 321 321H	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L		304 304H 304L 321 321H	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L		
		mm	mm								mm							
6	1/8	10.5	1.0	0.237	0.238	0.233	0.231	0.230	0.241	0.240	1.2	0.278	0.280	0.273	0.272	0.270		
8	1/4	13.8	1.2	0.377	0.379	0.370	0.368	0.366	0.383	0.382	1.65	0.499	0.503	0.491	0.488	0.485		
10	3/8	17.3	1.2	0.481	0.484	0.473	0.470	0.467	0.489	0.489	1.65	0.643	0.647	0.633	0.629	0.625		
15	1/2	21.7	1.65	0.824	0.829	0.811	0.806	0.800	0.838	0.837	2.1	1.03	1.03	1.01	1.00	0.996		
20	3/4	27.2	1.65	1.05	1.06	1.03	1.03	1.02	1.07	1.07	2.1	1.31	1.32	1.29	1.28	1.28		
25	1	34.0	1.65	1.33	1.34	1.31	1.30	1.29	1.35	1.35	2.8	2.18	2.19	2.14	2.13	2.11		
32	1 1/4	42.7	1.65	1.69	1.70	1.66	1.65	1.64	1.71	1.71	2.8	2.78	2.80	2.74	2.72	2.70		
40	1 1/2	48.6	1.65	1.93	1.94	1.90	1.89	1.87	1.96	1.96	2.8	3.19	3.21	3.14	3.12	3.10		
50	2	60.5	1.65	2.42	2.43	2.38	2.36	2.35	2.46	2.46	2.8	4.02	4.05	3.96	3.93	3.91		
65	2 1/2	76.3	2.1	3.88	3.91	3.82	3.79	3.77	3.95	3.94	3.0	5.48	5.51	5.39	5.35	5.32		
80	3	89.1	2.1	4.55	4.58	4.48	4.45	4.42	4.63	4.62	3.0	6.43	6.48	6.33	6.29	6.25		
90	3 1/2	101.6	2.1	5.20	5.24	5.12	5.09	5.05	5.29	5.28	3.0	7.37	7.42	7.25	7.20	7.16		
100	4	114.3	2.1	5.87	5.91	5.77	5.74	5.70	5.97	5.96	3.0	8.32	8.37	8.18	8.13	8.08		
125	5	139.8	2.8	9.56	9.62	9.40	9.34	9.28	9.71	9.70	3.4	11.6	11.6	11.4	11.3	11.2		
150	6	165.2	2.8	11.3	11.4	11.1	11.1	11.0	11.5	11.5	3.4	13.7	13.8	13.5	13.4	13.3		
200	8	216.3	2.8	14.9	15.0	14.6	14.6	14.5	15.1	15.1	4.0	21.2	21.3	20.8	20.7	20.5		
250	10	267.4	3.4	22.4	22.5	22.0	21.9	21.7	22.7	22.7	4.0	26.2	26.4	25.8	25.7	25.5		
300	12	318.5	4.0	31.3	31.5	30.8	30.6	30.4	31.9	31.8	4.5	35.2	35.4	34.6	34.4	34.2		
350	14	355.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
400	16	406.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
450	18	457.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
500	20	508.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
550	22	558.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
600	24	609.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
650	26	660.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—		

ıs of stainless steel pipes for piping

Nominal wall thickness																		
		Schedule 20S								Schedule 40								
		Thick-ness	Unit mass kg/m							Thick-ness	Unit mass kg/m							
			Grade								Grade							
836L	890L		304 304H 304L 321 321H	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L		304 304H 304L 321 321H	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L
		mm								mm								
0.283	0.282	1.5	0.336	0.338	0.331	0.329	0.327	0.342	0.341	1.7	0.373	0.375	0.367	0.364	0.362	0.378	0.378
0.508	0.507	2.0	0.588	0.592	0.578	0.575	0.571	0.598	0.597	2.2	0.636	0.640	0.625	0.621	0.617	0.646	0.645
0.654	0.653	2.0	0.762	0.767	0.750	0.745	0.740	0.775	0.774	2.3	0.859	0.865	0.845	0.840	0.835	0.874	0.873
1.04	1.04	2.5	1.20	1.20	1.18	1.17	1.16	1.22	1.21	2.8	1.32	1.33	1.30	1.29	1.28	1.34	1.34
1.33	1.33	2.5	1.54	1.55	1.51	1.50	1.49	1.56	1.56	2.9	1.76	1.77	1.73	1.72	1.70	1.78	1.78
2.21	2.21	3.0	2.32	2.33	2.28	2.26	2.25	2.35	2.35	3.4	2.59	2.61	2.55	2.53	2.51	2.63	2.63
2.83	2.83	3.0	2.97	2.99	2.92	2.90	2.88	3.02	3.01	3.6	3.51	3.53	3.45	3.43	3.40	3.56	3.56
3.25	3.24	3.0	3.41	3.43	3.35	3.33	3.31	3.46	3.46	3.7	4.14	4.16	4.07	4.05	4.02	4.21	4.20
4.09	4.09	3.5	4.97	5.00	4.89	4.86	4.83	5.05	5.05	3.9	5.50	5.53	5.41	5.38	5.34	5.59	5.58
5.57	5.56	3.5	6.35	6.39	6.24	6.20	6.16	6.45	6.44	5.2	9.21	9.27	9.06	9.00	8.94	9.36	9.35
6.54	6.53	4.0	8.48	8.53	8.34	8.29	8.23	8.62	8.61	5.5	11.5	11.5	11.3	11.2	11.1	11.6	11.6
7.49	7.48	4.0	9.72	9.79	9.56	9.51	9.44	9.88	9.87	5.7	13.6	13.7	13.4	13.3	13.2	13.8	13.8
8.45	8.44	4.0	11.0	11.1	10.8	10.7	10.7	11.2	11.2	6.0	16.2	16.3	15.9	15.8	15.7	16.5	16.4
11.7	11.7	5.0	16.8	16.9	16.5	16.4	16.3	17.1	17.0	6.6	21.9	22.0	21.5	21.4	21.3	22.3	22.2
13.9	13.9	5.0	20.0	20.1	19.6	19.5	19.4	20.3	20.3	7.1	28.0	28.1	27.5	27.3	27.2	28.4	28.4
21.5	21.5	6.5	34.0	34.2	33.4	33.2	33.0	34.5	34.5	8.2	42.5	42.8	41.8	41.6	41.3	43.2	43.2
26.7	26.6	6.5	42.2	42.5	41.5	41.3	41.0	42.9	42.9	9.3	59.8	60.2	58.8	58.4	58.1	60.8	60.7
35.8	35.7	6.5	50.5	50.8	49.7	49.4	49.1	51.3	51.3	10.3	79.1	79.6	77.8	77.3	76.8	80.4	80.3
–	–	–	–	–	–	–	–	–	–	11.1	95.3	95.9	93.7	93.1	92.5	96.8	96.7
–	–	–	–	–	–	–	–	–	–	12.7	125	125	122	122	121	127	126
–	–	–	–	–	–	–	–	–	–	14.3	158	159	155	154	153	160	160
–	–	–	–	–	–	–	–	–	–	15.1	185	187	182	181	180	188	188
–	–	–	–	–	–	–	–	–	–	15.9	215	216	211	210	209	219	218
–	–	–	–	–	–	–	–	–	–	17.5	258	260	254	252	251	262	262
–	–	–	–	–	–	–	–	–	–	18.9	302	304	297	295	293	307	307

Table 5 (concluded

Nominal diameter		Outside diameter	Nominal wall thickness														
			Schedule 80								Schedule 120						
A	B		Thickness	Unit mass kg/m							Thickness	Unit mass kg/m					
				Grade								Grade					
				304 304H 304L 321 321H	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L		304 304H 304L 321 321H	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L
		mm	mm								mm						
6	1/8	10.5	2.4	0.484	0.487	0.476	0.473	0.470	0.492	0.492	—	—	—	—	—	—	—
8	1/4	13.8	3.0	0.807	0.812	0.794	0.789	0.784	0.820	0.819	—	—	—	—	—	—	—
10	3/8	17.3	3.2	1.12	1.13	1.11	1.10	1.09	1.14	1.14	—	—	—	—	—	—	—
15	1/2	21.7	3.7	1.66	1.67	1.63	1.62	1.61	1.69	1.68	—	—	—	—	—	—	—
20	3/4	27.2	3.9	2.26	2.28	2.23	2.21	2.20	2.30	2.30	—	—	—	—	—	—	—
25	1	34.0	4.5	3.31	3.33	3.25	3.23	3.21	3.36	3.36	—	—	—	—	—	—	—
32	1 1/4	42.7	4.9	4.61	4.64	4.54	4.51	4.48	4.69	4.68	—	—	—	—	—	—	—
40	1 1/2	48.6	5.1	5.53	5.56	5.44	5.40	5.37	5.62	5.61	—	—	—	—	—	—	—
50	2	60.5	5.5	7.54	7.58	7.41	7.37	7.32	7.66	7.65	—	—	—	—	—	—	—
65	2 1/2	76.3	7.0	12.1	12.2	11.9	11.8	11.7	12.3	12.3	—	—	—	—	—	—	—
80	3	89.1	7.6	15.4	15.5	15.2	15.1	15.0	15.7	15.7	—	—	—	—	—	—	—
90	3 1/2	101.6	8.1	18.9	19.0	18.6	18.4	18.3	19.2	19.2	—	—	—	—	—	—	—
100	4	114.3	8.6	22.6	22.8	22.3	22.1	22.0	23.0	23.0	11.1	28.5	28.7	28.1	27.9	27.7	29.0
125	5	139.8	9.5	30.8	31.0	30.3	30.1	29.9	31.3	31.3	12.7	40.2	40.5	39.5	39.3	39.0	40.9
150	6	165.2	11.0	42.3	42.5	41.6	41.3	41.0	42.9	42.9	14.3	53.8	54.1	52.9	52.5	52.2	54.6
200	8	216.3	12.7	64.4	64.8	63.4	63.0	62.5	65.5	65.4	18.2	89.8	90.4	88.3	87.8	87.2	91.3
250	10	267.4	15.1	94.9	95.5	93.3	92.8	92.2	96.5	96.3	21.4	131	132	129	128	127	133
300	12	318.5	17.4	131	131	128	128	127	133	132	25.4	185	187	182	181	180	189
350	14	355.6	19.0	159	160	157	156	155	162	162	27.8	227	228	223	222	220	231
400	16	406.4	21.4	205	207	202	201	199	209	208	30.9	289	291	284	283	281	294
450	18	457.2	23.8	257	259	253	251	250	261	261	34.9	367	369	361	359	357	373
500	20	508.0	26.2	314	316	309	307	305	320	319	38.1	446	449	439	436	433	453
550	22	558.8	28.6	378	380	372	369	367	384	383	41.3	532	536	524	520	517	541
600	24	609.6	31.0	447	450	439	437	434	454	454	46.0	646	650	635	631	627	656
650	26	660.4	34.0	531	534	522	519	515	539	539	49.1	748	752	735	731	726	760

Remarks 1 The designation of the pipe shall be based on the nominal diameter and nominal wall thickness (sche and letter A or B shall be suffixed to the figures of nominal diameter respectively for identification.

2 The value of mass shall be calculated by the following formula and rounded off to 3 significant digits in accordance with Rule B of **JIS Z 8401**. However, in the case of exceeding 1 000 kg/m, the results shall be rounded off to an integral value of kg/m.

Symbol of grade
SUS304TP, SUS304HTP, SUS304LTP, SUS321TP, SUS321HTP
SUS309TP, SUS309STP, SUS310TP, SUS310STP, SUS315J1TP, SUS315J2TP, SUS316TP, SUS316HT SUS316LTP, SUS316TiTP, SUS317TP, SUS317LT SUS347TP, SUS347HTP
SUS329J1TP, SUS329J3LTP, SUS329J4LTP
SUS405TP, SUS409LTP, SUS444TP
SUS430TP, SUS430LXTP, SUS430J1LTP, SUS436L
SUS836LTP
SUS890LTP

3 When dimensions other than those given in the above-mentioned table are required, the dimensions

)

	Schedule 160							
	Thick-ness	Unit mass kg/m						
		Grade						
890L		304 304H 304L 321 321H	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L
	mm							
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	4.7	1.99	2.00	1.96	1.95	1.93	2.02	2.02
—	5.5	2.97	2.99	2.92	2.91	2.89	3.02	3.02
—	6.4	4.40	4.43	4.33	4.30	4.27	4.47	4.47
—	6.4	5.79	5.82	5.69	5.66	5.62	5.88	5.88
—	7.1	7.34	7.39	7.22	7.17	7.13	7.46	7.45
—	8.7	11.2	11.3	11.0	11.0	10.9	11.4	11.4
—	9.5	15.8	15.9	15.5	15.5	15.4	16.1	16.0
—	11.1	21.6	21.7	21.2	21.1	20.9	21.9	21.9
—	12.7	28.1	28.3	27.7	27.5	27.3	28.6	28.5
29.0	13.5	33.9	34.1	33.3	33.1	32.9	34.5	34.4
40.8	15.9	49.1	49.4	48.3	48.0	47.7	49.9	49.8
54.6	18.2	66.6	67.1	65.5	65.1	64.7	67.7	67.7
91.2	23.0	111	111	109	108	108	113	112
133	28.6	170	171	167	166	165	173	173
188	33.3	237	238	233	231	230	240	240
230	35.7	284	286	280	278	276	289	289
293	40.5	369	372	363	361	358	375	375
373	45.2	464	467	456	453	450	472	471
453	50.0	570	574	561	558	554	580	579
541	54.0	679	683	668	664	659	690	689
656	59.5	815	821	802	797	792	829	828
759	64.2	953	960	938	932	926	969	968

dule number: Sch). However, for the nominal diameter, either A or B shall be used,

	Basic mass (2) kg	Formulas (3)
	7.93	$W = 0.024\,91t\ (D-t)$
P, P,	7.98	$W = 0.025\,07t\ (D-t)$
	7.80	$W = 0.024\,50t\ (D-t)$
	7.75	$W = 0.024\,35t\ (D-t)$
IP	7.70	$W = 0.024\,19t\ (D-t)$
	8.06	$W = 0.025\,32t\ (D-t)$
	8.05	$W = 0.025\,29t\ (D-t)$

Notes (2) The basic mass means the mass of stainless steel of 1 mm in thickness and 1 m² in area.

(3) W: unit mass of pipe (kg/m)
t: wall thickness of pipe (mm)
D: outside diameter of pipe (mm)

shall be determined as agreed upon between the purchaser and the manufacturer.

Table 6 Dimensions

Nominal diameter		Outside diameter	Schedule 5S							Schedule 10S					
A	B		Thick-ness	Grade						Thick-ness	Grade				
				304 304L 321	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L		304 304L 321	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L
		mm	mm							mm					
6	1/8	10.5	1.0	0.237	0.238	0.233	0.231	0.230	0.241	0.240	1.2	0.278	0.280	0.273	0.272	0.270
8	1/4	13.8	1.2	0.377	0.379	0.370	0.368	0.366	0.383	0.382	(1.5)	0.460	0.463	0.452	0.449	0.446
10	3/8	17.3	1.2	0.481	0.484	0.473	0.470	0.467	0.489	0.489	(2.0)	0.762	0.767	0.750	0.745	0.740
15	1/2	21.7	(1.5)	0.755	0.760	0.742	0.738	0.733	0.767	0.766	(2.0)	0.981	0.988	0.965	0.959	0.953
20	3/4	27.2	(1.5)	0.960	0.966	0.944	0.939	0.933	0.976	0.975	(2.0)	1.26	1.26	1.23	1.23	1.22
25	1	34.0	(2.0)	1.59	1.60	1.57	1.56	1.55	1.62	1.62	(2.5)	1.96	1.97	1.93	1.92	1.90
32	1 1/4	42.7	(2.0)	2.03	2.04	1.99	1.98	1.97	2.06	2.06	(3.0)	2.97	2.99	2.92	2.90	2.88
40	1 1/2	48.6	(2.0)	2.32	2.34	2.28	2.27	2.25	2.36	2.36	(3.0)	3.41	3.43	3.35	3.33	3.31
50	2	60.5	(2.0)	2.91	2.93	2.87	2.85	2.83	2.96	2.96	(3.0)	4.30	4.32	4.23	4.20	4.17
65	2 1/2	76.3	(2.0)	3.70	3.73	3.64	3.62	3.59	3.76	3.76	3.0	5.48	5.51	5.39	5.35	5.32
80	3	89.1	(2.0)	4.34	4.37	4.27	4.24	4.21	4.41	4.41	3.0	6.43	6.48	6.33	6.29	6.25
90	3 1/2	101.6	(2.5)	6.17	6.21	6.07	6.03	5.99	6.27	6.27	3.0	7.37	7.42	7.25	7.20	7.16
100	4	114.3	(2.5)	6.96	7.01	6.85	6.81	6.76	7.08	7.07	3.0	8.32	8.37	8.18	8.13	8.08
125	5	139.8	(3.0)	10.2	10.3	10.1	10.0	9.9	10.4	10.4	(3.5)	11.9	12.0	11.7	11.6	11.5
150	6	165.2	(3.0)	12.1	12.2	11.9	11.8	11.8	12.3	12.3	(3.5)	14.1	14.2	13.9	13.8	13.7
200	8	216.3	(3.0)	15.9	16.0	15.7	15.6	15.5	16.2	16.2	4.0	21.2	21.3	20.8	20.7	20.5
250	10	267.4	(3.5)	23.0	23.2	22.6	22.5	22.3	23.4	23.4	4.0	26.2	26.4	25.8	25.7	25.5
300	12	318.5	4.0	31.3	31.5	30.8	30.6	30.4	31.9	31.8	4.5	35.2	35.4	34.6	34.4	34.2

Remarks 1 When the nominal diameter is used for the welded pipe, the dimensions and mass of weldec purchaser and the manufacturer.

In addition, the designation of the pipe shall be based on the nominal diameter and the wa or B shall be used, and letter A or B shall be suffixed to the figures of nominal diameter resp

2 The method for calculation of the numerical value of mass shall be the same as that in rema

3 Dimensions in which the thickness differs between table 5 and table 6 are enclosed by paren

4 When dimensions other than those described above are especially necessary, the dimensions a ment between the purchaser and the manufacturer.

and mass of welded pipe

Unit: kg/m

Unit mass																	
		Schedule 20S							Schedule 40								
		Thick-ness	Grade						Thick-ness	Grade							
836L	890L		304 304L 321	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L		304 304L 321	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L
		mm								mm							
0.283	0.282	1.5	0.336	0.338	0.331	0.329	0.327	0.342	0.341	(2.0)	0.423	0.426	0.417	0.414	0.411	0.430	0.430
0.467	0.467	2.0	0.588	0.592	0.578	0.575	0.571	0.598	0.597	(2.5)	0.704	0.708	0.692	0.688	0.683	0.715	0.714
0.775	0.774	2.0	0.762	0.767	0.750	0.745	0.740	0.775	0.774	(2.5)	0.922	0.928	0.907	0.901	0.895	0.937	0.936
0.998	0.996	2.5	1.20	1.20	1.18	1.17	1.16	1.22	1.21	(3.0)	1.40	1.41	1.37	1.37	1.36	1.42	1.42
1.28	1.27	2.5	1.54	1.55	1.51	1.50	1.49	1.56	1.56	(3.0)	1.81	1.82	1.78	1.77	1.76	1.84	1.84
1.99	1.99	3.0	2.32	2.33	2.28	2.26	2.25	2.35	2.35	(3.5)	2.66	2.68	2.62	2.60	2.58	2.70	2.70
3.02	3.01	3.0	2.97	2.99	2.92	2.90	2.88	3.02	3.01	(3.5)	3.42	3.44	3.36	3.34	3.32	3.47	3.47
3.46	3.46	3.0	3.41	3.43	3.35	3.33	3.31	3.46	3.46	(4.0)	4.44	4.47	4.37	4.34	4.32	4.52	4.51
4.37	4.36	3.5	4.97	5.00	4.89	4.86	4.83	5.05	5.05	(4.0)	5.63	5.67	5.54	5.50	5.47	5.72	5.72
5.57	5.56	3.5	6.35	6.39	6.24	6.20	6.16	6.45	6.44	5.0	8.88	8.94	8.73	8.68	8.62	9.03	9.02
6.54	6.53	4.0	8.48	8.53	8.34	8.29	8.23	8.62	8.61	(5.5)	11.5	11.5	11.3	11.2	11.1	11.6	11.6
7.49	7.48	4.0	9.72	9.79	9.56	9.51	9.44	9.88	9.87	(6.0)	14.3	14.4	14.1	14.0	13.9	14.5	14.5
8.45	8.44	4.0	11.0	11.1	10.8	10.7	10.7	11.2	11.2	(6.0)	16.2	16.3	15.9	15.8	15.7	16.5	16.4
12.1	12.1	5.0	16.8	16.9	16.5	16.4	16.3	17.1	17.0	(7.0)	23.2	23.3	22.8	22.6	22.5	23.5	23.5
14.3	14.3	5.0	20.0	20.1	19.6	19.5	19.4	20.3	20.3	(7.0)	27.6	27.8	27.1	27.0	26.8	28.0	28.0
21.5	21.5	6.5	34.0	34.2	33.4	33.2	33.0	34.5	34.5	(8.0)	41.5	41.8	40.8	40.6	40.3	42.2	42.1
26.7	26.6	6.5	42.2	42.5	41.5	41.3	41.0	42.9	42.9	(10.0)	64.1	64.5	63.1	62.7	62.3	65.2	65.1
35.8	35.7	6.5	50.5	50.8	49.7	49.4	49.1	51.3	51.3	(10.0)	76.8	77.3	75.6	75.1	74.6	78.1	78.0

l pipe shall be in accordance with agreement between the

.ll thickness. However, for the nominal diameter, either A
)ectively for identification.

rks 2 of table 5.

:heses for partition.

ınd mass of welded pipe shall be in accordance with agree-

Table 6 (concluded)

Unit: kg/m

Nominal diameter		Outside diameter	Unit mass						
			Schedule 80						
A	B		Thick-ness	Grade					
				304 304L 321	309 309S 310 310S 315J1 315J2 316 316H 316L 316Ti 317 317L 347 347H	329J1 329J3L 329J4L	405 409L 444	430 430LX 430J1L 436L	836L	890L
		mm	mm							
6	1/8	10.5	(2.5)	0.498	0.501	0.490	0.487	0.484	0.506	0.506
8	1/4	13.8	3	0.807	0.812	0.794	0.789	0.784	0.820	0.819
10	3/8	17.3	(3.5)	1.20	1.21	1.18	1.18	1.17	1.22	1.22
15	1/2	21.7	(3.5)	1.59	1.60	1.56	1.55	1.54	1.61	1.61
20	3/4	27.2	(4.0)	2.31	2.33	2.27	2.26	2.24	2.35	2.35
25	1	34	4.5	3.31	3.33	3.25	3.23	3.21	3.36	3.36
32	1 1/4	42.7	(5.0)	4.70	4.73	4.62	4.59	4.56	4.77	4.77
40	1 1/2	48.6	(5.0)	5.43	5.47	5.34	5.31	5.27	5.52	5.51
50	2	60.5	5.5	7.54	7.58	7.41	7.37	7.32	7.66	7.65
65	2 1/2	76.3	7.0	12.1	12.2	11.9	11.8	11.7	12.3	12.3
80	3	89.1	(8.0)	16.2	16.3	15.9	15.8	15.7	16.4	16.4
90	3 1/2	101.6	(8.0)	18.7	18.8	18.3	18.2	18.1	19.0	18.9
100	4	114.3	(9.0)	23.6	23.8	23.2	23.1	22.9	24.0	24.0
125	5	139.3	(10.0)	32.3	32.5	31.8	31.6	31.4	32.9	32.8
150	6	165.2	(12.0)	45.8	46.1	45.0	44.8	44.5	46.5	46.5
200	8	216.3	(13.0)	65.8	66.3	64.8	64.4	63.9	66.9	66.8
250	10	267.4	(15.0)	94.3	94.9	92.8	92.2	91.6	95.9	95.7
300	12	318.5	(18.0)	135	136	133	132	131	137	137

11.2 Dimensional tolerances The dimensional tolerances of the pipe shall be as follows:

a) The tolerances on outside diameter, wall thickness, and wall thickness deviation of pipes shall be as specified in table 7.

b) In the case where the pipe length is specified, the tolerances on pipe length shall be applied on the plus side only.

Table 7 Tolerances on outside diameter, wall thickness and wall thickness deviation

Division	Tolerances on outside diameter	Tolerances on wall thickness	Tolerances on wall thickness deviation
Hot-finished seamless pipe	Under 50 mm ±0.5 mm 50 mm or over ±1 %	Under 4 mm ±0.5 mm 4 mm or over ±12.5 %	At most 20 % of wall thickness
Cold-finished seamless pipe, automatic arc welded pipe, electric resistance welded pipe, and laser welded pipe	Under 30 mm ±0.3 mm 30 mm or over ±1 %	Under 2 mm ±0.2 mm 2 mm or over ±10 %	—

Remarks 1 The wall thickness deviation means the ratio of the difference between maximum and minimum wall thickness measured in the same section to the specified wall thickness, and this shall not be applied to pipes under 5.6 mm in wall thickness.

2 For the portions locally ground or the like, the above tolerance on outside diameter shall not be applied if it is confirmed that the wall thickness is within the tolerance range given in the above table 7.

12 Appearance The appearance of pipes shall be as follows:

a) Pipes shall be straight for practical purposes, and their both ends shall be at right angles to the axis.

b) The inside and outside surfaces of the pipes shall be well finished, and free from defects detrimental to practical use.

13 Test

13.1 Chemical analysis

13.1.1 Chemical analysis General matters common to chemical analysis and the method of sampling specimens for analysis shall be in accordance with clause **8** in **JIS G 0404**.

13.1.2 Analytical method The analytical method shall be in accordance with any one of the following standards:

JIS G 1211, JIS G 1212, JIS G 1213, JIS G 1214, JIS G 1215, JIS G 1216, JIS G 1217, JIS G 1218, JIS G 1223, JIS G 1224, JIS G 1228, JIS G 1237, JIS G 1238, JIS G 1253, JIS G 1256, JIS G 1257, JIS G 1258

13.1.3 Number of product analytical samples The number of product analytical samples shall be determined as agreed upon between the purchaser and the manufacturer.

13.2 Tensile test

13.2.1 Sampling method of specimen and number of test pieces For sampling method of a specimen and the number of test pieces, one specimen shall be sampled per 50 pipes simultaneously heat-treated and fraction thereof, and one tensile test piece, one flattening test piece, one austenitic grain size test piece shall be sampled therefrom.

13.2.2 Test piece The test piece shall be any one of No. 11, No. 12A, No. 12B, No. 12C, No. 4 or No. 5 specified in **JIS Z 2201** to be cut off from the pipe. In the case of No. 4 test piece, only the test piece of 14 mm in diameter (the gauge length is 50 mm) shall be used.

13.2.3 Testing method The testing method shall be in accordance with **JIS Z 2241**.

13.3 Flattening test

13.3.1 Sampling method of specimen and number of test pieces The sampling method of a specimen and the number of test pieces shall be as given in **13.2.1**

13.3.2 Test piece A length 50 mm or over of a pipe shall be cut off from the end of the pipe to serve as a test piece. For the pipe whose wall thickness is 15 % or over of the outside diameter, a C-shape test piece made by removing a part of the circumference of a ring-shaped test piece may be used.

13.3.3 Testing method Place the test piece at ordinary temperature between two platens and flatten by compression until the distance between the platens reaches the specified value, and examine for the occurrence of flaws or cracks on the wall surface of the test piece. In the cases of the automatic arc welded pipe, laser welded pipe, and electric resistance welded pipe, the weld zone shall be placed at right angles to the direction of compression as shown in figure 2, and the C-shape test piece shall be places as shown in figure 3.

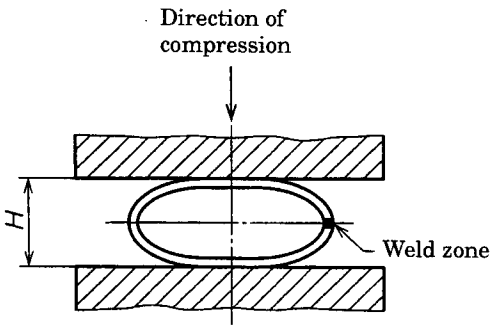

Figure 2 Flattening test (for right-shaped test piece)

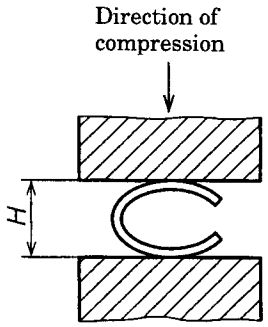

Figure 3 Flattening test (for C-shape test piece)

13.4 Guide bend test of weld zone

13.4.1 Sampling method of specimen and number of test pieces For sampling method of a specimen and the number of test pieces, when sampled from a pipe, one specimen shall be sampled for each 120 m of the pipe of the same dimensions produced under the same heat treatment and fraction thereof.

When sampled from the specimen of a pipe end welded under the same condition as the pipe body, one specimen shall be sampled per each lot equivalent to 120 m of the pipe of the same dimensions produced under the same heat treatment and fraction thereof.

One guide bend test piece of weld zone shall be sampled from respective specimens.

13.4.2 Test piece The test piece shall be in accordance with clause **4** of **JIS Z 3122**.

13.4.3 Testing method The test method shall be in accordance with clause **5** of **JIS Z 3122**.

In the case where the wall thickness exceeds 12 mm or both sides are butt-welded, the side bend test shall be carried out, and where the wall thickness is 12 mm or under (except the pipes of which both sides are butt-welded), the root bend test shall be conducted.

13.5 Austenitic grain size test

13.5.1 Sampling method of specimen and number of test pieces The sampling method of a specimen and the number of test pieces shall be as given in **13.2.1**.

13.5.2 Test piece A 20 mm long pipe shall be cut off from the pipe end to serve as a test piece.

13.5.3 Testing method The austenitic grain size number shall be measured in accordance with **JIS G 0551**.

13.6 Hydraulic test or non-destructive examination The hydraulic test or non-destructive examination shall be as follows:

13.6.1 Number of specimens Either the hydraulic test or the non-destructive examination shall be carried out for each pipe.

13.6.2 Hydraulic test When the pipe is subjected to a hydraulic pressure and kept at the pressure specified in **8 a)** for 5 s or longer, whether it withstands the pressure without leakage shall be examined.

13.6.3 Non-destructive examination The testing method of a non-destructive examination shall be in accordance with **JIS G 0582**, **JIS G 0583** or **JIS Z 3106**.

13.7 Pressure resistance performance test The method for a pressure resistance performance test shall be in accordance with the main text of **JIS S 3200-1**.

13.8 Leaching performance test The leaching performance test shall be as specified in **JIS S 3200-7**.

14 Inspection

14.1 Inspection The inspection shall be as follows:

a) General matters common to inspection shall be as specified in **JIS G 0404**.

b) The chemical composition shall conform to the requirements specified in clause **5**.

c) The mechanical properties shall conform to the requirements specified in clause **6**.

d) The austenitic grain size number of SUS321HTP shall conform to the requirements specified in clause **7**.

e) Hydraulic test characteristic or non-destructive examination characteristic shall conform to the requirements specified in clause **8**. However, the non-destructive examination may be replaced by other appropriate non-destructive examinations other than **13.6.3** subjected to the agreement between the purchaser and the manufacturer.

f) Pressure resistance performance(4) shall conform to the requirements specified in clause **9** as a type test.

g) Leaching performance(4) shall conform to the requirements specified in clause **10** as a type test.

h) The dimensions shall conform to the requirements specified in clause **11**.

i) The appearance shall conform to the requirements specified in clause **12**.

j) When the special quality requirements given in annex 1 are specified subjected to the agreement between the purchaser and the manufacturer, the results of inspection shall conform to the relevant requirements specified in clause **1**, **2**, **3**, **4**, and **5** in annex 1.

Note (4) The pressure resistance performance test and leaching performance test are not carried out per each delivery as a type test.

14.2 Reinspection For pipes having failed to pass the tensile test, flattening test or guide bend test of weld zone, the final acceptance may be determined by performing the retest in accordance with **9.8** of **JIS G 0404**.

15 Marking Each pipe having passed the inspection shall be marked with the following items. However, in the case of either small pipes or a requirement from the purchaser, the pipes may be bundled and marked for each bundle by a suitable means. In either case, the order of arranging the items is not specified.

When approved by the purchaser, a part of the items may be omitted.

a) Symbol of grade

b) Symbol indicating the manufacturing method(5)

c) Dimension(6)

d) Manufacturer's name or abbreviation

e) Symbol Z indicating the designation of special quality requirements

f) Symbol M indicating the pressure resistance performance and leaching performance.

Notes (5) The symbols indicating the manufacturing method shall be as follows: However, the sign of dash may be replaced by a space.

Hot-finished seamless pipe: −S−H

Cold-finished seamless pipe: −S−C

Automatic arc welded pipe: −A

Cold-finished automatic arc welded pipe: −A−C

Weld zone work finished automatic arc welded pipe: −A−B

Laser welded pipe: −L

Cold-finished laser welded pipe: −L−C

Weld zone work finished laser welded pipe: −L−B

Electric resistance welded pipe other than hot-finished or cold finished ones: −E−G

Cold-finished electric resistance welded pipe: −E−C

(6) The dimensions shall be indicated as follows:

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

Example : 50A × Sch 10S, 60.5 × 2.8 or 50A × 2.8

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

Attached Table 1 Normative references

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

Remarks : **ISO 404** : 1992 *Steel and steel products—General technical delivery requirements* is equivalent to the said standard.

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

Remarks : **ISO 10474** : 1991 *Steel and steel products—Inspection documents* is identical with the said standard.

JIS G 0551 *Methods of austenite grain size determination for steel*

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

Remarks : **ISO 783** : 1989 *Metallic materials—Tensile testing at elevated temperature* is equivalent to the said standard.

JIS G 0571 *Method of oxalic acid etching test for stainless steels*

JIS G 0572 *Method of ferric sulfate-sulfuric acid test for stainless steels*

JIS G 0573 *Method of 65 per cent nitric acid test for stainless steels*

Remarks : **ISO 3651-1** : 1998 *Determination of resistance to intergranular corrosion of stainless steels—Part 1 : Austenitic and ferritic-austenitic (duplex) stainless steels—Corrosion test in nitric acid medium by measurement of loss in mass (Huey test)* is equivalent to the said standard.

JIS G 0575 *Method of copper sulfate-sulfuric acid test for stainless steels*

Remarks : **ISO 3651-2** : 1998 *Determination of resistance to intergranular corrosion of stainless steels—Part 2 : Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels—Corrosion test in media containing sulfuric acid* is equivalent to the said standard.

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

Remarks : **ISO 9303** : 1989 *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes—Full peripheral ultrasonic testing for the detection of longitudinal imperfections* is equivalent to the said standard.

JIS G 0583 *Eddy current examination of steel pipes and tubes*

Remarks : **ISO 9304** : 1989 *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes—Eddy current testing for the detection of imperfections* is equivalent to the said standard.

JIS G 1211 *Iron and steel—Methods for determination of carbon content*

JIS G 1212 *Iron and steel—Methods for determination of silicon content*

JIS G 1213 *Iron and steel—Methods for determination of manganese content*

JIS G 1214 *Iron and steel—Methods for determination of phosphorus content*

JIS G 1215 *Iron and steel—Methods for determination of sulfur content*

JIS G 1216 *Iron and steel—Methods for determination of nickel content*

JIS G 1217 *Methods for determination of chromium in iron and steel*

JIS G 1218 *Iron and steel—Methods for determination of molybdenum content*

JIS G 1223 *Iron and steel—Methods for determination of titanium content*

JIS G 1224 *Iron and steel—Methods for determination of aluminium content*

JIS G 1228 *Iron and steel—Methods for determination of nitrogen content*

JIS G 1237 *Iron and steel—Methods for determination of niobium content*

JIS G 1238 *Steel and iron—Determination of chromium content—Potentiometric or visual titration method*

JIS G 1253 *Iron and steel—Method for spark discharge atomic emission spectrometric analysis*

JIS G 1256 *Iron and steel—Method for X-ray fluorescence spectrometric analysis*

JIS G 1257 *Iron and steel—Methods for atomic absorption spectrometric analysis*

JIS G 1258 *Iron and steel—Methods for inductively coupled plasma atomic emission spectrometry*

JIS S 3200-1 *Equipment for water supply service—Test methods of hydrostatic pressure*

JIS S 3200-7 *Equipment for water supply service—Test methods of effect to water quality*

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

Remarks : **ISO 6892** : 1984 *Metallic materials—Tensile testing at ambient temperature* is equivalent to the said standard.

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

Remarks : **ISO 6892** : 1984 *Metallic materials—Tensile testing at ambient temperature* is equivalent to the said standard.

JIS Z 3106 *Methods of radiographic examination for welded joints in stainless steel*

JIS Z 3122 *Methods of bend test for butt welded joint*

JIS Z 8401 *Guide to the rounding of numbers*

Attached Table 2 Hydraulic test pressure according to schedule No.

Unit: MPa

Schedule No. Sch	5S	10S	20S	40	80	120	160
Hydraulic test pressure	1.5	2.0	3.5	6.0	12	18	20

Remarks : For the pipes with dimensions other than those given in table 5, the hydraulic test pressure shall conform to the attached table 3 according to the division of the ratio of the wall thickness to the outside diameter of the pipe (t/D). However, in the case of the welded pipe, when the outside diameter conform to table 6 and the thickness comes in between the values in that table, adopt the schedule number for the larger thickness and carry out the test with the hydraulic test pressure specified in attached table 2. On the other hand, where the outside diameter does not meet the values in the table, the hydraulic test pressure shall conform to the attached table 3 according to the division of the ratio of the wall thickness to the outside diameter of the pipe (t/D).

Attached Table 3 Hydraulic test pressure of pipes of different outside diameter

Unit: MPa

System	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

Annex 1 (normative)
Special quality requirements

The special quality requirements shall be applied when requested by the purchaser and shall be executed by the manufacturer on the specified items.

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

a) The values of the elevated temperature yield point or proof stress and the test temperature shall be subjected to the agreement between the purchaser and the manufacturer.

b) The test piece and test method shall be as specified in **JIS G 0567**.

When it is difficult to take the test piece of the shape specified in **JIS G 0567**, the shape of test piece shall be subjected to the agreement between the purchaser and the manufacturer.

c) In respect of the sampling method of a test specimen and the number of test pieces, one test specimen shall be taken from a lot of the same cast steel, and one test piece shall be taken from the test specimen for each test temperature.

2 Ultrasonic examination (Z3) The ultrasonic examination shall be applied to seamless pipes as described below:

a) The criteria for working sensitivity of ultrasonic examination shall be UB or UC specified in **JIS G 0582**, and there shall be no signal greater than signals produced by the artificial flaws of a reference test piece.

b) The method for ultrasonic examination shall be as specified in **JIS G 0582**.

c) The ultrasonic examination shall be carried out for each pipe and the results shall conform to the requirements specified in **a**).

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

a) The criteria for working sensitivity of eddy current examination shall be EU, EV, EW or EX specified in **JIS G 0583**, and there shall be no signal greater than the signals produced by the artificial flaws of a reference test piece.

b) The method for eddy current examination shall be as specified in **JIS G 0583**.

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

4 Corrosion test (Z6) The corrosion test shall be as follows:

4.1 Corrosion resistance The corrosion resistance of the pipe by an intergranular corrosion test shall comply with the following requirements. In this case, the detail of the intergranular corrosion test to be applied shall be subjected to the agreement between the purchaser and the manufacturer.

a) The evaluation according to an etch structure obtained by a 10 % oxalic acid etch test shall be as specified in annex 1 table 1.

Annex 1 Table 1 Evaluation by 10 % oxalic acid etch test

<table>
<tr><th>Symbol of grade</th><th>Condition</th><th>Structure for ferric sulfate-sulfuric acid test</th><th>Structure for 65 % nitric acid test</th><th>Structure for copper sulfate-sulfuric acid test</th></tr>
<tr><td>SUS304TP</td><td rowspan="5">As delivered (solution treatment)</td><td rowspan="5">Ditch structure</td><td rowspan="3">Ditch structure
End grain pitting II</td><td rowspan="5">Ditch structure</td></tr>
<tr><td>SUS315J1</td></tr>
<tr><td>SUS315J2</td></tr>
<tr><td>SUS316TP</td><td rowspan="2">—</td></tr>
<tr><td>SUS317TP</td></tr>
<tr><td>SUS304LTP</td><td rowspan="5">Sensitization</td><td rowspan="3">Ditch structure</td><td rowspan="2">Ditch structure
End grain pitting II</td><td rowspan="5">Ditch structure</td></tr>
<tr><td>SUS316LTP</td><td rowspan="3">—</td></tr>
<tr><td>SUS317LTP</td></tr>
<tr><td>SUS321TP</td><td rowspan="2">—</td><td rowspan="2">—</td></tr>
<tr><td>SUS347TP</td></tr>
</table>

b) The corrosion resistance by ferric sulfate-sulfuric acid test shall be evaluated by corrosion rate. The corrosion rate shall be as given in annex 1 table 2.

Annex 1 Table 2 Corrosion rate by ferric sulfate-sulfuric acid test

<table>
<tr><th>Symbol of grade</th><th>Condition</th><th>Corrosion rate g/m^2 · h</th></tr>
<tr><td>SUS304TP
SUS315J1
SUS315J2
SUS316TP
SUS317TP</td><td>As delivered (solution treatment)</td><td>As agreed upon between the purchaser and the manufacturer</td></tr>
<tr><td>SUS304LTP
SUS316LTP
SUS317LTP</td><td>Sensitization</td><td>As agreed upon between the purchaser and the manufacturer</td></tr>
</table>

c) The corrosion resistance by 65 % nitric acid test shall be evaluated by corrosion rate. The corrosion rate shall be as given in annex 1 table 3.

Annex 1 Table 3 Corrosion rate by 65 % nitric acid test

Symbol of grade	Condition	Corrosion rate $g/m^2 \cdot h$
SUS304TP	As delivered (solution treatment)	As agreed upon between the purchaser and the manufacturer
SUS304LTP	Sensitization	As agreed upon between the purchaser and the manufacturer

d) The corrosion resistance by the copper sulfate-sulfuric acid test shall be evaluated by conditions of the bent surface. Conditions of the bent surface shall be as given in annex 1 table 4.

Annex 1 Table 4 Conditions of bent surface by copper sulfate-sulfuric acid test

Symbol of grade	Condition	Conditions of bent surface
SUS304TP SUS315J1 SUS315J2 SUS316TP SUS317TP	As delivered (solution treatment)	To be free from cracks due to intergranular corrosion
SUS304LTP SUS316LTP SUS317LTP SUS321TP SUS347TP	Sensitization	To be free from cracks due to intergranular corrosion

4.2 Test piece An appropriate length of a pipe shall be cut off from the end of the pipe to serve as a test piece.

4.3 Test method The test method shall be in accordance with any one of the following standards:

JIS G 0571, JIS G 0572, JIS G 0573, JIS G 0575

4.4 Test The results for a corrosion test shall conform to the requirements specified in **4.1**.

4.5 Sampling method of test specimen and number of test pieces The sampling method of a test specimen and the number of test pieces shall be as given in the case of the grain size test in **13.5.1** of the main text. However, if required, the above-mentioned test piece shall be sampled for a lot of the pipes of the same cast steel produced under the same heat treatment.

5 Radiographic examination of weld zone (Z7) The radiographic examination of weld zone shall be as follows:

a) The classification of radiographs in the radiographic examination of weld zone shall be grade 1 or grade 2 specified in **JIS Z 3106** in accordance with the specification by the purchaser.

b) The method of radiographic examination shall be as specified in annex 1 (normative) of **JIS Z 3106**. In this case, the penetrometer sensitivity shall be A class. However, the purchaser may specify class B of the penetrometer sensitivity if especially required.

c) The radiographic examination shall be carried out for the full length of the weld zone for each pipe, and the results obtained shall conform to the requirements specified in **a**).

Related standards:

JIS G 4303 *Stainless steel bars*

JIS G 4304 *Hot rolled stainless steel plates, sheets and strip*

JIS G 4305 *Cold rolled stainless steel plates, sheets and strip*

Annex 2 (informative)

Comparison table between JIS and corresponding International Standards

JIS G 3459: 2004 *Stainless steel pipes*			**ISO 9329-4**: 1997 *Seamless steel tubes for pressure purposes—Technical delivery conditions—Part 4: Austenitic stainless steels* **ISO 9330-6**: 1997 *Welded steel tubes for pressure purposes—Technical delivery conditions—Part 6: Longitudinally welded austenitic stainless steel tubes*			
(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: dotted underlines or continuous sidelines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
1	Scope: Stainless steel pipes used for the piping for corrosion resistance, low temperature service, high temperature service, etc.	**ISO 9329-4** **ISO 9330-6**	1	Scope: Austenitic steel tubes used for pressure and corrosion resisting purposes at room temperature, at low temperatures or at elevated temperatures.	MOD/ addition	In **JIS** the pipe for pressure purpose is specified.	Since the pipe for pressure purpose is specified in **JIS B 8270**, it is not specified in this Standard.
2	Normative references **JIS G 0404** **JIS G 0415** **JIS G 0567** **JIS G 0573** **JIS G 0575**	**ISO 9329-4** **ISO 9330-6**	2	Normative references **ISO 404** **ISO 10474** **ISO 783** **ISO 3651-1** **ISO 3651-2**	MOD/ alteration IDT MOD/ alteration MOD/ alteration MOD/ alteration		Added **JIS**s as normative references are essential for analysis of composition, and deleted **ISO** Standards are normative references corresponding to the matters not specified in **JIS**.

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Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
2 (concluded)	**JIS G 0582**			**ISO 9303**	MOD/ alteration		
	JIS G 0583			**ISO 9304**	MOD/ alteration		
	JIS Z 2201			**ISO 6892**	MOD/ alteration		
	JIS Z 2241			**ISO 6892**	MOD/ alteration		
	JIS other than the above-mentioned **JIS** described in attached table 1.				MOD/ addition	**JIS**s related to chemical analysis were added.	
				ISO 148, ISO 377-1, ISO 683-13, ISO/R 831, ISO 1127, ISO 1129, ISO 2037, ISO 2566-2, ISO 3205, ISO 4200, ISO/TR 4949, ISO 5252, ISO 5730, ISO 6759, ISO 6761, ISO 7438, ISO 7598, ISO 8492, ISO 8493, ISO 8495, ISO 8496, ISO 9302, ISO 9305, ISO 9765, ISO/TR 9769, ISO 10332, ISO 11496, ISO 12096, ISO 14284	MOD/ deletion	Normative references which do not fall in the scope of **JIS** were deleted.	

(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: dotted underlines or continuous sidelines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
3	Classification and symbol: 21 grades of austenitic pipes, 3 grades of austenitic ferritic pipes, and 7 grades of ferritic pipes are specified.	**ISO 9329-4** **ISO 9330-6**	4.1	Austenitic tubes are specified, and grades differ according to standards. **ISO 9329-4**: 17 grades **ISO 9330-6**: 12 grades	MOD/ addition MOD/ alteration	In **JIS** austenitic ferritic pipes, and ferritic pipes are added.	**ISO** Standard is included in **JIS**.
4 a)	Manufacturing method: Manufactured by a seamless process, an electric resistance welding process, a laser welding process, or an electric resistance welding process.	**ISO 9329-4** **ISO 9330-6**	5.2	Product-making process for tubes **ISO 9329-4**: Manufactured by a seamless process **ISO 9330-6**: Welded by fusion with or without the addition of filler metal.	MOD/ addition	In **JIS** both processes of a seamless process and an electric resistance welding process are specified, but in **ISO** Standard either of the processes is specified.	In **JIS** the requirements are specified by use application, and in **ISO** Standard by manufacturing method. The standard system differs between **JIS** and **ISO** Standard.
4 b)	It is specified that the solution treatment or annealing is performed and then pickled or similarly treated.	**ISO 9329-4** **ISO 9330-6**	5.3.1	Two kinds of heat treatment are specified. a) Tubes are pressed or extruded at a temperature within the solution-treatment temperature range, and then cooled rapidly.	MOD/ addition	In **JIS** an annealing process is added to austenitic pipes. In **JIS** for the austenitic pipes, the solution treatment is performed after the hot work.	In **JIS** another heat treatment may be applied according to agreement, and **JIS** can correspond to **ISO** Standard.

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Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
4 c)	It is specified that when required by the purchaser, the pipes may be fabricated to the bevel end.	**ISO 9329-4** **ISO 9330-6**	8.2	b) Preparation of ends: By agreement between the purchaser and the manufacturer at the time of ordering, tubes can be delivered with bevelled ends.	IDT	—	
5	Chemical composition: The composition of 31 grades each is specified.	**ISO 9329-4** **ISO 9330-6**	6.1	Chemical composition: The composition of 17 grades each for **ISO 9329-4** and 12 grades each for **ISO 9330-6** is specified.	MOD/ addition MOD/ alteration	For the composition range of austenitic stainless steel of **ISO** Standard and JIS, the composition range of C, Si, Ni, P, Cr, Mo slightly differ between both standards even on the equivalent grade.	The adjustment of composition range will be proposed to **ISO**.
6.1	Tensile strength, proof stress and elongation: The tensile strength, proof stress and elongation at ordinary temperature are specified.	**ISO 9329-4** **ISO 9330-6**	6.2.1	Room temperature characteristic: The tensile strength, proof stress, elongation, impact value, flattening, expanding, are specified.	MOD/ deletion	In **JIS** the impact value and expanding are not specified.	In **JIS** the impact value and expanding are deleted because the pipe for pressure purpose is not specified.

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Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
6.2	Flattening or guide bend resistance of weld zone: The flattening or guide bend resistance in the welded is specified.		9.9.3	Either a flattening test or a bend test or a ring tensile test is specified.	MOD/ addition	In **JIS** a guide bend resistance of weld zone is specified in stead of a flattening for the welded pipe of 200A or over. In **ISO** Standard either a flattening test or a bend test or a ring tensile test is performed at the option of the manufacturer.	Only a flattening test in **JIS** can correspond to **ISO** Standard, and a bend test and a ring tensile test are not performed.
7	Austenitic grain size: The austenitic grain size of SUS321HTP is specified.		—	Not specified.	MOD/ addition	Not specified in **ISO** Standard.	This item is necessary for assuring creep strength and the addition of this item will be proposed to **ISO**.
8	Hydraulic test characteristic or non-destructive examination characteristic: Either hydraulic test characteristic or non-destructive examination characteristic is applied.	**ISO 9329-4** **ISO 9330-6**	9.5	Either hydraulic test characteristic or non-destructive examination characteristic is applied.	IDT		
9	Pressure resistance performance: The pressure resistance performance is specified.	—	—	Not specified.	MOD/ addition	The pressure resistance performance is necessary for the pipe used for feed water.	The item stipulated in the Water Works Law.

(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: dotted underlines or continuous sidelines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
10	Leaching performance: The leaching performance is specified.	—	—	Not specified.	MOD/ addition	The leaching performance is necessary for the pipe used for feed water.	The item stipulated in the Water Works Law.
11.1	Dimensions and mass: The dimensions and mass of pipes are specified.	**ISO 9329-4** **ISO 9330-6**	7.1	Outside diameters, wall thicknesses and masses: The outside diameters, wall thicknesses and masses of the tubes should be selected from those in **ISO 4200** and **ISO 1127**.	MOD/ alteration	The dimensional system differs.	The alteration of dimensional system may cause confusion in the market.
11.2	Dimensional tolerances: a) The tolerances on outside diameter, wall thickness, and wall thickness deviation of pipes are specified. b) It is specified that in the case where the pipe length is specified, the tolerances on pipe length shall be applied on the plus side only.	**ISO 9329-4** **ISO 9330-6**	7.3.1	Tolerances on outside diameter and wall thickness: The tolerances on the outside diameter and wall thickness of pipes are specified.	MOD/ addition MOD/ alteration	In **JIS** the tolerance on wall thickness deviation of seamless pipes is added. Furthermore, the value of tolerance in **JIS** is equivalent to or stricter than that in **ISO** Standard.	The alteration of dimensional system may cause confusion in the market.
		ISO 9329-4 **ISO 9330-6**	7.3.2	Tolerances on length: The tolerances on exact lengths are specified.	MOD/ alteration	In **JIS** the specific tolerance is not specified.	At the present moment, it is difficult to make the tolerance in **JIS** identical with that in **ISO** Standard.

(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: dotted underlines or continuous sidelines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
12	Appearance: a) It is specified that the pipe is straight for practical purposes, and their both ends are at right angles to the axis	**ISO 9329-4** **ISO 9330-6**	8.1.7	It is specified that all tubes are reasonably straight.	IDT		
	b) It is specified that the inside and outside surfaces of the pipe are well finished, and free from defects detrimental to practical use.		8.1.2	It is specified that the tubes are clean and free from defects.	IDT		
13.1	Chemical analysis: General matters common to chemical analysis and the method of sampling specimens for analysis are specified.	**ISO 9329-4** **ISO 9330-6**	9.3	Chemical analysis: General matters common to chemical analysis and the method of sampling specimens for analysis are specified.	IDT		
13.2	Tensile test: The sampling method of a specimen and the number of test pieces are specified.		9.4	The sampling method and the shape of test pieces are specified.	MOD/ alteration	The unit of sampling test pieces is 50 pieces in **JIS**, and 100 pieces in **ISO** Standard. The shape of test piece differs between **JIS** and **ISO** Standard.	For sampling test pieces, **JIS** can correspond to **ISO** Standard. The alteration of shape of test piece may cause confusion in the market.
			9.9.2	Tensile test: The test method is specified.	IDT		

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Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
13.3	Flattening test: The sampling method of a specimen and the number of test pieces are specified.		9.4	The sampling method and the shape of test pieces are specified.	MOD/ alteration	In **JIS** one test piece per 50 pieces is sampled, and in **ISO** Standard one test piece per 100 pieces is sampled.	For sampling test pieces, **JIS** can correspond to **ISO** Standard.
			9.9.3.2	The test method of flattening test is specified.	IDT	Not specified in **ISO** Standard.	
13.4	Guide bend test of weld zone: The sampling method of a specimen and the number of test pieces are specified.		—	Not specified.	MOD/ addition	Not specified in **ISO** Standard.	Be able to be replaced by a flattening test.
13.5	Austenitic grain size test: The test method is specified.		—	Not specified.	MOD/ addition	Not specified in **ISO** Standard.	The addition will be proposed to **ISO**.
13.6	Hydraulic test or non-destructive examination: The test method is specified.		9.9.7	Leak-tightness test: The hydraulic test or the non-destructive test is specified.	IDT		
13.7	Pressure resistance performance test: The test method is specified.		—	Not specified.	MOD/ addition	Necessary for the pipe used for feed water.	The item stipulated in the Water Works Law.
13.8	Leaching performance test: The test method is specified.		—	Not specified.	MOD/ addition	Necessary for the pipe used for feed water.	The item stipulated in the Water Works Law.

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Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
14.1	Inspection: The inspection is specified.	**ISO 9329-4** **ISO 9330-6**	9.9	Test methods and results: The test methods and results specified at the same time.	MOD/ deletion	In **JIS** the test methods and results are separately specified.	The standard system differs.
14.2	Reinspection: The method of reinspection is specified.		9.11	Retests: The method of retests is specified.	IDT		
15	Marking: The items to mark are specified.	**ISO 9329-4** **ISO 9330-6**	10.1	Marking: The items to mark are specified.	MOD/ deletion MOD/ alteration MOD/ addition	In **JIS** the mark of symbol indicating a manufacturing method and symbols designating length and special quality requirements are added. **ISO** Standard has more numbers of items to mark.	The alteration of items to mark may cause confusion in the market.
16	Report: The requirements for report are specified.	**ISO 9329-4** **ISO 9330-6**	9.11	Report: The requirements for report are specified.	MOD/ alteration	For the kinds of inspection documents, 2 kinds in **JIS** and 4 kinds in **ISO** Standard are specified.	The inspection document is made suitable for the specified items in **JIS**.

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Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
Annex 1	Special quality requirements: The following matters are specified.	**ISO 9329-4** **ISO 9330-6**					
	• Elevated temperature yield point or proof stress		6.2.2	Elevated temperature characteristic	IDT		
	• Ultrasonic examination		9.9.8	Non-destructive testing	IDT		
	• Corrosion test		9.9.6	Intergranular corrosion test	IDT		
	• Eddy current examination	**ISO 9330-6**	9.9.8.1	Non-destructive testing	IDT		
	• Radiographic examination of weld zone		9.9.8.1	Non-destructive testing	IDT		

Designated degree of correspondence between **JIS** and International Standards: MOD

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

— IDT: Identical in technical contents.

— MOD/deletion: Deletes specification item(s) or content(s) of International Standards.

— MOD/addition: Adds specification item(s) or content(s) not included in International Standards.

— MOD/alteration: Alters the specification content(s) included in International Standards.

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

— MOD: Modifies International Standard.

JAPANESE INDUSTRIAL STANDARD
JIS G 3459 : 2004
Stainless steel pipes

August, 2004

ERRATA

Page 4
Table 2, the value of Si for SUS321 HTP.

Error: 0.75 min
Correct: 0.75 max

Page 7
Informative Table 1, title.

Error : 3mm in wall thickness
Correct : 8mm in wall thickness

Page 12
Remarks 2 of Table 5

Error: Rule B of JIS Z 8401
Correct: Rule A of JIS Z 8401

Remarks: This erratum is for correcting the first edition of this Standard.

Japanese Standards Association

Errata for JIS (English edition) are printed in *Standardization Journal*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

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