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Stainless steel pipes

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Reference number : JIS G 3459 : 2004 (E)



G 3459 : 2004

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.

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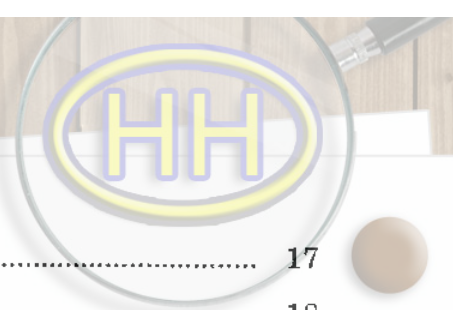
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Stainless steel pipes

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 sidlined 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		SUS329J4LTP	950 min., rapid cooling
	SUS316TP	1 010 min., rapid cooling			SUS405TP
	SUS316HTP	1 040 min., rapid cooling	Ferritic pipes	SUS409LTP	Annealing 700 min., air cooling or slow cooling
	SUS316LTP	1 010 min., rapid cooling		SUS430TP	Annealing 700 min., air cooling or slow cooling
	SUS316TiTP	920 min., rapid cooling		SUS430LXTP	Annealing 700 min., air cooling or slow cooling
	SUS317TP	1 010 min., rapid cooling		SUS430J1LTP	Annealing 720 min., air cooling or slow cooling
	SUS317LTP	1 010 min., rapid cooling		SUS436LTP	Annealing 720 min., air cooling or slow cooling
	SUS836LTP	1 030 min., rapid cooling		SUS444TP	Annealing 700 min., air cooling or slow cooling
SUS890LTP	1 030 min., rapid cooling				

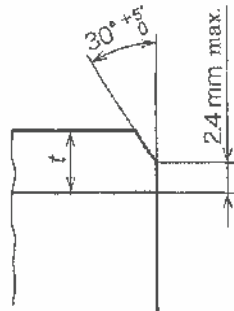
Remarks : For the pipes of SUS321TP, SUS316TiTP and SUS347TP, stabilizing treatment may be specified. In this case, the temperature of heat treatment shall be from 850 °C to 930 °C.



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

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	—
SUS316TTP	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	—
SUS36LTP	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	Cu 1.00 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 max.	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

Unit: %

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
SUS430JLTP	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
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	Cu 0.30 to 0.80 N 0.025 max. Ti, Nb, Zr or their combination
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	8 × (C % + N %) to 0.80 N 0.025 max. Ti, Nb, Zr or their combination

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, SUS317LTP, SUS336LTP, 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 N/mm ²	Proof stress N/mm ²	Elongation %			
			No. 11 test piece No. 12 test piece		No. 5 test piece No. 4 test piece	
			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.
SUS316TTP	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.
SUS336LTP	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 8 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)

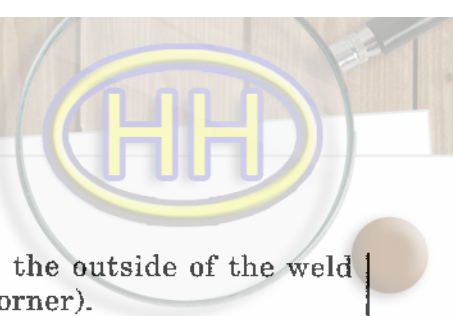
t : wall thickness of pipe (mm)

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 grain 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/mm²)

- 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.



Table 5 Dimensions and mass of stainless steel pipes for piping

Nominal diameter Outside diameter	Schedule	Schedule 40S										Schedule 40										Schedule 80S										Schedule 80									
		Unit mass kg/m					Unit mass lb/m					Unit mass kg/m					Unit mass lb/m					Unit mass kg/m					Unit mass lb/m														
A	B	304	304L	316	316L	304H	304L	316	316L	304H	304L	316	316L	304H	304L	316	316L	304H	304L	316	316L	304H	304L	316	316L	304H	304L	316	316L	304H	304L	316	316L								
6	10.5	1.0	0.237	0.231	0.231	0.230	0.230	0.230	0.230	1.2	0.278	0.270	0.272	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270								
8	11.8	1.2	0.277	0.279	0.279	0.279	0.279	0.279	0.279	1.5	0.409	0.401	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403								
10	13.3	1.2	0.481	0.484	0.484	0.484	0.484	0.484	0.484	1.65	0.643	0.637	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639	0.639								
15	17.7	1.65	0.824	0.828	0.828	0.828	0.828	0.828	0.828	2.1	1.03	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01								
20	21.7	1.65	1.33	1.34	1.34	1.34	1.34	1.34	1.34	2.1	1.32	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29								
25	26.2	1.65	1.84	1.84	1.84	1.84	1.84	1.84	1.84	2.1	1.61	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57								
32	33.7	1.65	2.42	2.41	2.41	2.41	2.41	2.41	2.41	2.8	2.18	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19								
40	42.7	1.65	3.18	3.18	3.18	3.18	3.18	3.18	3.18	2.8	2.78	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80								
50	51.3	1.65	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.5	3.48	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51								
65	71.3	2.1	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.0	4.08	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11	4.11								
80	81.3	2.1	5.20	5.20	5.20	5.20	5.20	5.20	5.20	4.5	4.68	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71								
100	101.6	2.1	6.87	6.87	6.87	6.87	6.87	6.87	6.87	5.0	5.37	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40								
125	125.3	2.8	9.56	9.56	9.56	9.56	9.56	9.56	9.56	6.0	6.25	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28	6.28								
150	151.2	2.8	11.3	11.3	11.3	11.3	11.3	11.3	11.3	6.5	6.88	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91								
200	203.2	3.4	15.9	15.9	15.9	15.9	15.9	15.9	15.9	8.0	8.24	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27								
250	253.4	4.0	21.3	21.3	21.3	21.3	21.3	21.3	21.3	10.0	10.28	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31								
300	304.8	4.0	27.8	27.8	27.8	27.8	27.8	27.8	27.8	12.0	12.32	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35	12.35								
350	316.6	4.0	35.1	35.1	35.1	35.1	35.1	35.1	35.1	15.0	15.36	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39	15.39								
400	408.4	4.0	43.2	43.2	43.2	43.2	43.2	43.2	43.2	18.0	18.40	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43	18.43								
450	457.2	4.0	51.8	51.8	51.8	51.8	51.8	51.8	51.8	21.0	21.44	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47	21.47								
500	508.0	4.0	60.9	60.9	60.9	60.9	60.9	60.9	60.9	24.0	24.48	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51	24.51								
550	558.8	4.0	70.6	70.6	70.6	70.6	70.6	70.6	70.6	27.0	27.52	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55	27.55								
600	609.6	4.0	80.9	80.9	80.9	80.9	80.9	80.9	80.9	30.0	30.56	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59	30.59							
650	660.4	4.0	91.7	91.7	91.7	91.7	91.7	91.7	91.7	33.0	33.60	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63	33.63								

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Table 5 (concluded)

Nominal diameter Schedule 80 Unit mass kg/m	Nominal diameter Schedule 120 Unit mass kg/m	Nominal diameter Schedule 160 Unit mass kg/m	Nominal diameter Schedule 200 Unit mass kg/m	Nominal diameter Schedule 240 Unit mass kg/m	Nominal diameter Schedule 280 Unit mass kg/m	Schedule 80		Schedule 120		Schedule 160		Schedule 200		Schedule 240		Schedule 280			
						Unit mass kg/m		Unit mass kg/m		Unit mass kg/m		Unit mass kg/m		Unit mass kg/m		Unit mass kg/m		Unit mass kg/m	
						A	B	A	B	A	B	A	B	A	B	A	B	A	B
6	10.5	2.4	0.484	0.487	0.476	0.473	0.470	0.462	0.462	0.452	0.452	0.442	0.442	0.432	0.432	0.422	0.422	0.412	
8	13.8	3.2	0.612	0.612	0.612	0.609	0.609	0.609	0.609	0.609	0.609	0.609	0.609	0.609	0.609	0.609	0.609	0.609	
10	17.3	4.1	0.761	0.761	0.761	0.758	0.758	0.758	0.758	0.758	0.758	0.758	0.758	0.758	0.758	0.758	0.758	0.758	
12	21.7	5.1	0.928	0.928	0.928	0.924	0.924	0.924	0.924	0.924	0.924	0.924	0.924	0.924	0.924	0.924	0.924	0.924	
15	27.2	6.5	1.152	1.152	1.152	1.148	1.148	1.148	1.148	1.148	1.148	1.148	1.148	1.148	1.148	1.148	1.148	1.148	
20	37.8	9.1	1.584	1.584	1.584	1.579	1.579	1.579	1.579	1.579	1.579	1.579	1.579	1.579	1.579	1.579	1.579	1.579	
25	47.8	11.3	1.984	1.984	1.984	1.979	1.979	1.979	1.979	1.979	1.979	1.979	1.979	1.979	1.979	1.979	1.979	1.979	
32	61.5	14.3	2.528	2.528	2.528	2.523	2.523	2.523	2.523	2.523	2.523	2.523	2.523	2.523	2.523	2.523	2.523	2.523	
40	77.2	17.8	3.184	3.184	3.184	3.179	3.179	3.179	3.179	3.179	3.179	3.179	3.179	3.179	3.179	3.179	3.179	3.179	
50	98.5	22.5	3.984	3.984	3.984	3.979	3.979	3.979	3.979	3.979	3.979	3.979	3.979	3.979	3.979	3.979	3.979	3.979	
60	121.5	27.5	4.848	4.848	4.848	4.843	4.843	4.843	4.843	4.843	4.843	4.843	4.843	4.843	4.843	4.843	4.843	4.843	
75	154.5	34.5	6.144	6.144	6.144	6.139	6.139	6.139	6.139	6.139	6.139	6.139	6.139	6.139	6.139	6.139	6.139	6.139	
90	191.5	42.5	7.584	7.584	7.584	7.579	7.579	7.579	7.579	7.579	7.579	7.579	7.579	7.579	7.579	7.579	7.579	7.579	
100	214.5	48.5	8.448	8.448	8.448	8.443	8.443	8.443	8.443	8.443	8.443	8.443	8.443	8.443	8.443	8.443	8.443	8.443	
125	271.5	61.5	10.584	10.584	10.584	10.579	10.579	10.579	10.579	10.579	10.579	10.579	10.579	10.579	10.579	10.579	10.579	10.579	
150	327.5	75.5	12.720	12.720	12.720	12.715	12.715	12.715	12.715	12.715	12.715	12.715	12.715	12.715	12.715	12.715	12.715	12.715	
200	438.5	101.5	16.608	16.608	16.608	16.603	16.603	16.603	16.603	16.603	16.603	16.603	16.603	16.603	16.603	16.603	16.603	16.603	
250	551.5	128.5	20.544	20.544	20.544	20.539	20.539	20.539	20.539	20.539	20.539	20.539	20.539	20.539	20.539	20.539	20.539	20.539	
300	666.5	156.5	24.480	24.480	24.480	24.475	24.475	24.475	24.475	24.475	24.475	24.475	24.475	24.475	24.475	24.475	24.475	24.475	
350	783.5	184.5	28.416	28.416	28.416	28.411	28.411	28.411	28.411	28.411	28.411	28.411	28.411	28.411	28.411	28.411	28.411	28.411	
400	902.5	212.5	32.352	32.352	32.352	32.347	32.347	32.347	32.347	32.347	32.347	32.347	32.347	32.347	32.347	32.347	32.347	32.347	
450	1023.5	240.5	36.288	36.288	36.288	36.283	36.283	36.283	36.283	36.283	36.283	36.283	36.283	36.283	36.283	36.283	36.283	36.283	
500	1146.5	268.5	40.224	40.224	40.224	40.219	40.219	40.219	40.219	40.219	40.219	40.219	40.219	40.219	40.219	40.219	40.219	40.219	
550	1271.5	296.5	44.160	44.160	44.160	44.155	44.155	44.155	44.155	44.155	44.155	44.155	44.155	44.155	44.155	44.155	44.155	44.155	
600	1400.5	324.5	48.096	48.096	48.096	48.091	48.091	48.091	48.091	48.091	48.091	48.091	48.091	48.091	48.091	48.091	48.091	48.091	
650	1532.5	352.5	52.032	52.032	52.032	52.027	52.027	52.027	52.027	52.027	52.027	52.027	52.027	52.027	52.027	52.027	52.027	52.027	

Remark 1: The designation of the pipe shall be based on the nominal diameter and nominal wall thickness (schedule number: Sch). However, for the nominal diameter, either A or B shall be used, and letter A or B shall be omitted for 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 A 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.

3 When dimensions other than those given in the above-mentioned table are required, the dimensions shall be determined as agreed upon between the purchaser and the manufacturer.

Series of grade	Basic mass ⁽¹⁾ , kg	Formula ⁽²⁾
SUS304L1, SUS304L2, SUS304L3, SUS304L4, SUS304L5, SUS304L6, SUS304L7, SUS304L8, SUS304L9, SUS304L10, SUS304L11, SUS304L12, SUS304L13, SUS304L14, SUS304L15, SUS304L16, SUS304L17, SUS304L18, SUS304L19, SUS304L20, SUS304L21, SUS304L22, SUS304L23, SUS304L24, SUS304L25, SUS304L26, SUS304L27, SUS304L28, SUS304L29, SUS304L30, SUS304L31, SUS304L32, SUS304L33, SUS304L34, SUS304L35, SUS304L36, SUS304L37, SUS304L38, SUS304L39, SUS304L40, SUS304L41, SUS304L42, SUS304L43, SUS304L44, SUS304L45, SUS304L46, SUS304L47, SUS304L48, SUS304L49, SUS304L50, SUS304L51, SUS304L52, SUS304L53, SUS304L54, SUS304L55, SUS304L56, SUS304L57, SUS304L58, SUS304L59, SUS304L60, SUS304L61, SUS304L62, SUS304L63, SUS304L64, SUS304L65, SUS304L66, SUS304L67, SUS304L68, SUS304L69, SUS304L70, SUS304L71, SUS304L72, SUS304L73, SUS304L74, SUS304L75, SUS304L76, SUS304L77, SUS304L78, SUS304L79, SUS304L80, SUS304L81, SUS304L82, SUS304L83, SUS304L84, SUS304L85, SUS304L86, SUS304L87, SUS304L88, SUS304L89, SUS304L90, SUS304L91, SUS304L92, SUS304L93, SUS304L94, SUS304L95, SUS304L96, SUS304L97, SUS304L98, SUS304L99, SUS304L100	7.93	$W = 0.02491 \cdot (D - t)^2$
SUS309L1, SUS309L2, SUS309L3, SUS309L4, SUS309L5, SUS309L6, SUS309L7, SUS309L8, SUS309L9, SUS309L10, SUS309L11, SUS309L12, SUS309L13, SUS309L14, SUS309L15, SUS309L16, SUS309L17, SUS309L18, SUS309L19, SUS309L20, SUS309L21, SUS309L22, SUS309L23, SUS309L24, SUS309L25, SUS309L26, SUS309L27, SUS309L28, SUS309L29, SUS309L30, SUS309L31, SUS309L32, SUS309L33, SUS309L34, SUS309L35, SUS309L36, SUS309L37, SUS309L38, SUS309L39, SUS309L40, SUS309L41, SUS309L42, SUS309L43, SUS309L44, SUS309L45, SUS309L46, SUS309L47, SUS309L48, SUS309L49, SUS309L50, SUS309L51, SUS309L52, SUS309L53, SUS309L54, SUS309L55, SUS309L56, SUS309L57, SUS309L58, SUS309L59, SUS309L60, SUS309L61, SUS309L62, SUS309L63, SUS309L64, SUS309L65, SUS309L66, SUS309L67, SUS309L68, SUS309L69, SUS309L70, SUS309L71, SUS309L72, SUS309L73, SUS309L74, SUS309L75, SUS309L76, SUS309L77, SUS309L78, SUS309L79, SUS309L80, SUS309L81, SUS309L82, SUS309L83, SUS309L84, SUS309L85, SUS309L86, SUS309L87, SUS309L88, SUS309L89, SUS309L90, SUS309L91, SUS309L92, SUS309L93, SUS309L94, SUS309L95, SUS309L96, SUS309L97, SUS309L98, SUS309L99, SUS309L100	7.98	$W = 0.02507 \cdot (D - t)^2$
SUS316L1, SUS316L2, SUS316L3, SUS316L4, SUS316L5, SUS316L6, SUS316L7, SUS316L8, SUS316L9, SUS316L10, SUS316L11, SUS316L12, SUS316L13, SUS316L14, SUS316L15, SUS316L16, SUS316L17, SUS316L18, SUS316L19, SUS316L20, SUS316L21, SUS316L22, SUS316L23, SUS316L24, SUS316L25, SUS316L26, SUS316L27, SUS316L28, SUS316L29, SUS316L30, SUS316L31, SUS316L32, SUS316L33, SUS316L34, SUS316L35, SUS316L36, SUS316L37, SUS316L38, SUS316L39, SUS316L40, SUS316L41, SUS316L42, SUS316L43, SUS316L44, SUS316L45, SUS316L46, SUS316L47, SUS316L48, SUS316L49, SUS316L50, SUS316L51, SUS316L52, SUS316L53, SUS316L54, SUS316L55, SUS316L56, SUS316L57, SUS316L58, SUS316L59, SUS316L60, SUS316L61, SUS316L62, SUS316L63, SUS316L64, SUS316L65, SUS316L66, SUS316L67, SUS316L68, SUS316L69, SUS316L70, SUS316L71, SUS316L72, SUS316L73, SUS316L74, SUS316L75, SUS316L76, SUS316L77, SUS316L78, SUS316L79, SUS316L80, SUS316L81, SUS316L82, SUS316L83, SUS316L84, SUS316L85, SUS316L86, SUS316L87, SUS316L88, SUS316L89, SUS316L90, SUS316L91, SUS316L92, SUS316L93, SUS316L94, SUS316L95, SUS316L96, SUS316L97, SUS316L98, SUS316L99, SUS316L100	7.98	$W = 0.02507 \cdot (D - t)^2$
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SUS347L1, SUS347L2, SUS347L3, SUS347L4, SUS347L5, SUS347L6, SUS347L7, SUS347L8, SUS347L9, SUS347L10, SUS347L11, SUS347L12, SUS347L13, SUS347L14, SUS347L15, SUS347L16, SUS347L17, SUS347L18, SUS347L19, SUS347L20, SUS347L21, SUS347L22, SUS347L23, SUS347L24, SUS347L25, SUS347L26, SUS347L27, SUS347L28, SUS347L29, SUS347L30, SUS347L31, SUS347L32, SUS347L33, SUS347L34, SUS347L35, SUS347L36, SUS347L37, SUS347L38, SUS347L39, SUS347L40, SUS347L41, SUS347L42, SUS347L43, SUS347L44, SUS347L45, SUS347L46, SUS347L47, SUS347L48, SUS347L49, SUS347L50, SUS347L51, SUS347L52, SUS347L53, SUS347L54, SUS347L55, SUS347L56, SUS347L57, SUS347L58, SUS347L59, SUS347L60, SUS347L61, SUS347L62, SUS347L63, SUS347L64, SUS347L65, SUS347L66, SUS347L67, SUS347L68, SUS347L69, SUS347L70, SUS347L71, SUS347L72, SUS347L73, SUS347L74, SUS347L75, SUS347L76, SUS347L77, SUS347L78, SUS347L79, SUS347L80, SUS347L81, SUS347L82, SUS347L83, SUS347L84, SUS347L85, SUS347L86, SUS347L87, SUS347L88, SUS347L89, SUS347L90, SUS347L91, SUS347L92, SUS347L93, SUS347L94, SUS347L95, SUS347L96, SUS347L97, SUS347L98, SUS347L99, SUS347L100	7.98	$W = 0.02507 \cdot (D - t)^2$
SUS355L1, SUS355L2, SUS355L3, SUS355L4, SUS355L5, SUS355L6, SUS355L7, SUS355L8, SUS355L9, SUS355L10, SUS355L11, SUS355L12, SUS355L13, SUS355L14, SUS355L15, SUS355L16, SUS355L17, SUS355L18, SUS355L19, SUS355L20, SUS355L21, SUS355L22, SUS355L23, SUS355L24, SUS355L25, SUS355L26, SUS355L27, SUS355L28, SUS355L29, SUS355L30, SUS355L31, SUS355L32, SUS355L33, SUS355L34, SUS355L35, SUS355L36, SUS355L37, SUS355L38, SUS355L39, SUS355L40, SUS355L41, SUS355L42, SUS355L43, SUS355L44, SUS355L45, SUS355L46, SUS355L47, SUS355L48, SUS355L49, SUS355L50, SUS355L51, SUS355L52, SUS355L53, SUS355L54, SUS355L55, SUS355L56, SUS355L57, SUS355L58, SUS355L59, SUS355L60, SUS355L61, SUS355L62, SUS355L63, SUS355L64, SUS355L65, SUS355L66, SUS355L67, SUS355L68, SUS355L69, SUS355L70, SUS355L71, SUS355L7		



14
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Table 6 (concluded)

Unit: kg/m

Nominal diameter		Outside diameter		Unit mass							
				Schedule 80							
A	B		Thick-ness	Grade							
				304	309	329H	405	430	836L	890L	
				304L	309S	3293L	409L	430LX			
				321	310	3294L	444	4307L			
					310S			436L			
					315H						
					315J2						
					316						
					316H						
					316L						
					316T						
					317						
					317L						
					347						
					347H						
		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	60.3	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	139.5	(10.0)	32.5	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	

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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.

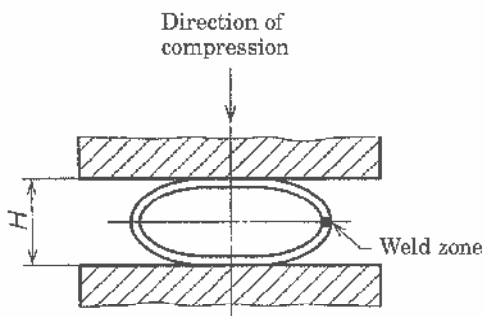


Figure 2 Flattening test (for right-shaped test piece)

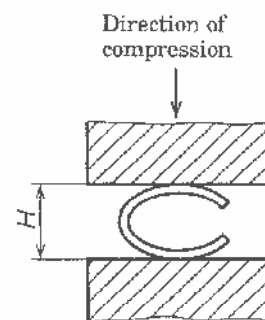


Figure 3 Flattening test (for C-shape test piece)



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

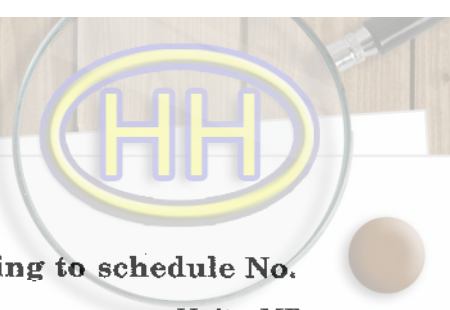
16 Report The report shall comply with the requirements of clause 13 in JIS G 0404. However, unless otherwise especially specified at the time of order, the specification of inspection document shall be symbol 2.3 or 3.1.B in table 1 of JIS G 0415.



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:

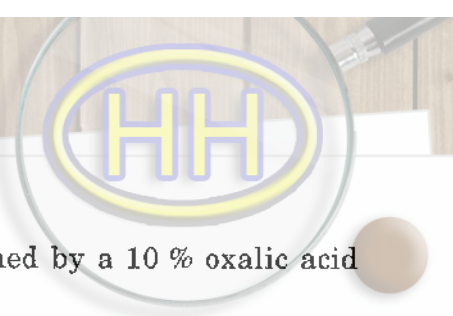
a) The criteria for working sensitivity of eddy current examination shall be EU, EV, EW or EX specified in **JIS G 0583**, and there shall be no signal greater than the signals produced by the artificial flaws of a reference test piece.

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

Symbol of grade	Condition	Structure for ferric sulfate-sulfuric acid test	Structure for 65 % nitric acid test	Structure for copper sulfate-sulfuric acid test
SUS304TP	As delivered (solution treatment)	Ditch structure	Ditch structure End grain pitting II	Ditch structure
SUS315J1				
SUS315J2			---	
SUS316TP				
SUS317TP				
SUS304LTP	Sensitization	Ditch structure	Ditch structure End grain pitting II	Ditch structure
SUS316LTP				
SUS317LTP				
SUS321TP		---		
SUS347TP				

- 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

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

- 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 ·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:



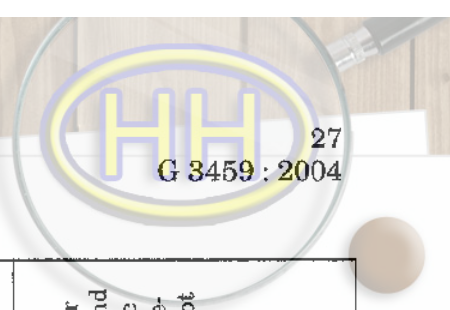
- a) The classification of radiographs in the radiographic examination of weld zone shall be grade 1 or grade 2 specified in **JIS Z 3106** in accordance with the specification by the purchaser.
- b) The method of radiographic examination shall be as specified in annex 1 (normative) of **JIS Z 3106**. 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 <i>Stainless steel pipes</i>		ISO 9329-4 : 1997 <i>Seamless steel tubes for pressure purposes—Technical delivery conditions—Part 4 : Austenitic stainless steels</i>		ISO 9330-6 : 1997 <i>Welded steel tubes for pressure purposes—Technical delivery conditions—Part 6 : Longitudinally welded austenitic stainless steel tubes</i>		(V) Justification for the technical deviation and future measures	
(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	
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.	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	2	Normative references ISO 404 ISO 10474 ISO 788 ISO 3651-1 ISO 3651-2	MOD/ alteration IDT MOD/ alteration MOD/ alteration MOD/ alteration		Added JIS as normative references are essential for analysis of composition, and deleted ISO Standards are normative references corresponding to the matters not specified in JIS .	





(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	
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.		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 8498, ISO 8495, ISO 8496, ISO 9302, ISO 9305, ISO 9765, ISO/TR 9769, ISO 10332, ISO 11496, ISO 12096, ISO 14284	MOD/addition	JISs related to chemical analysis were added. 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		
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 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 another heat treatment may be applied according to agreement, and JIS can correspond to ISO Standard.





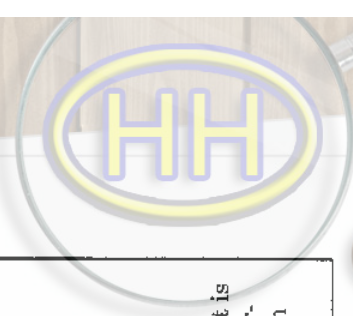
(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines or continuous sidelines	(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content		
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	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 deleted because the pipe for pressure purpose is not specified.





(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		
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	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	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 9829-4 ISO 9830-6	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 item stipulated in the Water Works Law.





(I) Requirements in JIS	(II) Inter-national 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		
10	--	--	Not specified.	Detail of technical deviation The leaching performance is necessary for the pipe used for feed water.	The item stipulated in the Water Works Law.
11.1	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.	The dimensional system differs.	The alteration of dimensional system may cause confusion in the market.
11.2	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	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	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		
12	ISO 9329-4 ISO 9330-6	8.1.7	It is specified that all tubes are reasonably straight.	IDT	
		8.1.2	It is specified that the tubes are clean and free from defects.	IDT	
13.1	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		9.4	Tensile test: The sampling method of a specimen and the number of test pieces are specified.	MOD/alteration	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	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.



(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	Location of deviation: text, annex	Indication method: dotted underlines or continuous sidelines		
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.	
13.4	Guide bend test of weld zone: The sampling method of a specimen and the number of test pieces are specified.	9.9.3.2	The test method of flattening test is specified.	IDT	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	Leak-tightness test: The hydraulic test or the non-destructive test is specified.				
13.7	Pressure resistance performance test: The test method is specified.	—	Not specified.	MOD/addition	Not specified.			The item stipulated in the Water Works Law.	
13.8	Leaching performance test: The test method is specified.	—	Not specified.	MOD/addition	Not specified.			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		(V) Justification for the technical deviation and future measures
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.





(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	
Annex 1	Special quality requirements: The following matters are specified. <ul style="list-style-type: none"> • Elevated temperature yield point or proof stress • Ultrasonic examination • Corrosion test • Eddy current examination • Radiographic examination of weld zone 	ISO 9329-4 ISO 9330-6	6.2.2 Elevated temperature characteristic 9.9.8 Non-destructive testing 9.9.6 Intergranular corrosion test 9.9.8.1 Non-destructive testing 9.9.8.1 Non-destructive testing	IDT IDT IDT IDT IDT	Location of deviation: text, annex Indication method: dotted underlines or continuous sidelines	

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.





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Standardization Promotion Department, Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN
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