Pipes

Symbol		Chemical Composition (%)								
JIS	ASTM	C	Si	Mn	P	S	Ni	Cr	Mo	Others
SUS 304TP SUS 304TB		≦0.08	≦1.00	≦2.00	≦0.04	≦0.03	8.00 ~ 11.00	18.00 ~ 20.00	--	
	TP 304	≦0.08	≦0.75	≦2.00	≦0.04	≦0.03	8.00 ~ 11.00	18.00 ~ 20.00	--	
SUS 304LTP SUS 304LTB		≦0.03	≦1.00	≦2.00	≦0.04	≦0.03	9.00 ~ 13.00	18.00 ~ 20.00	--	
	TP 304L	≦0.035*	≦0.75	≦2.00	≦0.04	≦0.03	8.00 ~ 13.00	18.00 ~ 20.00	--	
SUS 321TP SUS 321TB		≦0.08	≦1.00	≦2.00	≦0.04	≦0.03	9.00 ~ 13.00	17.00 ~ 19.00	--	Ti 5 x C% min.
	TP 321	≦0.08	≦0.75	≦2.00	≦0.04	≦0.03	9.00 ~ 13.00	17.00 ~ 19.00	--	Ti 5 x C% ~ 0.60
SUS 316TP SUS 316TB		≦0.08	≦1.00	≦2.00	≦0.04	≦0.03	10.00 ~ 14.00	16.00 ~ 18.00	2.00 ~ 3.00	
	TP 316	≦0.08	≦0.75	≦2.00	≦0.04	≦0.03	11.00 ~ 14.00	16.00 ~ 18.00	2.00 ~ 3.00	
SUS 316LTP SUS 316LTB		≦0.03	≦1.00	≦2.00	≦0.04	≦0.03	12.00 ~ 16.00	16.00 ~ 18.00	2.00 ~ 3.00	
	TP 316L	≦0.035*	≦0.75	≦2.00	≦0.04	≦0.03	10.00 ~ 15.00	16.00 ~ 18.00	2.00 ~ 3.00	
SUS 309STP SUS 309STB		≦0.15	≦1.00	≦2.00	≦0.04	≦0.03	12.00 ~ 15.00	22.00 ~ 24.00	--	
	TP 309	≦0.15	≦0.75	≦2.00	≦0.04	≦0.03	12.00 ~ 15.00	22.00 ~ 24.00	--	
SUS 310STP SUS 310STB		≦0.15	≦1.50	≦2.00	≦0.04	≦0.03	19.00 ~ 22.00	24.00 ~ 26.00	--	
	TP 310	≦0.15	≦0.75	≦2.00	≦0.04	≦0.03	19.00 ~ 22.00	24.00 ~ 26.00	--	
SUS 321HTP SUS 321HTB		0.04 ~ 0.10	≦0.75	≦2.00	≦0.03	≦0.03	9.00 ~ 13.00	17.00 ~ 20.00	--	Ti 4 x C% ~ 0.60
	TP 321H	0.04 ~ 0.10	≦0.75	≦2.00	≦0.04	≦0.03	9.00 ~ 13.00	17.00 ~ 20.00	--	Ti 4 x C% ~ 0.60

Note:

1. The above chemical composition shall be applied even when product analysis is requested by the purchasers. However, the carbon content of SUS 340LTP/LTB and SUS 316 LTP/LTB shall be 0.035% or less.

2. Those with an asterisk (*) having either a small diameter (i.e., outside diameter less than 0.5 in or 12.70 mm) or a thin wall (i.e., average wall thickness less than 0.049 in or 12.40 mm) or minimum wall thickness (less than 0.044 in or 1.12 mm) and requiring several drawings, shall have carbon content of 0.04% or less.

Pipes

All stainless steel pipes and tubes for piping, boilers and heat exchangers subjected to solution heat treatment as follows.

Symbol		Solution Heat Treatment	
For piping	For boilers and heat exchangers	Heat temperature (°C)	Cooling method
SUS 304 TP	SUS 304 TB	1010°C min.	Rapid cooling
SUS 304L TP	SUS 304L TB	1010°C min.	Rapid cooling
SUS 321 TP	SUS 321 TB	920°C min.	Rapid cooling
SUS 316 TP	SUS 316 TB	1010°C min.	Rapid cooling
SUS 316L TP	SUS 316L TB	1010°C min.	Rapid cooling
SUS 309S TP	SUS 309S TB	1030°C min.	Rapid cooling
SUS 310S TP	SUS 310S TB	1030°C min.	Rapid cooling
SUS 321H TP	SUS 321H TB	1095°C min.	Rapid cooling
TP 304		1040°C min.	Rapid cooling
TP 304L		1040°C min.	Rapid cooling
TP 321		1040°C min.	Rapid cooling
TP 316		1040°C min.	Rapid cooling
TP 316L		1040°C min.	Rapid cooling
TP 309		1040°C min.	Rapid cooling
TP 310		1040°C min.	Rapid cooling
TP 321H		1095°C min.	Rapid cooling

Symbol	Tension test				Flattening test	Flaring test	Reverse flattening test
	Tensile strength (kg/mm²)	Yield strength (kg/mm²)	Elongation (%) Longitudinal	Elongation (%) Transverse			
SUS 304TP/TB TP 304	53 min.	21 min.	35 min.	25 min.	$H = \frac{(1 + e)\,t}{e + \frac{t}{D}}$ where, H = Distance between flattening plates (mm) t = Wall thickness (mm) D = Outside diameter (mm) e = 0.09 (constant) Note: Welded section shall be affixed at an angle 90° to the direction of compression.	1.2 D (D = Outside diameter (mm))	When flattenned reversely, no cracks or breaks shall occur on its welded section. 
SUS 304LTP/LTB TP 304L	49 min.	18 min.	35 min.	25 min.			
SUS 321TP/TB TP 321	53 min.	21 min.	35 min.	25 min.			
SUS 316TP/TB TP 316	53 min.	21 min.	35 min.	25 min.			
SUS 316LTP/LTB TP 316L	49 min.	28 min.	35 min.	25 min.			
SUS 309STP/STB TP 309	53 min.	21 min.	35 min.	25 min.			
SUS 310STP/STB TP 310S	53 min.	21 min.	35 min.	25 min.			
SUS 321HTP/HTB TP 321H	53 min.	21 min.	35 min.	25 min.			

Notes:

1. Tensile strength shall not be measured unless specifically requested.
2. Flaring test and reverse flattening test shall be conducted only on tubes for boilers and heat exchanger.

Pipes

JIS	AISI	Characteristics	Uses
SUS 304	TP 304	Most widely used stainless steel. Because of its nickel content, it has excellent corrosion and heat resistance, strength under low temperature and improved mechanical properties. It has work hardening characteristic, and hardening by heat treatment is impossible. Has no magnetism.	Home appliances and kitchen utensils, architectural ornaments, vehicles, auto parts, medical equipment, and various applications in the food, chemical, and textile industries.
SUS 304L	TP 304L	Ni-Cr steel with extremely low carbon content. Although its degree of corrosion resistance under normal conditions is similar to that of SUS 304, it has greater resistance against intergranular corrosion after welding or stress-relief heat treatment. Has no magnetism.	Parts and structures in the chemical, petroleum, coal and pharmaceutical industries to which heat treatment is difficult to apply. Normally used at temperatures below 400°C.
SUS 321	TP 321	Excellent corrosion resistance. Other properties are similar to those of SUS 304. The resistance to intergranular corrosion is improved by addition of 18-8 type. It has no magnetism, and it is especially suited for use at temperatures between 430°C - 900°C. Though having no magnetism in annealed state, it becomes slightly magnetized by cold working.	Exhaust pipes of aircraft engines, boilers, jet engine parts, heating furnance parts, and other parts used in the chemical industry to which heat treatment after welding is difficult to apply.
SUS 316	TP 316	Substantial amounts of nickel and chromium content greatly improve heat and corrosion resistance. Work hardening characteristic but not magnetism.	Various uses in the chemical, food, photographic, textile, paper and pulp industries. Especially suited for exterior of structures located near coastal areas.
SUS 316L	TP 316L	Nickel-chromium steel containing molybdemun and an extremely small amount of carbon. Physical properties are similar to those of SUS 316. Excellent resistance against intergranular corrosion after welding or stress-relief heat treatment. Has no magnetism.	Typical applications similar to those of SUS 316. For machine parts and equipment which are not easily subjected to heat treatment after welding. Especially suited for use at temperatures below 420°C.
SUS 309S SUS 310S	TP 309 TP 310	Substantial amount of nickel and chromium content greatly improve heat and corrosion resistance.	Jet engine parts, tanks for chemicals, combustion apparatus parts, boilers, and gasturbine parts.

Pipes (Seamless/Welded)

Dimension and Weight

ASTM A312 TP 304/304L/316/316L/321/317/347/310, ETC. **ANSI-B36.19**

N.B.	Outside Diameter		SCH5S			SCH10S		
	inch	mm	Thick mm	Thick mm	Weight kg/m	Thick inch	Thick mm	Weight kg/m
1/8"	0.405	10.29	--	--	--	0.049	1.24	0.277
1/4"	0.54	13.72	--	--	--	0.065	1.65	0.491
3/8"	0.675	17.15	--	--	--	0.065	1.65	0.631
1/2"	0.84	21.34	0.065	1.65	0.801	0.083	2.11	1.00
3/4"	1.05	26.67	0.065	1.65	1.02	0.083	2.11	1.28
1"	1.315	33.40	0.065	1.65	1.29	0.109	2.77	2.09
1 1/4"	1.66	42.16	0.065	1.65	1.65	0.109	2.77	2.69
1 1/2"	1.90	48.26	0.065	1.65	1.90	0.109	2.77	3.11
2"	2.375	60.33	0.065	1.65	2.39	0.109	2.77	3.93
2 1/2"	2.875	73.03	0.083	2.11	3.69	0.12	3.05	5.26
3"	3.50	88.90	0.083	2.11	4.52	0.12	3.05	6.46
3 1/2"	4.00	101.60	0.083	2.11	5.18	0.12	3.05	7.41
4"	4.50	114.30	0.083	2.11	5.84	0.12	3.05	8.37
5"	5.563	141.30	0.109	2.71	9.46	0.134	3.40	11.60
6"	6.625	168.28	0.109	2.77	11.30	0.134	3.40	13.80
8"	8.625	219.08	0.109	2.77	14.80	0.148	3.76	20.00
10"	10.75	273.05	0.134	3.40	22.60	0.165	4.19	27.80
12"	12.75	323.85	0.156	3.96	31.20	0.18	4.57	36.00
14"	14.00	355.60	0.156	3.96	34.30	0.188	4.78	41.40
16"	16.00	406.40	0.165	4.19	41.60	0.188	4.78	47.30
18"	18.00	457.20	0.165	4.19	46.80	0.188	4.78	53.30
20"	20.00	508.00	0.188	4.78	59.30	0.218	5.54	68.60
22"	22.00	558.80	0.188	4.78	65.30	0.218	5.54	75.60
24"	24.00	609.60	0.218	5.54	82.50	0.25	6.36	94.50
30"	30.00	762.00	0.25	6.36	118.30	0.312	7.92	147.30

ASTM A312 TP 304/304L/316/316L/321/317/347/310, ETC. **ANSI-B36.19**

N.B.	Outside Diameter		SCH40S			SCH80S		
	inch	mm	Thick mm	Thick mm	Weight kg/m	Thick inch	Thick mm	Weight kg/m
1/8"	0.405	10.29	0.068	1.73	0.365	0.095	2.41	0.468
1/4"	0.54	13.72	0.088	2.24	0.634	0.119	3.02	0.797
3/8"	0.675	17.15	0.091	2.31	0.845	0.126	3.20	1.10
1/2"	0.84	21.34	0.109	2.77	1.27	0.147	3.73	1.62
3/4"	1.05	26.67	0.113	2.87	1.68	0.154	3.91	2.19
1"	1.315	33.40	0.133	3.38	2.50	0.179	4.55	3.42
1 1/4"	1.66	42.16	0.14	3.56	3.39	0.191	4.85	4.46
1 1/2"	1.90	48.26	0.146	3.68	4.05	0.20	5.08	5.41
2"	2.375	60.33	0.154	3.91	5.44	0.218	5.54	7.49
2 1/2"	2.875	73.03	0.203	5.61	8.64	0.276	7.01	11.40
3"	3.50	88.90	0.216	5.49	11.30	0.30	7.62	15.30
3 1/2"	4.00	101.60	0.226	5.74	13.60	0.318	8.08	18.60
4"	4.50	114.30	0.237	6.02	16.10	0.337	8.56	22.30
5"	5.563	141.30	0.258	6.55	21.80	0.375	9.25	30.90
6"	6.625	168.28	0.28	7.11	28.30	0.432	10.97	42.60
8"	8.625	219.08	0.322	8.18	42.50	0.50	12.70	64.60
10"	10.75	273.05	0.365	9.27	60.30	0.50	12.70	81.50
12"	12.75	323.85	0.375	9.52	73.80	0.50	12.70	97.40
14"	14.00	355.60	--	--	--	--	--	--
16"	16.00	406.40	--	--	--	--	--	--
18"	18.00	457.20	--	--	--	--	--	--
20"	20.00	508.00	--	--	--	--	--	--
22"	22.00	558.80	--	--	--	--	--	--
24"	24.00	609.60	--	--	--	--	--	--
30"	30.00	762.00	--	--	--	--	--	--

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