Tube Information

Proper tubing selection is essential to the performance of a tubing system. Consider a system's pressure, flow, temperature, environment and compatibility with the process fluids when choosing the tubing material, size and wall thickness.

Wall Thickness

The wall thickness selction should be based on the operating pressure, temperature and shock conditions. Fully annealed tubing is recommended Stainless Steel Tubing having a hardness of less than Rockwell Rb90 should be used.

Cold Drawn Tube A213 and A271 O.D 1-1/2" and under	Over 20%	Under 0%
Cold Drawn Tube A269 O.D Less than 1/2" 1/2" to less than 8"	Over and Under 15% Over and Under 10%	
Cold Drawn Pipe A312 and A376 O.D All size		Under 12.5%

Seamless Stainless Steel Tubes

Grades in regular production to ASTM A269 : TP304, TP304L, TP316, TP316L, TP321, TP347.
Grades in regular production to ASTM A213 : As stated for A269 plus TP304H, TP316H, TP321H, TP347H, TP310S.
Other grades available on application.

The weights shown in this table theoretical and provided only as a guide.

Cold drawn

Outside diameter		SWG gauge wall thickness								BWG gauge wall thickness							
		22	20	18	16	14	12	11	10	22	20	18	16	14	12	11	10
		mm 0.711 inches 0.028	mm 0.914 inches 0.036	mm 1.219 inches 0.048	mm 1.626 inches 0.064	mm 2.032 inches 0.080	mm 2.642 inches 0.104	mm 2.946 inches 0.116	mm 3.251 inches 0.128	mm 0.711 inches 0.028	mm 0.889 inches 0.035	mm 1.245 inches 0.049	mm 1.651 inches 0.065	mm 2.108 inches 0.083	mm 2.769 inches 0.109	mm 3.048 inches 0.120	mm 3.404 inches 0.134
inches	mm	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m	kg/ft kg/m
1/4 .250	6.350	0.030 0.100	0.038 0.124	0.047 0.156	0.058 0.191	0.067 0.219				0.030 0.100	0.037 0.121	0.048 0.158	0.059 0.193	0.068 0.223			
5/16 .313	7.938	0.039 0.128	0.049 0.160	0.062 0.204	0.078 0.256	0.091 0.300	0.106 0.349			0.039 0.128	0.048 0.156	0.063 0.208	0.079 0.259	0.094 0.307			
3/8 .375	9.525	0.048 0.156	0.060 0.196	0.077 0.252	0.098 0.320	0.116 0.379	0.138 0.453	0.147 0.483		0.048 0.156	0.058 0.191	0.078 0.257	0.099 0.324	0.119 0.389	0.142 0.466	0.150 0.492	
1/2 .500	12.700	0.065 0.212	0.082 0.268	0.106 0.349	0.137 0.449	0.165 0.540	0.202 0.662	0.218 0.716	0.233 0.765	0.065 0.212	0.080 0.262	0.108 0.355	0.139 0.454	0.170 0.556	0.209 0.685	0.223 0.733	0.240 0.788
5/8 .625	15.875	0.082 0.269	0.104 0.341	0.136 0.445	0.178 0.578	0.214 0.701	0.265 0.871	0.289 0.949	0.312 1.02	0.082 0.269	0.101 0.332	0.138 0.454	0.178 0.585	0.220 0.723	0.276 0.904	0.297 0.974	0.322 1.06
3/4 .750	19.050	0.099 0.325	0.126 0.413	0.165 0.541	0.215 0.706	0.263 0.861	0.329 1.08	0.360 1.18	0.390 1.28	0.099 0.325	0.123 0.402	0.168 0.552	0.218 0.716	0.271 0.890	0.342 1.12	0.370 1.21	0.404 1.33
7/8 .875	22.225	0.116 0.381	0.148 0.485	0.194 0.638	0.254 0.834	0.312 1.02	0.393 1.29	0.431 1.41	0.468 1.54	0.116 0.381	0.144 0.472	0.198 0.651	0.258 0.846	0.322 1.06	0.409 1.34	0.444 1.46	0.486 1.60
1 1.000	25.400	0.133 0.437	0.170 0.557	0.224 0.734	0.294 0.963	0.361 1.18	0.457 1.50	0.502 1.65	0.547 1.79	0.133 0.437	0.165 0.543	0.228 0.750	0.298 0.977	0.373 1.22	0.478 1.56	0.517 1.70	0.568 1.87

Stainless Steel Seamless Tube

Chemical Composition & Mechanical Property

Spec			Chemical Composttion (%)								
KS	ASTM	JIS	C	Si	Mn	P (max)	S (max)	Ni	Cr	Mo	OTHERS
STS304TB		SUS304TB	≦ .08	≦1.00	≦2.00	.040	.030	8.00~11.00	18.00~20.00	-	-
	TP304		≦.080	≦ .75	≦2.00	.040	.030	8.00~11.00	18.00~20.00	-	-
STS304LTB		SUS304LTB	≦.030	≦1.00	≦2.00	.040	.030	9.00~13.00	18.00~20.00	-	-
	TP304L		≦.035	≦ .75	≦2.00	.040	.030	8.00~13.00	18.00~20.00	-	-
STS309TB		SUS309TB	≦. 15	≦1.00	≦2.00	.040	.030	12.00~15.00	22.00~24.00	-	-
STS310TB		SUS310TB	≦. 15	≦1.50	≦2.00	.040	.030	19.00~22.00	24.00~26.00	-	-
STS316TB		SUS316TB	≦. 08	≦1.00	≦2.00	.040	.030	10.00~14.00	16.00~18.00	2.00~3.00	-
	TP316		≦. 08	≦ .75	≦2.00	.040	.030	11.00~14.00	16.00~18.00	2.00~3.00	-
STS316HTB	TP316H	SUS316HTB	.04~.10	≦ .75	≦2.00	.030	.030	11.00~14.00	16.00~18.00	2.00~3.00	-
STS316LTB		SUS316LTB	≦.030	≦1.00	≦2.00	.040	.030	12.00~16.00	16.00~18.00	2.00~3.00	-
	TP316L		≦.035	≦ .75	≦2.00	.040	.030	10.00~15.00	16.00~18.00	2.00~3.00	-
STS321TB		SUS321TB	≦ .08	≦1.00	≦2.00	.040	.030	9.00~13.00	17.00~19.00	-	Ti : 5×C% OVER
	TP321		≦ .08	≦ .75	≦2.00	.040	.030	9.00~13.00	17.00~20.00	-	-
STS347TB		SUS347TB	≦ .08	≦1.00	≦2.00	.040	.030	9.00~13.00	17.00~19.00	-	Nb10×C% OVER
	TP347		≦ .08	≦ .75	≦2.00	.040	.030	9.00~13.00	17.00~20.00	-	-
STS347HTB		SUS347HTB	.04~.10	≦1.00	≦2.00	.030	.030	9.00~13.00	17.00~20.00	-	Nb8×C%~1.0
STS410TB		SUS410TB	≦ .15	≦1.00	≦1.00	.040	.030	≦ .60	11.50~13.50	-	-
STS430TB		SUS430TB	≦ .12	≦ .75	≦1.00	.040	.030	≦ .60	16.00~18.00	-	-
STS304TP		SUS304TP	≦ .08	≦1.00	≦2.00	.040	.030	8.00~11.00	18.00~20.00	-	-
	TP304		≦ .08	≦ .75	≦2.00	.040	.030	8.00~11.50	18.00~20.00	-	-
STS304HTP	TP304H	SUS304HTP	.04~.10	≦ .75	≦2.00	.040	.030	8.00~11.00	18.00~20.00	-	-
STS304LTP		SUS304LTP	≦ .03	≦1.00	≦2.00	.040	.030	9.00~13.00	18.00~20.00	-	-
	TP304L		≦.035	≦ .75	≦2.00	.040	.030	8.00~13.00	18.00~20.00	-	-
STS309TP		SUS309TP	≦ .15	≦1.00	≦2.00	.040	.030	12.00~15.00	22.00~24.00	-	-
STS310TP		SUS310TP	≦ .15	≦1.50	≦2.00	.040	.030	19.00~22.00	24.00~26.00	-	-
STS316TP		SUS316TP	≦ .08	≦1.00	≦2.00	.040	.030	10.00~14.00	16.00~18.00	2.00~3.00	-
	TP316		≦ .08	≦ .75	≦2.00	.040	.030	12.00~14.00	16.00~18.00	2.00~3.00	-
STS316HTP		SUS316HTP	.04~.10	≦ .75	≦2.00	.030	.030	11.00~14.00	16.00~18.00	2.00~3.00	-
STS316LTP		SUS316LTP	≦.030	≦1.00	≦2.00	.040	.030	12.00~16.00	16.00~18.00	2.00~3.00	-
	TP316L		≦.035	≦ .75	≦2.00	.040	.030	10.00~15.00	16.00~18.00	2.00~3.00	-
STS321TP		SUS321TP	≦ .08	≦1.00	≦2.00	.040	.030	9.00~13.00	18.00~19.00	-	Ti : 5×C% OVER
	TP321		≦ .08	≦ .75	≦2.00	.040	.030	9.00~13.00	17.00~20.00	-	-
STS329JITP		SUS329JITP	≦ .08	≦1.00	≦1.50	.040	.030	3.00~ 6.00	23.00~28.00	1.00~3.00	-
STS347TP		SUS347TP	≦ .08	≦1.00	≦2.00	.040	.030	9.00~13.00	17.00~19.00	-	No10×C% OVER
	TP347		≦ .08	≦ .75	≦2.00	.040	.030	9.00~13.00	17.00~20.00	-	-
STS347HTP		SUS347HTP	.04~.10	≦1.00	≦2.00	.030	.030	9.00~13.00	17.00~20.00	-	No8×C%~1.0
	TP347H		.04~.10	≦ .75	≦2.00	.040	.030	9.00~13.00	17.00~20.00	-	-

Mechanical Property					Remark
Tensile Strength		Yield Strength		Elongation(%)	
kg/mm²	N/mm²	kg/mm²	N/mm²	(Min)	
53	520	21	205	35	
49	480	18	175	35	
53	520	21	205	35	
53	520	21	205	35	
53	520	21	205	35	
53	520	21	205	35	
49	480	18	175	35	
53	520	21	205	35	
53	520	21	205	35	
53	520	21	205	35	
42	410	21	205	20	
42	410	25	245	20	
53	520	21	205	35	
53	520	21	205	35	
49	480	18	175	35	
53	520	21	205	35	
53	520	21	205	35	
53	520	21	205	35	
53	520	21	205	35	
49	480	18	175	35	
53	520	21	205	35	
60	590	40	390	18	
53	520	21	205	35	
53	520	21	205	35	

Weight Table for Metric Tube

(ASTM A-269, A-213)

SIZE O.D × W.T	WEIGHT (kg/M)
★ 6 × 1	0.125
6 × 1.5	0.169
★ 8 × 1	0.175
8 × 1.5	0.244
8 × 2	0.301
★ 10 × 1	0.226
10 × 1.5	0.320
10 × 2	0.401
★ 12 × 1	0.276
12 × 1.5	0.395
12 × 2	0.501
14 × 1	0.326
14 × 2	0.602
15 × 1	0.351
★ 15 × 1.5	0.508
15 × 2	0.652
16 × 1	0.376
★ 16 × 1.5	0.545
16 × 2	0.702
16 × 2.5	0.846
18 × 1	0.426
★ 18 × 1.5	0.620
18 × 2	0.802
18 × 3	1.128
20 × 1.5	0.696
★ 20 × 2	0.903
20 × 2.5	1.097
20 × 3	1.278
22 × 1	0.526
22 × 1.5	0.771
★ 22 × 2	1.003
25 × 1.5	0.884
★ 25 × 2	1.153
★ 25 × 2.5	1.410
25 × 3	1.655

Cold drawn.
The weights shown in this table theoretical
and provided only as a guide.

★ Stock Available.

Stainless Steel Tubing

Fully annealed high quality(Type 304, 316, etc.) (Seamless or Welded and drawn)
Stainless Steel hydraulic tubing ASTM A-269 or A-213 or equivalent.
Hardness/equal Rb80 or less
Tubing free of scratches, suitable for bending and flaring.

Tube O.D (inch)	TUBE WALL THICKNESS (inches)												
	.010	.012	0.14	.016	.020	.028	.035	.049	.065	.083	.095	.109	.120
1/16	5600	6800	8100	9400	12000								
1/8						8500	10900			For Seamless Tubing			
3/16						5400	7000	10200					
1/4						4000	5100	7500	10200				
5/16							4000	5800	8000				
3/8							3300	4800	6500				
1/2							2400	3500	4700	6200			
5/8								2900	4000	5200	6000		
3/4								2400	3300	4200	4900	5800	
7/8								2000	2800	3600	4200	4800	
1									2400	3100	3600	4200	4700

ALLOWABLE STRESS= 19,500 psi between-20° F and 100°F
Safety Factor=4 considering tensile strength to be 75,000 psi at room temperature

working pressure(psi)

FACTORS USED TO DETERMINE
TUBING PRESSURE RATING AT
ELEVATED TEMPERATURES.

°F	°C	Copper	304SS	316SS	Monel
200	93	0.80	1.00	1.00	0.88
400	204	0.50	0.93	0.96	0.79
600	316	···	0.82	0.85	0.79
800	427	···	0.76	0.79	0.76
1000	538	···	0.69	0.76	···
1200	649	···	0.30	0.37	···

To determine maximum allowable working pressure at elevated temperatures, multiply working pressure from above Tables

Example :

Type 316 Stainless Steel 1/2" O.D.×0.035" wall at 1000°F 2400psi×.76=1824psi.

Allowable working pressure for 1/2" O.D.×.35" wall type 316 stainless steel tubing is therefore 1824 psi at 1000°F

Copper Tubing

High quality soft annealed seamless copper tubing ASTM B-75 or equivalent.

Tube O.D. (inch)	TUBE WALL THICKNESS (inches)							
	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
1/8	2700	3600						
3/16	1800	2300	3400					
1/4	1300	1600	2500	3500				
5/16		1300	1900	2700				
3/8		1000	1600	2200				
1/2		800	1100	1600	2100			
5/8			900	1200	1600	1900		
3/4			700	1000	1300	1500	1800	
7/8			600	800	1100	1300	1500	
1			500	700	900	1100	1300	1500

ALLOWABLE STRESS= 6,500 psi between-20° F and 100°F
Safety Factor= 5 considering tensile strength to be 30,000 psi at room temperature

working pressure(psi)