

Tubing Usage Guide



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Tubing Selection

When TMP Series and TCT Series tubing (hereinafter referred to as Tubing) are paired with FITOK double ferrule tube fittings (hereinafter referred to as Tube Fittings), proper selection, handling, and installation of tubing are essential to ensure a reliable tubing system.

The following variables should be considered when ordering tubing for use with FITOK tube fittings:

- ① Material
- ① Hardness
- ① Wall thickness
- ① Surface finish

Material

Our suggested ordering instructions for each type of tubing are shown under the respective tables.

Hardness

The key to selecting proper tubing for use with metal FITOK tube fittings is that the tubing must be softer than the fitting material. FITOK tube fittings are designed to work properly with the tubing that is suggested in the ordering instructions. The table below provides the chemical composition and mechanical properties of some tubing in typical materials.

Composition and Properties														
UNS	Grade	ASTM Standard	FITOK Designator	Composition %							Mechanical Properties			
				C	Cr	Ni	Mo	Cu	Ti	Others	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness
S31600/ S31603	316/316L	A269	SS	≤0.035 ^①	16-18	10-14	2.0-3.0	-	-	-	≥205	≥515	≥35	≤80 HRB
Enhanced-S31600/ S31603	Enhanced-316/316L		SH	≤0.030	17-18	12-14	2.6-3.0							
S30400/ S30403	304/304L		S4	≤0.035 ^①	18-20	8-11	-							
N08904	904L	A269	904L	≤0.02	19-23	23-28	4.0-5.0	1.0-2.0	-	N	≥490	≥215		
S31254	6Mo	A269	S12	≤0.02	19.5-20.5	17.5-18.5	6.0-6.5	-	-	-	≥310	≥675	≥35	≤96 HRB
S32750	2507	A789	D7	≤0.03	24-26	6-8	3.0-5.0	≤0.5	-	N	≥550	≥800	≥15	≤32 HRC
N04400	Alloy 400	B165	M	≤0.30	-	≥63	-	28.0-34.0	-	-	≥195	≥480	≥35	≤75 HRB
N08020	Alloy 20	B729	A20	≤0.07	19-21	32-38	2.0-3.0	3.0-4.0	-	Nb,Ta	≥240	≥550	≥30	≤95 HRB
N06600	Alloy 600	B167	INC	≤0.15	14-17	≥72	-	≤0.5	-	-	≥205	≥550	≥35	≤92 HRB
N06625	Alloy 625	B444	A65	≤0.10	20-23	≥58	8.0-10.0	-	0.4	Cb,Ta	≥276	≥690	≥30	≤25 HRC
N08825	Alloy 825	B423	A85	≤0.05	19.5-23.5	38-46	2.5-3.5	1.5-3.0	1.6-1.2	-	≥241	≥586	≥30	≤201 HV
N10276	Alloy C-276	B622	HC	≤0.01	14.5-16.5	BAL	15.0-17.0	-	-	W	≥283	≥690	≥40	≤100 HRB
C12200	C12200	B75	CU	-	-	-	-	≥99.90	-	P	≥62	≥205	-	-
R50400	Ti Gr2	B338	TI2	≤0.08	-	-	-	-	-	-	275-450	≥345	≥20	-

① The carbon content of tubing with outside diameter smaller than 1/2" or wall thickness smaller than 0.049" is allowed up to 0.04%.

Wall Thickness

The accompanying tables show working pressure of tubing in a wide range of wall thicknesses. Allowable working pressures are calculated from S values as specified by ASME B31.3, Process Piping. FITOK tube fittings have been repeatedly tested in both the minimum and maximum wall thicknesses shown. FITOK tube fittings are not recommended for tube wall thicknesses outside the ranges shown in the accompanying tables for each size.

Tubing Surface Finish

Many ASTM specifications cover the above requirements, but they often are not very detailed on surface finish. For example, ASTM A450, a general tubing specification, it is specified as below:

12. Straightness and Finish

12.1 Finished tubes shall be reasonably straight and have smooth ends free of burrs. They shall have a workmanlike finish. Surface imperfections (Note) may be removed by grinding, provided that a smooth curved surface is maintained, and the wall thickness is not decreased to less than that permitted by this or the product specification. The outside diameter at the point of grinding may be reduced by the amount so removed.

A good finish of FITOK tubing is guaranteed by the mechanically polished external surface and scale-free internal surface.

Note: An imperfection is any discontinuity or irregularity found in the tube.

Tubing Handling

It is important to properly handle the tubing in order to reduce the scratches and protect the surface finish.

- ⦿ Tubing should never be dragged out of a tubing rack or across a rough surface.
- ⦿ Tube cutters or hacksaws should be sharp. Do not take deep cuts with each turn of the cutter or stroke of the saw.
- ⦿ Removing burrs on the tube end which will be helpful for the tubing to go through the ferrules without damaging the ferrule sealing edge.

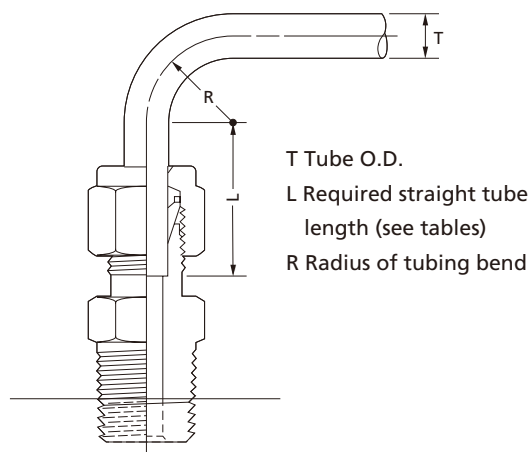
Gas Service

Gases (air, hydrogen, helium, nitrogen, etc.) have very small molecules that can escape through even the most minute leak path. Some surface defects on the tubing can provide such a leak path. As tube outside diameter (O.D.) increases, so does the likelihood of a scratch or other surface defect interfering with proper sealing.

The most successful connection for gas service will occur if all installation instructions are carefully followed and the heavier wall thicknesses of tubing on the accompanying tables are selected.

A heavy-wall tube resists ferrule action more than a thin-wall tube, allowing the ferrules to coin out minor surface imperfections and grip the tube more firmly. Within the applicable suggested allowable working pressure table, select a tube wall thickness whose working pressure is outside of the shaded areas.

Tubing Installation



Tubing properly selected and handled, combined with properly installed FITOK tube fittings, will give you a leaktight system and provide reliable service in a wide variety of applications.

When installing fittings near tube bends, there must be a sufficient straight length of tubing to allow the tubing to be bottomed in the FITOK fitting (see tables).

For maximum assurance of reliable performance, FITOK tube fittings shall be assembled in accordance with catalog instructions, and use properly selected and handled high-quality tubing—such as provided by FITOK.

Fractional, in.	
T Tube O.D.	L Required straight tube length.
1/16	1/2
1/8	23/32
3/16	3/4
1/4	13/16
5/16	7/8
3/8	15/16
1/2	1 3/16
5/8	1 1/4
3/4	
7/8	1 5/16
1	1 1/2
1 1/4	2
1 1/2	2 13/32
2	3 1/4

Metric, mm	
T Tube O.D.	L Required straight tube length.
3	19
6	21
8	23
10	25
12	31
14	32
15	
16	
18	34
20	
22	40
25	
28	46
30	50
32	54
38	63
50	80

Hydraulic Presetting Tools

A FITOK hydraulic presetting tool must be used to install FITOK tube fittings over 1 in. (25 mm). For tube fittings in 1 1/4, 1 1/2, and 2 in. (28, 30, 32, 38, and 50 mm), a presetting tool can be used to preset ferrules onto the tubing tightly. For more information about installation instructions, please contact FITOK or our authorized distributors.

Suggested Allowable Working Pressure for Tubing

Figures and tables are for reference only. No implication is made that these values can be used for design work. Applicable codes and practices in industry should be considered. ASME Codes are the successor to and replacement of ASA Piping Codes.

- ⦿ All pressures are calculated from equations in ASME B31.3, Process Piping. See factors for calculating working pressures in accordance with ASME B31.1, Power Piping.
- ⦿ Calculations are based on maximum O.D. and minimum wall thickness, except as noted in individual tables.
Example: " in. O.D. x 0.035 in. wall thickness stainless steel tubing according to ASTM A269:
O.D. Tolerance ± 0.005 in. / Wall Thickness Tolerance $\pm 10\%$
Calculations are based on 0.505 in. O.D. x 0.0315 in. wall thickness tubing.
- ⦿ No allowance is made for corrosion or erosion.

Enhanced-316/316L, 316/316L and 304/304L Stainless Steel Tubing

Fractional Seamless Tubing

Allowable working pressures are calculated from an S value of 20 000 psig (137.8 MPa) for ASTM A269 tubing at -20 to 100°F (-28 to 37°C), as listed in ASME B31.3 and ASME B31.1.

For Welded Tubing

For welded and drawn tubing, a derating factor must be applied for weld integrity:

- ⦿ For double-welded tubing, multiply working pressure by 0.85.
- ⦿ For single-welded tubing, multiply working pressure by 0.80.

Tube O.D. (in.)	Tube Wall Thickness, in.															
	0.010	0.012	0.014	0.016	0.020	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120	0.134	0.156	0.188
	Working Pressure, psig															
1/16	5600	6800	8100	9400	12000											
1/8						8500	10900									
3/16						5400	7000	10200								
1/4						4000	5100	7500	10200							
5/16							4000	5800	8000							
3/8							3300	4800	6500	7500						
1/2							2600	3700	5100	6700						
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			
1 1/4										2400	2800	3300	3600	4100	4900	
1 1/2											2300	2700	3000	3400	4000	4900
2												2000	2200	2500	2900	3600

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Table 2—Metric Seamless Tubing

Tube O.D. (mm)	Tube Wall Thickness, mm													
	0.8	1.0	1.2	1.5	1.8	2.0	2.2	2.5	2.8	3.0	3.5	4.0	4.5	5.0
	Working Pressure, bar													
3	670													
6	310	420	540	710										
8		310	390	520										
10		240	300	400	510	580								
12		200	250	330	410	470								
14		160	200	270	340	380	430							
15		150	190	250	310	360	400							
16			170	230	290	330	370	400						
18			150	200	260	290	320	370						
20			140	180	230	260	290	330	380					
22			140	160	200	230	260	300	340					
25					180	200	230	260	290	320				
28						180	200	230	260	280	330			
30						170	180	210	240	260	310			
32						160	170	200	220	240	290	330		
38							140	160	190	200	240	270	310	
50										150	180	210	240	270

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, fully annealed (Type 304/304L, 316/316L, Enhanced-316/316L) (seamless or welded and drawn) stainless steel hydraulic tubing, ASTM A269 or A213, or equivalent. Hardness not to exceed 80 HRB. Tubing to be free of scratches, suitable for bending and flaring.

Note: Certain austenitic stainless tubing has an allowable ovality tolerance double the O.D. tolerance and may not fit into FITOK precision tube fittings.

904L Tubing

Allowable working pressures are calculated from an S value of 20,700 psi (143 MPa) for ASTM A269 annealed seamless tubing at -20 to 100°F (-28 to 37°C), as listed in ASME B31.3 and ASME B31.1.

Table 3 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.			
	0.035	0.049	0.065	0.083
	Working Pressure, psig			
1/4	5200	7600	10500	
3/8		4800	6600	
1/2		3700	5100	6700

Table 4 — Metric

Tube O.D. (mm)	Tube Wall Thickness, mm		
	1.0	1.2	1.5
	Working Pressure, bar		
10	250	300	390
12	200	250	320

Suggested Ordering Information

ASTM A269-compliant, fully annealed 904L stainless steel tubing or an equivalent alternative with a maximum hardness of 80 HRB. The tubing must be free of scratches and suitable for bending and flaring.

6 Mo Tubing

Allowable working pressures are calculated from an S value of 27100 psig (186.8 MPa) for ASTM A269 tubing at -20 to 100°F (-28 to 37°C), as listed in ASME B 31.3 and ASME B31.1.

Table 5 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.			
	0.028	0.035	0.049	0.065
	Working Pressure, psig			
1/4	5400	6900	10100	13900
3/8		4500	6500	8900
1/2		3500	5000	6900

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Table 6 — Metric

Tube O.D. (mm)	Tube Wall Thickness, mm				
	0.8	1	1.2	1.5	1.8
	Working Pressure, bar				
6	430	580	740	980	
8		420	530	710	
10		330	420	550	700
12		270	340	450	570

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, fully annealed S31254 tubing, ASTM A269 or equivalent. Hardness not to exceed 96 HRB. Tubing to be free of scratches, suitable for bending and flaring. O.D. tolerances not to exceed ± 0.005 in (± 0.13 mm).

Super Duplex 2507 Tubing

Allowable working pressures are calculated from an S value of 38 700 psig (266.8 MPa) for ASTM A789 tubing at -20 to 100°F (-28 to 37°C), as listed in ASME B31.3.

Table 7 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.				
	0.035	0.049	0.065	0.083	0.095
	Working Pressure, psig				
1/4	10000	15000			
3/8	6500	10100	12700		
1/2	5000	7200	10100	12900	
5/8		5800	7600	10100	
3/4		4700	6300	8500	10000

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, fully annealed super duplex 2507 tubing, ASTM A789 or equivalent. Hardness not to exceed 32 HRC. Tubing to be free of scratches, suitable for bending and flaring.

Alloy 400 Tubing

Allowable working pressures are calculated from an S value of 18 700 psig (128.9 MPa) for ASTM B165 tubing at -20 to 100°F (-28 to 37°C), as listed in ASME B31.3 and ASME B31.1.

Table 8 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.							
	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
	Working Pressure, psig							
1/8	7900	10100						
1/4	3700	4800	7000	9500				
5/16		3700	5400	7300				
3/8		3100	4400	6100				
1/2		2300	3200	4400				
3/4			2200	3000	4000	4600		
1				2200	2900	3400	3900	4300

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Table 9 — Metric

Tube O.D. (mm)	Tube Wall Thickness, mm									
	0.8	1.0	1.2	1.5	1.8	2.0	2.2	2.5	2.8	3.0
	Working Pressure, bar									
6	310	390	490	620						
8		290	350	450						
10		220	280	350						
12		180	230	290						
14		160	190	240	270					
18			150	200	240	270	300			
20				180	210	240	270	290		
25					170	190	210	240	270	290

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, fully annealed seamless alloy 400 hydraulic tubing, ASTM B165 or equivalent. Hardness not to exceed 75 HRB. Tubing to be free of scratches, suitable for bending and flaring. O.D. tolerances not to exceed ± 0.005 in (± 0.13 mm).

Alloy 20 Tubing

Allowable working pressures are calculated from an S value of 20 000 psi (137.8 MPa) for ASTM B729 tubing at 20 to 100°F (-28 to 37°C), as listed in ASME B31.3 and ASME B31.1.

Table 10 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.			
	0.028	0.035	0.049	0.065
	Working Pressure, psig			
1/4	4000	5100	7500	10200
3/8		3300	4800	6500
1/2		2600	3700	5100

Note:For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, fully annealed seamless or welded and drawn alloy 20 tubing, ASTM B729, B468 or equivalent. Hardness not to exceed 95 HRB. Tubing to be free of scratches, suitable for bending and flaring. O.D. tolerances not to exceed ± 0.005 in (± 0.13 mm).

Table 11 — Metric

Tube O.D. (mm)	Tube Wall Thickness, mm			
	0.8	1.0	1.2	1.5
	Working Pressure, bar			
6	310	420	520	670
10		240	300	380
12		200	240	310

Note:For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Alloy 600 Tubing

Allowable working pressures are calculated from an S value of 20 000 psi (137.8 MPa) for ASTM B167 tubing at 20 to 100°F (-28 to 37°C), as listed in ASME B31.3 and ASME B31.1.

Table 12 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.			
	0.028	0.035	0.049	0.065
	Working Pressure, psig			
1/4	4000	5100	7500	10200
3/8		3300	4800	6500
1/2		2600	3700	5100

Note:For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, fully annealed, cold drawn #1 temper alloy 600 seamless alloy tubing, ASTM B167 or equivalent. Hardness not to exceed 92 HRB. Tubing to be free of scratches, suitable for bending and flaring. Order to outside diameter and wall thickness only, not to inside diameter, average wall specification. O.D. tolerances not to exceed ± 0.005 in (± 0.13 mm).

Table 13 — Metric

Tube O.D. (mm)	Tube Wall Thickness, mm			
	0.8	1.0	1.2	1.5
	Working Pressure, bar			
6	310	420	520	670
10		240	300	380
12		200	240	310

Note:For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Alloy 625 Tubing

Allowable working pressures are calculated from an S value of 26 700 psig (184.1 MPa) for ASTM B444 Grade 2 tubing at -20 to 100°F (-28 to 37°C) in accordance with ASME BPV 2007 Section II, Part D, Table 1B, tubing outside diameter and wall thickness tolerances from ASTM B444 for small-diameter tube.

Table 14 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.		
	0.035	0.049	0.065
	Working Pressure, psig		
1/4	7300	10700	14600
3/8	4700	6800	9400
1/2	3500	5000	6800

Table 15 — Metric

Tube O.D. (mm)	Tube Wall Thickness, mm				
	0.8	1.0	1.2	1.5	1.8
	Working Pressure, bar				
6	470	610	750		
10		350	430	550	
12		290	350	450	550

Suggested Ordering Information

High-quality, fully annealed seamless alloy 625 tubing, ASTM B444, Grade 2 or equivalent. Hardness not to exceed 25 HRC. Tubing to be free of scratches, suitable for bending and flaring.

Note: For sizes not listed in the tables above, we recommend that a sample of the tubing and all pertinent information relating to system parameters be provided for evaluation before installation. Give tubing sample and system information to any of authorized FITOK distributors to forward to the factory.

Alloy 825 Tubing

Allowable working pressures are calculated from an S value of 23 300 psi (160.6 MPa) for ASTM B704 tubing at 20 to 100°F (-28 to 37°C), as listed in ASME B31.3 or ASME BPV 2007 Section II, Part D, Table 1B.

Table 16 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.		
	0.035	0.049	0.065
	Working Pressure, psig		
1/4	6400	9300	11 600
3/8	4100	5900	8 200
1/2	3000	4300	5 900

Table 17 — Metric

Tube O.D. (in.)	Tube Wall Thickness, mm				
	0.8	1.0	1.2	1.5	1.8
	Working Pressure, bar				
6	410	530	660		
10		300	370	480	
12		250	300	390	480

Suggested Ordering Information

High-quality, fully annealed seamless alloy 825 tubing, ASTM B163, or equivalent. Fully annealed welded alloy 825 tubing, ASTM B704, class 1 or equivalent. Hardness not to exceed 90 HRB. Tubing to be free of scratches, suitable for bending and flaring. Wall thickness tolerances not to exceed $\pm 10\%$.

Alloy C-276 Tubing

Allowable working pressures are calculated from an S value of 20 000 psi (137.8 MPa) for ASTM B622 tubing at 20 to 100°F (-28 to 37°C), as listed in ASME B31.3 and ASME B31.1.

Table 18 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.			
	0.028	0.035	0.049	0.065
	Working Pressure, psig			
1/4	4000	5100	7500	10200
5/16		4000	5800	7800
3/8		3300	4800	6500
1/2		2600	3700	5100

Note:For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Table 19 — Metric

Tube O.D. (mm)	Tube Wall Thickness, mm			
	0.8	1.0	1.2	1.5
	Working Pressure, bar			
6	310	420	520	670
8		310	390	500
10		240	300	380
12		200	240	310

Note:For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, fully annealed alloy C-276 tubing, ASTM B622 or equivalent. Hardness not to exceed 100 HRB. Tubing to be free of scratches, suitable for bending and flaring. O.D. tolerances not to exceed ± 0.005 in (± 0.13 mm).

Copper Tubing

Allowable working pressures are calculated from an S value of 6000 psi (41.3 MPa) for ASTM B75 tubing at 20 to 100°F (-28 to 37°C), as listed in ASME B31.3 and ASME B31.1.

Table 20 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.									
	0.028	0.030	0.035	0.049	0.065	0.083	0.095	0.109	0.120	0.134
	Working Pressure, psig									
1/8	2700	3000	3600							
3/16	1800	1900	2300	3400						
1/4	1300	1400	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	
1 1/8					600	800	1000	1100	1300	1400

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Table 21 —Metric

Tube O.D. (mm)	Tube Wall Thickness, mm									
	0.8	1.0	1.2	1.5	1.8	2.0	2.2	2.5	2.8	3.0
	Working Pressure, bar									
6	110	140	170	220						
8		100	120	160						
10		80	100	130						
12		60	80	100	130	140				
14		50	60	90	110	120	130			
15			60	80	100	110	120			
16				70	90	100	110	120		
18				60	80	90	100	110		
20				60	70	80	90	100	110	
22				50	60	70	80	90	100	
25				40	50	60	70	80	90	100
28					40	50	60	70	80	90

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, soft annealed seamless copper tubing, ASTM B75 (B75M) or equivalent. Also soft annealed (Temper O) copper water tube, type K or type L to ASTM B88.

Grade 2 Titanium Tubing

Allowable working pressures are calculated from an S value of 16 700 psi (115.1 MPa) for ASTM B338 tubing at 20 to 100°F (-28 to 37°C), as listed in ASME B31.3 and ASME B31.1. For working pressure in accordance with ASME B31.1, multiply by 0.85.

Table 22 — Fractional

Tube O.D. (in.)	Tube Wall Thickness, in.			
	0.028	0.035	0.049	0.065
	Working Pressure, psig			
1/4	3500	4500	6700	9100
3/8		2900	4200	5800
1/2		2100	3100	4200

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Suggested Ordering Information

High-quality, fully annealed seamless or welded and drawn grade 2 titanium tubing, ASTM B338 or equivalent. Tubing to be free of scratches, suitable for bending. O.D. tolerances not to exceed ± 0.005 in (± 0.13 mm).

Table 23 — Metric

Tube O.D. (mm)	Tube Wall Thickness, mm			
	0.8	1.0	1.2	1.5
	Working Pressure, bar			
6	290	380	470	600
10		210	260	340
12		180	220	280

Note: For gas service, select tubing with a wall thickness corresponding to a working pressure outside the shaded area.

Pressure Ratings at Elevated Temperatures

Table 24 — Elevated Temperature Factors

Temperature		Tubing Materials												
°F	°C	316/ 316L ^①	304/ 304L ^①	904L	6 Mo	Super Duplex 2507	Alloy 400	Alloy 20 ^②	Alloy 600 ^②	Alloy 625	Alloy 825	Alloy C-276 ^②	Copper	Ti
200	93	1.00	1.00	1.00	0.90	0.99	0.87	1.00	1.00	0.93	1.00	1.00	0.80	0.86
400	204	0.96	0.93	0.91	0.74	0.91	0.79	0.96	0.96	0.85	0.90	0.96	0.50	0.61
600	315	0.85	0.82		0.67	0.89 ^③	0.79	0.85	0.85	0.79	0.84	0.85		0.45
800	426	0.79	0.76				0.75	0.79	0.79	0.75	0.81	0.79		
1000	537	0.76	0.69						0.35	0.73		0.76		

① Dual-certified grades such as 304/304L and 316/316L meet the minimum chemistry and the mechanical properties of both alloy grades.

② Based on the lower derating factor for stainless steel, in accordance with ASME B31.3.

③ Using 2507 duplex stainless steel at temperatures above 482°F (250°C) may cause microstructural changes, resulting in embrittlement and reduced corrosion resistance. At 482°F (250°C), the rating reduction factor is 0.90.

To determine allowable working pressure at elevated temperatures, multiply allowable working pressures from Tables 1 through 23 by a factor shown in Table 24.

Example: Type 316/316L stainless steel 1/2 in. O.D.×0.035 in. wall at 1000°F

1. The allowable working pressure at -20 to 100°F (-28 to 37°C) is 2600 psig (Table 1).

2. The elevated temperature factor for 1000°F (537°C) is 0.76 (Table 24, above):

$$2600 \text{ psig} \times 0.76 = 1976 \text{ psig}$$

The allowable working pressure for 316/316L 1/2 in. O.D.×0.035 in. wall tubing at 1000°F (537°C) is 1976 psig.