



FLUIDLINE

Seamless
Stainless
Steel

TUBE

Seamless stainless steel tubes cold drawn and annealed to ASTM A269 & ASTM A213 in Grades 304, 316, 316L & 316Ti material. Speciality alloy Grades such as 904L, SAF2205 & MONEL are also available upon request and are not a standard stock item.

Applications

Tube is used for the conveyance of air, liquid and gas in instrumentation, hydraulic and general service applications.

Key features

- *Ease of installation* – Tube provides many advantages over traditional piping systems, it is easy to bend with a tube bender which reduces the number of connections and potential leak points, it is less heavy and bulky than pipe and there is no need to thread the tube.
- *Weldability* – Seamless tubes are able to be welded and orbital welded or used in conjunction with tube fittings.
- *Surface finish* – Seamless tube is required to be 'free of scale' and can be supplied pickled or bright annealed.
- *Certification* – certified and manufactured in accordance with ASTM A269 & ASTM A213.
- *Traceability* – In accordance with the above specifications each length of tube is fully traceable.
- *Special requirements* – plugged ends, oxygen cleaning and individual wrapped tubes are available upon request.

Tube selection

Proper selection and handling of the tube is critical in ensuring reliability in tubing systems and when used with tube fittings the tube should be inspected for surface finish defects and scratches. It is recommended that a tube cutter be used to cut the tube and thereafter the ends be deburred.

The selection of tube should also be based on the operating pressure, flow, temperature and the compatibility of the process fluid in any application.

Material certification and specifications should also be inspected to identify the material and dimensions i.e. the OD size and the wall thickness, the hardness of the tube and the ASTM test results.

All tube comes standard with the following markings, the size of the OD & Wall Thickness, material grade, specification & heat code for traceability.

- *Hardness* - For use with tube fittings the tube should not exceed RB90 and be made of a softer material than the tube fittings.
- *Wall Thickness* – The wall thickness determines the recommended pressure the tube can withstand as listed in ASME B31.3. The tables identify the allowable working pressures. (see tables below)

Suggested Allowable Pressure Tables

Figure 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 OD and minimum wall thickness, except as noted in individual tables.
- No allowance is made for corrosion or erosion.

Example: 1/2 in. OD x 0.035 in. wall stainless steel tubing purchased to ASTM A269:

OD Tolerance ± 0.005 in. / Wall Thickness ± 10 %

Calculations are based on 0.505 in. OD x 0.0315 in. wall tubing.

Table 01: Fractional Stainless Steel Seamless Tubing

Allowable working pressures are calculated from an S value of 20 000 psi (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, except as noted.

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.

Suggested Ordering Information

High-quality, fully annealed (Type 304, 304/304L, 316, 316/316L, 317, 317/317L) (seamless or welded and drawn) stainless steel hydraulic tubing, ASTM A269 or A213, or equivalent. Hardness not to exceed 90 HRB or 200 HV. Tubing to be free of scratches, suitable for bending and flaring. OD tolerances not to exceed ± 0.003 in. for 1/16 in. OD tubing.

Note: Dual-certified grades such as 304/304L, 316/316L, and 317/317L meet the minimum chemistry and the mechanical properties of both alloy grades.

Tube OD 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
	Note: For gas service, select a tube wall thickness outside of the shaded area															
1/16	5 600	6 800	8 100	9 400	12 000											
1/8						8 500	10 900									
3/16						5 400	7 000	10 200								
1/4						4 000	5 100	7 500	10 200							
5/16							4 000	5 800	8 000							
3/8							3 300	4 800	6 500	7 500						
1/2							2 600	3 700	5 100	6 700						
5/8								2 900	4 000	5 200	6 000					
3/4								2 400	3 300	4 200	4 900	5 800				
7/8								2 000	2 800	3 600	4 200	4 800				
1									2 400	3 100	3 600	4 200	4 700			
1 1/4										2 400	2 800	3 300	3 600	4 100	4 900	
1 1/2											2 300	2 700	3 000	3 400	4 000	4 900
2												2 000	2 200	2 500	2 900	3 600

Table 02: Metric Stainless Steel Seamless Tubing

Allowable working pressures are based on equations from ASME B31.3 and ASME B31.1 for EN ISO 1127 tubing (D4, T4 tolerance for 3 to 12 mm; D4, T3 tolerance 14 to 50 mm), using a stress value of 137.8 MPa (20 000 psi) and tensile strength of 516.4 MPa (74 900 psi), except as noted.

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 OD 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
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

4-1 safety factor considering tensile strength of 75,000 psi at room temperature.

Suggested Ordering Information

High-quality, fully annealed (Type 304, 304/304L, 316, 316/316L, 317, 317/317L) stainless steel tubing, EN ISO 1127 or equivalent. Hardness not to exceed 90 HRB or 200 HV. Tubing to be free of scratches, suitable for bending or flaring. OD tolerances not to exceed ± 0.076 mm for 3 mm OD tubing.

Note: Dual-certified grades such as 304/304L, 316/316L, and 317/317L meet the minimum chemistry and the mechanical properties of both alloy grades.



Pressure Ratings at Elevated Temperatures

Table 03: Elevated Temperature Factors

To determine allowable working pressure at elevated temperatures, multiply allowable working pressures from Tables 1 and 2 by a factor shown in Table 3.

Temperature		Tubing Materials													
°F	°C	Al	Copper	Carbon Steel ¹	304, 304/304L ²	316, 316/316L ²	317, 317/317L ²	Alloy 400	Alloy 20 ³	Alloy C-276 ³	Alloy 600 ³	Ti	SAF 2507	Alloy 825	Alloy 625
200	93	1.00	0.80	0.95	1.00	1.00	1.00	0.87	1.00	1.00	1.00	0.86	0.90	1.00	0.93
400	204	0.40	0.50	0.87 ¹	0.93	0.96	0.96	0.79	0.96	0.96	0.96	0.61	0.82	0.90	0.85
600	315				0.82	0.85	0.85	0.79	0.85	0.85	0.85	0.45	0.80	0.84	0.79
800	426				0.76	0.79	0.79	0.76	0.79	0.79	0.79			0.81	0.75
1000	537				0.69	0.76	0.76				0.35	0.35			0.73

1. Based on 375°F (190°C) max.
2. Dual-certified grades such as 304/304L, 316/316L and 317/317L meet the minimum chemistry and the mechanical properties of both alloy grades
3. Based on the lower derating factor for stainless steel, in accordance with ASME B31.3.



Example: Type 316 stainless steel 1/2 in. OD 3 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 3):
2600 psig 3 0.76 = 1976 psig
The allowable working pressure for 316 SS 1/2 in. OD 3 0.035 in. wall tubing at 1000°F (537°C) is 1976 psig.