Fittings, Materials and Tubing Guide

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Allowable Pressure Working Tables

System Pressure

The system operating pressure is another important factor in determining the type, and more importantly, the size of tubing to be used. In general, high pressure installations require stronger materials. Heavy walled softer tubing such may be used if chemical compatibility exists with the media. However, the higher strength of materials such as Alloy 625 permits the use of thinner tubes without reducing the ultimate rating of the system. In any event, tube fitting assemblies should never be pressurized beyond the recommended working pressure.

The following tables (1-14) list by material, the maximum suggested working pressure of various tubing sizes in combination with Parker A-LOK®/CPI™ fittings. Acceptable tubing diameters and wall thicknesses are those for which a rating is listed. Combinations, which do not have a pressure rating, are currently not recommended for use with instrument fittings. For higher pressures, see the Parker **Medium-Pressure Fittings or Phastite Fittings Range**.

Table 15 lists the de-rating factors which should be applied to the working pressures listed in Tables 1-14 for elevated temperature conditions. Simply locate the correct factor in Table 15 and multiply this by the appropriate value in Tables 1-14 for elevated temperature working pressure.

Table 15		Elevated Temperature Rating Factors						
Temperature		Tubing Material						
°F	°C	Stainless 316/316L*	6Mo	Alloy 400	Alloy 625	Alloy 825	Alloy C276	Titanium Gr. 2
100	38	1	1	1	1	1	1	1
200	93	1	1	0.88	0.93	0.92	0.91	0.87
300	149	1	0.95	0.81	0.88	0.87	0.84	0.72
400	204	0.97	0.9	0.79	0.85	0.83	0.78	0.62
500	260	0.9	0.87	0.79	0.82	0.79	0.73	0.53
600	315	0.85	0.86	0.79	0.79	0.76	0.69	0.45
700	371	0.82	0.84	0.78	0.77	0.74	0.65	--
800	426	0.8	--	0.76	0.75	0.73	0.63	--
900	482	0.78	--	0.43	0.74	--	0.61	--
1000	537	0.77	--	--	0.73	--	0.6	--
1100	593	0.62	--	--	0.73	--	--	--
1200	649	0.37	--	--	0.72	--	--	--

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

Example:

Tubing Type 316 stainless steel seamless, 1/2 in. x 0.049 in. wall at 100 °F

- The allowable working pressure at room temperature (up to 100 °F) is 2800 psi (Refer to Table 1)
- The elevated temperature factor for 316 stainless steel is 0.77 at 1000 °F (Refer to Table 15)
- The allowable working pressure for 316 stainless steel tubing ½ in. x 0.049 in. wall at 1000 °F is then: 2800 psi x 0.77 = 2156 psi

The figures and tables included are for reference purposes only. Applicable codes and industry practices should be always considered when designing pressure systems.

- All working pressures have been calculated following the recommendations contained within ASME B31.3, Chemical Plant and Petroleum Refinery Piping Code, and ASME B31.1, Power Piping, and have been proven as accurate by extensive product testing. The calculation utilises an allowable stress figure that incorporates a 4:1 factor of safety.
- All calculations are based on maximum outside diameter and minimum wall thickness.
- All working pressures are applicable at ambient (72°F or 22°C) temperature.

NB.

All Parker A-LOK®/CPI™ tube fittings are designed such that successful assembly is achieved under most circumstances with 1 ¼ turns of the nut being applied from finger tight. For high pressure gaseous services or other critically severe service, consideration should be given to the utilization of a high pressure make up being 1 ½ turns of the nut from finger tight.

Certain combinations of tube and fitting may also benefit from other techniques to aid assembly such as utilization of a pre setting tool. Guidelines are given within the following tables and again we recommend attention to the Parker Instrument Tube Fitting Installation Manual and to the SBEX 'Small Bore Expert' training.
See page 15 for further details

Pipe Pressure Ratings

NPT / BSPT Pipe Size	BRASS			
	Male		Female	
	Straight[a]	Shape[b]	Straight[a]	Shape[b]
1/16	6000	5500	4500	3800
1/8	5600	5000	4000	2900
1/4	4100	4100	4300	3000
3/8	4000	4000	3500	2700
1/2	3900	3100	3600	2500
3/4	3800	3400	3000	2000
1	2700	2700	3100	2300
1-1/4	2000	2000	2300	1900
1-1/2	1800	1800	2100	1700
2	1600	1600	2000	1500

NPT / BSPT Pipe Size	STAINLESS STEEL			
	Male		Female	
	Straight[a]	Shape[b]	Straight[a]	Shape[b]
1/16	10000	9500	7500	7000
1/8	9100	9100	6400	5500
1/4	7500	7500	6600	5600
3/8	7200	7200	5300	5000
1/2	6600	5800	5200	4500
3/4	6400	6400	4300	3500
1	4600	4600	4500	3900
1-1/4	3500	3500	3500	3100
1-1/2	2900	2900	3200	2500
2	2600	2600	2700	2300

NPT / BSPT Pipe Size	CARBON STEEL			
	Male		Female	
	Straight[a]	Shape[b]	Straight[a]	Shape[b]
1/16	10500	10100	8000	7500
1/8	9700	9700	6800	5900
1/4	8000	8000	7000	6000
3/8	7600	7600	5600	5300
1/2	7000	6200	5500	4800
3/4	6800	6800	4600	3700
1	4900	4900	4800	4200
1-1/4	3700	3700	3700	3300
1-1/2	3100	3100	3400	2600
2	2800	2800	2800	2400

Notes:

a. Fittings manufactured from bar stock.
b. Fittings manufactured from forgings.
c. Material of construction in accordance with Parker Catalog 4230/4233, Table 1.
d. Pressure ratings for fittings with both tube and pipe ends are rated to the lower pressure.

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