

Tubing Selection Guide

Although Parker's MPI™ Fittings are engineered and manufactured to consistently provide high levels of reliability, no system's integrity is complete without considering the critical link: tubing.

This section is intended to help you properly select and order quality tubing, both annealed and medium-pressure cold drawn – 1/8 hard as well as 2507 Super Duplex materials.

Parker believes that proper tubing selection and installation are key to building leak-free, reliable tubing systems.

Parker's MPI™ Fittings have been designed to operate on a wide variety of "medium pressure" applications to 15,000 psi.

General Selection Criteria

The data tables in this section will help you select the tubing that best satisfies the flow (size) and material requirements of the application.

The most important consideration in the selection of suitable tubing for any application is the compatibility of the tubing materials with the media to be contained.

System Pressure

The system operating pressure is another important factor in determining the material strength and tubing wall thickness to be used.

In General, high pressure installations require strong materials such as Stainless Steel or Super Duplex to be employed. MPI™ tube fitting assemblies are limited to the lowest MAWP rated part in the fluid system - tubing, fitting or valve. "Periodic" testing of 1.5 times MAWP is allowed.

Temperature Derating Factors

Table 1 (top) indicates derating factors for both Annealed and 1/8th Hard (cold worked) 316SS and 317SS tubing. As indicated this material can be used from -425°F (-254°C) to 1000°F (538°C). **Table 1 (bottom)** indicates derating factors for our 2507 Super Duplex tubing which is designed for use from -50°F (-45°C) to 500°F (260°C).

Table 1	Temperature Derating Factors									
°F	-425° to 100°	200°	300°	400°	500°	600°	700°	800°	900°	1000°
°C	-254° to 538°	93°	149°	204°	260°	316°	371°	427°	482°	538°
1/8 Hard*	1.000	1.000	1.000	0.960	0.885	0.835	0.795	0.770	0.750	0.740
Annealed**	1.000	1.000	1.000	0.965	0.895	0.850	0.815	0.795	0.775	0.765
Super Duplex 2507	1.000	.90	.86	.82	.81	-	-	-	-	-

* Use with 1/8 Hard 316 tubing shown in Tables 2 (MPI) and 3 (C&T) on page 10.

** Use with Annealed 316 tubing shown in Table 4 on page 10.

The rating at temperature is the room temperature (RT) pressure rating listed in the catalog multiplied by the Derating Factor at temperature.

Example: 1/4" MPI™ fittings and tubing @ 800°F

Room Temperature Working Pressure
= **15,000** psi (as shown in Table 3)

800°F Temperature Derating Factor
= **.770** (1/8 Hard tube) (as shown above)

800°F Working Pressure
= **15,000 x .770 = 11,550 psi**

Maximum Allowable Working Pressure Tables

Tables 2, 3 and 4 list the maximum working pressure of various tubing sizes, according to material. Acceptable tubing diameters and wall thicknesses are those for which a rating is listed. O.D./I.D. combinations which do not have a pressure rating are not recommended for use with MPI™ Fittings.

MPI™ 316/317 Cold Drawn Stainless Steel Tubing

MPI™ tubing is marked "MPI" and is designed to provide optimum performance for MPI™ fittings. MPI™ tubing is nominal OD (±.003") 316 seamless stainless steel, cold drawn – 1/8 hard (cold drawn) tubing. Tensile strength is approximately 40% higher than annealed tubing.

Table 2 – 316 or 317 Stainless Steel (Seamless / Cold Drawn – 1/8 Hard for 15,000 psi MAWP applications)

Tube Size (in.)	Nominal OD (in.)	Nominal ID (in.)	Working Pressure (psi)	MPI™ Tube Part No.*
1/4	.250	.125	15,000	4-240 MPITube-SS-15K
3/8	.375	.219	15,000	6-240 MPITube-SS-15K
9/16	.562	.344	15,000	9-240 MPITube-SS-15K
3/4	.750	.469	15,000	12-240 MPITube-SS-15K
1	1.000	.656	12,500	16-240 MPITube-SS-12K

NOTES:

Sizes 3/4" & 1" MPI™ tubing require hydraulic presetting when used with MPI™ fittings.

Working pressures are calculated using an allowable stress of 35,000 psi for 1/8 hard 316 and 317 tubing with a minimum tensile strength of 105,000 psi.

Dimensions in inches are for reference only, subject to change.

* To order 317 tube replace SS with 317

316/316L Cold Drawn Stainless Steel Cone & Thread Tubing

Medium Pressure Cone & Thread (C&T) tubing is available as 1/8 hard 316 seamless stainless steel tubing and MPI™ is designed to work with existing C&T albeit to a pressure lower than marked on the tubing as C&T tubing is undersized by as much as .010" to fit the threading dies. MPI™ fittings work effectively with C&T tubing as listed below but **require hydraulic presetting** for optimum performance.

Table 3 – 316 Stainless Steel (Undersized OD, Seamless /Cold Drawn – 1/8 Hard)

Tube Size (in.)	Maximum OD (in.)	Nominal ID (in.)	Working Pressure (psi)	Parker Autoclave Part Number
1/4	.250	.109	12,500	MS15-092
3/8	.375	.203	12,500	MS15-093
9/16 (1)	.562	.312	12,500	MS15-085
9/16 (2)	.562	.359	10,000	MS15-097
3/4	.750	.516	10,000	MS15-098
1	1.000	.688	10,000	MS15-099

¹ Medium Pressure Tubing with .312" ID will be marked with 20,000 psi working pressure. Working pressure used with MPI fittings or valves is limited to pressure max in chart above.

² Medium Pressure Tubing with .359" ID will be marked with 15,000 psi working pressure. Working pressure used with MPI fittings or valves is limited to pressure max in chart above.

Instrumentation Grade Heavy Wall Tubing

Table 4 – 316 or 317 Stainless Steel (Seamless / Annealed)

Tube Size (in.)	Tube Wall Thickness (in.)								
	.065	.083	.095	.109	.120	.134	.156	.188	.220
	Working Pressure (psi)								
1/4	10,300	13,300	-	-	-	-	-	-	-
3/8	6,600	8,600	10,000	11,700	-	-	-	-	-
1/2	-	6,700	7,800	9,100	10,000	11,400	-	-	-
3/4	-	-	-	5,800	6,400	7,300	8,600	10,600	-
1	-	-	-	-	4,700	5,300	6,200	7,700	9,200

NOTE: Working pressures calculated using an allowable stress of 20,000 psi for annealed 316 stainless steel tubing with a nominal O.D. tolerance of ±.005".

Dimensions in inches are for reference only, subject to change.

Ordering Suggestion:

Fully annealed, high-quality type 316/316L stainless steel tubing ASTM A269 or A213, or equivalent. Hardness not to exceed 90 HRB. Tubing to be free of scratches, suitable for bending and flaring.

MPI™ 2507 Super Duplex

Tubing is an engineered part of our total system “package” - the same as any of our components. Parker’s 2507 MPI™ tubing is manufactured to a specialized and tightly controlled set of design specifications that make it different than that of standard “commercial” tubing. We have designed our products (Valves, Fittings, & Tubing) to work together as a complete system. Using Parker’s MPI™ 2507 tubing in your system will gain you the following benefits:

- **Minimum PREN of 42**
Offers an increased chloride corrosion resistance over standard ASTM A789 tube (PREN 38).
- **6% Greater Allowable Stress** ²
Allows the tube wall to be thinner without compromising pressure holding capability.
- **Up to 19% Weight Saving**
Critical in offshore application where every pound counts. ³
- **Optimized ID (inner diameter) with up to 43% Flow Area Increase** ²
Parker has maximized flow area and minimized pressure drop which allows for more consistent fluid dynamic calculations. ³
- **Finite Tight Tolerance Tube** ²
Unlike standard ASTM A789 tubing where tolerance is based on percentage of wall thickness, Parker’s MPI™ tubing offers a tolerance of ± 0.003 regardless of size, for dimensional consistency from lot to lot.

Table 5 – MPI™ 2507 Seamless Tubing ¹ For 15,000 psi Service

Tube Size (in.)	Nominal OD (in.)	Nominal ID (in.)	Working Pressure (psi)	MPI™ Tube Part No.
1/4	0.250	0.165	15,000	4-240 MPITUBE-2507-15K
3/8	0.375	0.250	15,000	6-240 MPITUBE-2507-15K
1/2	0.500	0.334	15,000	8-240 MPITUBE-2507-15K
3/4	0.750	0.500	15,000	12-240 MPITUBE-2507-15K
1	1.000	0.669	15,000	16-240 MPITUBE-2507-15K

¹ Customer should verify acceptable corrosion resistance for the combination of 316 fittings with 2507 tubing for their specific application (media and environment). Parker recommends matching fitting material to tube material.

² When compared to standard ASTM A789 tubing

³ Based on 3/8 x .083" wall (.210" ID) tubing

NOTES:

Sizes 3/4" & 1" MPI™ 2507 tubing require hydraulic presetting when used with MPI™ fittings and also require -XF High Strength Ferrules.

Working pressures are calculated using an allowable stress of 41,000 psi for annealed 2507 Super Duplex tubing with a minimum tensile strength of 123,000 psi

Consult factory for pressure tables regarding other materials.

Dimensions in inches are for reference only, subject to change.

Instrument Grade Nominal Wall 2507 Tubing

Table 6 – MPI™ Fittings on Annealed 2507 Seamless Tubing ^{1,2,3}

Tube Size (in.)	Wall Thickness								
	0.035	0.049	0.065	0.083	0.095	0.109	0.120	0.134	0.156 ⁴
	Working Pressure (psi)								
1/4	10,600	15,000	-	-	-	-	-	-	-
3/8	6,800	9,900	13,600 ⁴	15,000 ⁴	-	-	-	-	-
1/2	-	7,200	9,900	13,000 ⁴	15,000 ⁴	-	-	-	-
5/8	-	-	7,700	10,100 ⁴	11,800 ⁴	13,700 ⁴	15,000 ⁴	-	-
3/4	-	-	6,400	8,300	9,600 ⁴	11,200 ⁴	12,500 ⁴	14,100 ^{4,5}	-
1	-	-	-	6,100	7,000	8,200 ⁴	9,100 ⁴	10,200 ⁴	12,100 ⁴

¹ Customer should verify acceptable corrosion resistance for the combination of 316 fittings with 2507 tubing for their specific application (media and environment). Parker recommends matching fitting material to tube material.

² Tubing per ASTM A789 or UNS S32750 material is recommended. Hardness not to exceed 32 HRC..

³ ASME B31.3 allowable stress of 38,700 psi for UNS 32750 (A789) and tube wall thickness tolerance of $\pm 10\%$ used to calculate pressure ratings. Please contact factory for assistance in calculating pressure ratings for different parameters.

⁴ Heavier wall 2507 (high lighted fields) may require additional preset pressure. Refer to page 80 for recommended 2507 tube preset pressures.

⁵ 15,000 psi with a minimum wall thickness of 0.127"

⁶ Size 10 MPI is only available for 2507 tube applications.

⁷ 2507 Super Duplex size 12 & 16 MPI Fittings shall be ordered with the -XF high strength Ferrule Option.