Pressure Ratings, Steel Tubing for General Hydraulic System Applications

The following chart lists the nominal pressure ratings of tubing products which conform to SAE J524, SAE J525, SAE J526 and SAE J356. These pressure ratings are derived from the Lamé formula with 12,500 psi (86 MPa) allowable stress factors and approximately 4:1 design factor. Pressure values shown in bold are for tubing wall thickness normally considered suitable for 37 degree single flaring to SAE J533. Many factors influence the pressure at which a hydraulic system will perform satisfactorily. The values shown below should not be used as a standard or specification and are not to be construed as guaranteed minimums.

Note: For single flaring to SAE J533, SAE J524 or J525 tubing is recommended. For double flaring applications, tubing to SAE J 524, J525, J526 or J356 may be used.

Nominal Tube O.D. inch	mm	Nominal Tube Wall Thickness											
		0.028	0.035	0.049	0.065	0.083	0.093	0.109	0.120	0.134	0.148	0.156	0.188
		0.71mm	0.89mm	1.24mm	1.65mm	2.11mm	2.41mm	2.77mm	3.05mm	3.40mm	3.76mm	3.96mm	4.78mm
		Reference Working Pressures at 4:1 Design Factor(psi/MPa)											
0.125		6650	8450										
	3.18	46.0	58.5										
0.188		4250	5450										
	4.77	29.5	37.5										
0.250		3100	3950	5750	7800								
	6.35	21.5	27.0	39.5	54.0								
0.312		2450	3100	4500	6150								
	7.92	16.8	21.5	31.0	42.5								
0.375		2000	2550	3650	5000	6550	7600						
	9.53	13.8	17.6	25.0	34.5	45.0	52.5						
0.500			1850	2700	3650	4800	5550	6450	7200				
	12.70		12.8	18.6	25.0	33.0	38.5	44.5	49.5				
0.625			1500	2100	2850	3750	4350	5050	5600				
	15.88		10.4	14.5	19.6	26.0	30.0	35.0	38.5				
0.750			1200	1750	2350	3050	3550	4150	4600				
	19.05		8.3	12.0	16.2	21.0	24.5	28.5	31.5				
0.875			1050	1500	2000	2600	3000	3500	3900				
	22.23		7.2	10.4	13.8	18.0	20.5	24.0	27.0				
1.000			900	1300	1750	2250	2600	3000	3350	3800	4200		
	25.40		6.2	9.0	12.0	15.5	18.0	20.5	23.0	26.0	29.0		
1.125				1150	1550	2000	2300	2650	2950	3300	3700		
	28.58			7.9	10.6	13.8	15.8	18.2	20.5	23.0	25.5		
1.250				1000	1350	1750	2050	2350	2650	2950	3300	3500	4300
	31.75			6.9	9.3	12.0	14.2	16.2	18.2	20.5	23.0	24.0	29.5
1.500					1150	1450	1700	1950	2150	2450	2700	2850	3500
	38.10				7.9	10.0	11.8	13.5	14.8	16.8	18.6	19.6	24.0
1.750					950	1250	1450	1650	1850	2050	2300	2400	2950
	44.45				6.6	8.6	10.0	11.4	12.8	14.2	15.8	16.6	20.5
2.000					850	1100	1250	1450	1600	1800	2000	2100	2550
	50.80				5.9	7.6	8.6	10.0	11.0	12.4	13.8	14.5	17.6

Calculation of Design Pressures for Alternate Tubing Materials

Design pressures for alternate tubing materials may be calculated using the Lamé formula as follows:

$P=S((D^2-d^2)/(D^2+d^2))$ where:

D= nominal outside diameter of tubing
d= nominal inside diameter of tubing
P= design pressure
S= allowable fiber stress of material at 4:1 design factor

Design stress and temperature derating factors for typical hydraulic system tubing materials and temperature ranges are listed below. Derating factors for SS-304 and SS-316 are derived from ASME B31.1-1998 Edition. Carbon steel tubing in these temperature ranges do not require derating.

Tubing Material	S= Allowable Fiber Stress@ 25% UTS Design Factor=4:1	Temperature Derating Factors		
		Temp.	SS304	SS316
C-1010	12,500 psi / 86MPa	100°F	1.00	1.00
C-1021	15,000 psi / 103 MPa	200°F	0.84	0.86
8630 GR	17,800 psi / 123 MPa	300°F	0.75	0.78
SS-304	18,800 psi / 130MPa	400°F	0.69	0.71
SS-316	18,800 psi / 130MPa	500°F	0.65	0.66