Pipes & Tubes

Tube-Mac maintains a large stock of Carbon Steel NPS pipes and METRIC tubes in strategic locations around the world for use on hydraulic oil, lubrication, and many other piping systems. Tube-Mac also has a vast supply chain for stainless steel type 316, duplex and super duplex.

Material
Carbon steel
EN 10305-4 E235+N (ST37.4)
EN 10305-4 E355+N (ST52.4)
*ASTM A106 Grade B
Stainless steel
ASTM A269 TP316L / DIN 2391
ASTM A312 / A530 Grade TP316L
DUPLEX UNS S32205

Other specifications

Tube-Mac recommends the use of carbon steel, **Cold Drawn, Seamless** pipes, and tubes according to EN 10305-4. This standard specifies the technical delivery conditions for the pipes and tubes used in high pressure hydraulic and pneumatic power systems. Tubes according to EN 10305-4 are characterised by having precisely defined tolerances on dimensions and a specified surface roughness. These cold formed pipes and tubes are normalized without oxygen so there is no mill scale inside or outside surfaces. The pipes and tubes are clean and have an excellent surface for 37° roll flaring. As a comparison, hot rolled tubes will always have some mill scale both inside and out due to the manufacturing process.

All Tube-Mac precision carbon steel pipes and tubes are supplied with MTR's (Material Test Reports). Trace or heat numbers, pipe size by Schedule or OD x Wall and Tube-Mac's name are stencilled along the outside diameter of each pipe and tube. If an MTR certificate is required, the customer must specify at the time of order.

To further ensure quality and traceability Tube-Mac delivers the pipes and tubes with EN-10204.3.2 certificates in accordance with EU standard EN 10204 – DIN 50049.

Welded Pipe and Tubes according to the above specification and have been re-drawn over a mandrel are acceptable however seamless pipes and tubes are recommended. Note the pressure capability may be reduced due to the welding seam and the quality of the weld may affect the roll flaring.

Hot Rolled Pipes and Tubes are not recommended for roll flaring as the tolerances are much broader and the pipe or tube may slip in the flaring dies. Also, there is mill scale inside and outside of the pipe and tube which damage the flaring pin, cause a poor flare, and contaminate the fluid of the system.

*ASTM A106 Grade B are mechanically cleaned & oiled. Recommended for Retain Ring piping connection system only

3D step models available upon request

Designers Guide

Pipe Type, Size, Schedule or OD x Wall Selection

1. Given: The system design pressure (PSI) or (bar).
2. Given: The flow rate through the pipe in US gal/min. or ltr./min.
3. Recommended line velocity in Table 1. FPS (ft/sec.) or Table 2. (m/s)

Recommended Oil Velocities Table 1. (FPS)

Suction Lines	Return Lines	Pressure Lines						
		150-375 psi	375-750psi	750-1500 psi	1500-2250 psi	2250-3000 psi	3000-5000 psi	5000-6000 psi
≤ 5 FPS	≤10 FPS	≤12 FPS	≤13 FPS	≤14 FPS	≤16 FPS	≤18 FPS	≤20 FPS	≤22 FPS

Recommended Oil Velocities Table 2. (m/s)

Suction Lines	Return Lines	Pressure Lines						
		10-30 bar	30-50 bar	50-100 bar	100-155 bar	155-210 bar	210-350 bar	350-420 bar
≤ 1.5 m/s	≤ 3.0 m/s	≤ 3.7 m/s	≤ 4.0 m/s	≤ 4.3 m/s	≤ 4.9 m/s	≤ 5.5 m/s	≤ 6.0 m/s	≤ 6.7 m/s

4. Go to Table 3. (NPS)
   Under the selected line velocity column (FPS) read down until the approximate flow rate (GPM) is found.
   Read across to the left column showing the nominal pipe size and schedule required.
5. Go to Table 4. (Metric)
   Under the selected line velocity column (m/s) read down until the approximate flow rate (ltr./min.) is found.
   Read across to the left column showing the pipe OD x wall required.
6. Go to Pressure Rating Guide Pages below for NPS Pipe.
   Page C5 for Carbon Steel, E235+N (ST 37.4), E355+N (ST 52.4) and A106 Grade B.
   Page C6 for Stainless Steel Types 304/316.
   Page C7 for Duplex Stainless steel UNS S32205.

   For the NPS (nominal pipe size) and schedule selected, read down the Working Pressure column showing the corresponding pressure rating to meet the design criteria. The connection type is also provided based on the pipe size and schedule.
7. Go to Pressure Rating Guide Pages below for METRIC Pipe.
   Page C8 for Carbon Steel E235+N (ST 37.4) acc to DNV Rules for Marine and Offshore.
   Page C9 for Carbon Steel E235+N (ST 37.4) acc to DIN Rules for Land Based and Industrial Applications.
   Page C10 for Carbon Steel E355+N (ST 52.4) acc to DNV Rules for Marine and Offshore.
   Page C11 for Carbon Steel E355+N (ST 52.4) acc to DIN Rules for Land Based and Industrial Applications.
   Page C12 for Stainless Steel 316/316L acc to DNV Rules for Marine and Offshore.
   Page C13 for Stainless Steel 316/316L acc to DIN Rules for Land Based and Industrial Applications.

   For the METRIC pipe OD x wall selected, read down the Working Pressure column showing the corresponding pressure rating to meet the design criteria. The connection type is also provided based on the pipe OD and wall.

Example:
System delivering 250 GPM at 3500 PSI with a design velocity of around 20 FPS using carbon steel pipe.

Selection:
TMP52CD pipe, flared, schedule 80, 2-1 /2" size would meet the design requirement of this example.

Pipe Flow/Velocity Guide, NPS

Table 3 (NPS)

Nominal Pipe Size (in)	Wall Schedule	Internal Area (in^2)	Bore Dia. (in)	Flow (GPM)						
				2 FPS	5 FPS	10 FPS	15 FPS	20 FPS	25 FPS	30 FPS
1/2"	SCH40	0.304	0.622	1.9	4.7	9.5	14.2	18.9	23.7	28.4
	SCH80	0.234	0.546	1.5	3.6	7.3	10.9	14.6	18.2	21.9
	SCH160	0.171	0.466	1.1	2.7	5.3	8.0	10.6	13.3	15.9
	SCHXXS	0.050	0.252	0.3	0.8	1.6	2.3	3.1	3.9	4.7
3/4"	SCH40	0.533	0.824	3.3	8.3	16.6	24.9	33.2	41.5	49.8
	SCH80	0.432	0.742	2.7	6.7	13.5	20.2	26.9	33.7	40.4
	SCH160	0.296	0.614	1.8	4.6	9.2	13.8	18.4	23.1	27.7
	SCHXXS	0.148	0.434	0.9	2.3	4.6	6.9	9.2	11.5	13.8
1"	SCH40	0.864	1.049	5.4	13.5	26.9	40.4	53.8	67.3	80.7
	SCH80	0.719	0.957	4.5	11.2	22.4	33.6	44.8	56.0	67.2
	SCH160	0.522	0.815	3.3	8.1	16.3	24.4	32.5	40.6	48.8
	SCHXXS	0.282	0.599	1.8	4.4	8.8	13.2	17.6	21.9	26.3
1-1/4"	SCH40	1.496	1.380	9.3	23.3	46.6	69.9	93.2	116.5	139.8
	SCH80	1.283	1.278	8.0	20.0	40.0	60.0	79.9	99.9	119.9
	SCH160	1.057	1.160	6.6	16.5	32.9	49.4	65.8	82.3	98.8
	SCHXXS	0.593	0.869	3.7	9.2	18.5	27.7	37.0	46.2	55.4
1-1/2"	SCH40	2.036	1.610	12.7	31.7	63.4	95.1	126.9	158.6	190.3
	SCH80	1.767	1.500	11.0	27.5	55.0	82.6	110.1	137.6	165.1
	SCH160	1.406	1.338	8.8	21.9	43.8	65.7	87.6	109.5	131.4
	SCHXXS	0.950	1.100	5.9	14.8	29.6	44.4	59.2	74.0	88.8
2"	SCH40	3.356	2.067	20.9	52.3	104.5	156.8	209.1	261.4	313.6
	SCH80	2.953	1.939	18.4	46.0	92.0	138.0	184.0	230.0	276.0
	SCH160	2.235	1.687	13.9	34.8	69.6	104.4	139.3	174.1	208.9
	SCHXXS	1.774	1.503	11.1	27.6	55.3	82.9	110.5	138.2	165.8
2-1/2"	SCH40	4.788	2.469	29.8	74.6	149.2	223.7	298.3	372.9	447.5
	SCH80	4.238	2.323	26.4	66.0	132.0	198.0	264.0	330.1	396.1
	SCH160	3.547	2.125	22.1	55.2	110.5	165.7	221.0	276.2	331.5
	SCHXXS	2.463	1.771	15.3	38.4	76.7	115.1	153.5	191.8	230.2
3"	SCH40	7.393	3.068	46.1	115.2	230.3	345.5	460.6	575.8	690.9
	SCH80	6.605	2.900	41.2	102.9	205.8	308.6	411.5	514.4	617.3
	SCH160	5.408	2.624	33.7	84.2	168.5	252.7	336.9	421.2	505.4
	SCHXXS	4.155	2.300	25.9	64.7	129.4	194.2	258.9	323.6	388.3
4"	SCH40	12.730	4.026	79.3	198.3	396.6	594.9	793.1	991.4	1,189.7
	SCH80	11.500	3.826	71.7	179.1	358.3	537.4	716.5	895.6	1,074.8
	SCH160	9.283	3.438	57.8	144.6	289.2	433.8	578.4	723.0	867.6
	SCHXXS	7.803	3.152	48.6	121.5	243.1	364.6	486.2	607.7	729.3
5"	SCH40	20.006	5.047	124.6	311.6	623.2	934.9	1,246.5	1,558.1	1,869.7
	SCH160	14.610	4.313	91.0	227.6	455.1	682.7	910.3	1,137.8	1,365.4
	SCHXXS	12.965	4.063	80.8	202.0	403.9	605.9	807.8	1,009.8	1,211.7
6"	SCH40	28.890	6.065	180.0	450.0	900.0	1,350.0	1,800.0	2,250.0	2,700.0
	SCH160	21.147	5.189	131.8	329.4	658.8	988.2	1,317.6	1,647.0	1,976.4
	SCHXXS	18.834	4.897	117.3	293.4	586.7	880.1	1,173.5	1,466.9	1,760.2
8"	SCH40	50.027	7.981	311.7	779.2	1,558.5	2,337.7	3,117.0	3,896.2	4,675.4
	SCH160	36.456	6.813	227.1	567.8	1,135.7	1,703.5	2,271.4	2,839.2	3,407.1
	SCHXXS	37.122	6.875	231.3	578.2	1,156.5	1,734.7	2,312.9	2,891.2	3,469.4
10"	SCH40	78.854	10.020	491.3	1,228.3	2,456.5	3,684.8	4,913.1	6,141.3	7,369.6
	SCH160	56.745	8.500	353.6	883.9	1,767.8	2,651.6	3,535.5	4,419.4	5,303.3

* Flow is shown in US Gallons/min

3D step models available upon request

TMI Pipe Flow/Velocity Guide, Metric

Table 4 (Metric)								
OD x Wall (mm)	Internal Area (mm2)	Bore Dia. (mm)	Flow (litres/min) based on Line Velocity (m/s)					
			2 m/s	3 m/s	4.5 m/s	6 m/s	8 m/s	10 m/s
20 x 2.0	201.1	16	24.1	36.2	54.3	72.4	95.6	120.6
20 x 2.5	176.7	15	21.2	31.8	47.7	63.6	84.8	106.0
20 x 3.0	153.9	14	18.5	27.7	41.5	55.5	73.9	92.4
25 x 2.5	314.2	20	37.7	56.5	84.8	113.1	150.8	188.5
25 x 3.0	283.5	19	34.0	51.0	76.5	102.1	136.1	170.1
25 x 4.0	227.0	17	27.2	40.8	61.3	81.7	108.9	136.2
30 x 3.0	452.4	24	54.3	81.4	122.1	162.9	217.1	271.4
30 x 4.0	380.1	22	45.6	68.4	102.6	136.8	182.5	228.1
30 x 5.0	314.2	20	37.7	56.5	84.8	113.1	150.8	188.5
38 x 3.0	804.2	32	96.5	144.7	217.1	289.5	386.0	482.5
38 x 4.0	706.9	30	84.8	127.2	190.8	254.5	339.3	424.1
38 x 5.0	615.8	28	73.9	110.8	166.2	221.7	295.5	369.4
42 x 3.0	1017.9	36	122.1	183.2	274.8	366.4	488.6	610.7
42 x 4.0	907.9	34	108.9	163.4	245.1	326.8	435.8	544.7
50 x 3.0	1520.5	44	182.4	273.7	410.5	547.4	729.8	912.3
50 x 5.0	1256.6	40	150.8	226.2	339.3	452.4	603.2	754.0
50 x 6.0	1134.1	38	136.1	204.1	306.2	408.3	544.4	680.5
56 x 8.5	1194.6	39	143.3	215.0	322.5	430.1	573.4	716.7
60 x3.0	2290.2	54	274.8	412.2	618.4	824.5	1099.3	1374.1
60 x 5.0	1963.5	50	235.6	353.4	530.1	706.9	942.5	1178.1
60 x 6.0	1809.6	48	217.1	325.7	488.6	651.4	868.6	1085.7
60 x 8.0	1520.5	44	182.5	273.7	410.5	547.4	729.8	912.3
66 x 8.5	1885.7	49	226.3	339.4	509.1	680.6	905.1	1131.4
73 x 7.0	2734.0	59	328.1	492.1	738.2	984.2	1312.3	1640.4
75 x 3.0	3739.3	69	448.7	673.1	1009.6	1346.1	1794.8	2243.6
75 x 5.0	3318.3	65	398.2	597.3	895.9	1194.6	1592.8	1991.0
75 x 7.0	2922.5	61	350.7	526.0	789.1	1052.1	1402.8	1753.5
80 x 10	2827.4	60	339.3	508.9	763.4	1017.9	1357.2	1696.5
90 x 3.5	5410.6	83	649.3	973.9	1460.8	1947.8	2597.1	3246.4
90 x 5.0	5026.6	80	603.2	904.8	1357.2	1809.6	2412.7	3015.9
90 x 9.0	4071.5	72	488.6	732.9	1099.3	1465.7	1954.3	2442.9
97 x 12	4185.4	73	502.2	753.4	1130.1	1506.7	2009.0	2511.2
100 x 4.0	6647.6	92	797.7	1196.6	1794.8	2393.1	3190.8	3,988.60
115 x4.0	8992.0	107	1079.0	1618.6	2427.8	3237.1	4316.2	5395.2
115 x 15	5674.5	85	680.9	1021.4	1532.1	2042.8	2723.7	3404.7
130 x 15	7854.0	100	942.5	1413.7	2120.6	2827.4	3769.9	4712.4
140 x 4.5	13478.2	131	1617.4	2426.1	3639.1	4852.2	6469.5	8086.9
150 x 15	11309.8	120	1357.2	2035.7	3053.6	4071.5	5428.7	6785.8
165 x 5.0	18869.2	155	2264.3	3396.4	5094.7	6792.9	9057.2	11321.5
190 x 20	17671.5	150	2120.6	3180.9	4771.3	6361.7	8482.3	10602.9
220 x 6.0	33979.5	208	4077.5	6116.3	9174.5	12232.6	16310.1	20387.7
220 x 20	25447.0	180	3053.6	4580.4	6870.7	9160.9	12214.5	15268.1
250 x 25	31416.0	200	3769.9	5645.9	8482.3	11309.7	15079.6	18849.6
273 x 6.0	53502.2	261	6420.3	9630.4	14445.6	19260.7	25681.0	32101.3
273 x 28.6	36575.8	215.8	4397.2	6595.8	9893.8	13191.7	17588.9	21986.1

* Flow is shown in litres/min

3D step models available upon request

Pressure Rating Guide, NPS Carbon Steel Pipes,

According to ASME B31.3

Nominal Pipe Size (in)	Wall Schedule	Connection Type	Material Type/Grade	Pipe OD x Wall (in)	Pipe OD x Wall (mm)	Working Pressure PSI (bar)	Burst Pressure PSI (bar)	Weight lbs/ft	Weight kg/mtr
1/2"	SCH40	Flare	E235+N (ST37.4 NBK)	0.840 x 0.109	21.34 x 2.77	5410 (373)	16230 (1119)	0.851	1.29
	SCH80	Flare	E235+N (ST37.4 NBK)	0.840 x 0.147	21.34 x 3.73	7570 (522)	22710 (1566)	1.088	1.64
	SCH160	Retain Ring	A106 Grade B	0.840 x 0.187	21.34 x 4.78	9230 (636)	27690 (1909)	1.304	1.95
3/4"	SCH40	Flare	E235+N (ST37.4 NBK)	1.050 x 0.113	26.67 x 2.81	4410 (304)	13230 (912)	1.131	1.71
	SCH80	Flare	E235+N (ST37.4 NBK)	1.050 x 0.154	26.67 x 3.91	6200 (428)	18600 (1283)	1.474	2.22
	SCH160	Retain Ring	A106 Grade B	1.050 x 0.218	26.67 x 5.56	8502 (586)	25506 (1793)	1.937	2.89
1"	SCH40	Flare	E235+N (ST37.4 NBK)	1.315 x 0.133	33.40 x 3.38	4120 (284)	12360 (852)	1.679	2.54
	SCH80	Flare	E235+N (ST37.4 NBK)	1.315 x 0.179	33.40 x 4.55	5700 (393)	17100 (1179)	2.172	3.28
	SCH80	Flare	E355+N (ST52.4 NBK)	1.315 X 0.179	33.40 X 4.55	6500 (448)	19500 (1345)	2.172	3.28
	SCH160	Retain Ring	A106 Grade B	1.315 x 0.250	33.40 x 6.35	7675 (540)	23025 (1588)	2.844	4.23
1-1/4"	SCH40	Flare	E235+N (ST37.4 NBK)	1.660 x 0.140	42.16 x 3.56	3394 (234)	10182 (702)	2.273	3.43
	SCH80	Flare	E355+N (ST52.4 NBK)	1.660 x 0.191	42.16 x 4.85	5400 (372)	16200 (1116)	2.997	4.54
	SCH160	Retain Ring	A106 Grade B	1.660 x 0.250	42.16 x 6.35	5892 (406)	17676 (1219)	3.765	5.60
	SCHXXS	Retain Ring	A106 Grade B	1.660 x 0.382	42.16 x 9.70	9601 (662)	28803 (1986)	5.214	7.75
1-1/2"	SCH40	Flare	E235+N (ST37.4 NBK)	1.900 x 0.145	48.26 x 3.68	3050 (210)	9150 (631)	2.718	4.11
	SCH80	Flare	E355+N (ST52.4 NBK)	1.900 x 0.200	48.26 x 5.08	4900 (338)	14700 (1014)	3.631	5.48
	SCH160	Flare & Retain Ring	E355+N (ST52.4 NBK)	1.900 x 0.281	48.26 x 7.14	6930 (478)	20790 (1434)	4.859	7.23
	SCHXXS	Retain Ring	A106 Grade B	1.900 x 0.400	48.26 x 10.16	8642 (596)	25926 (1788)	6.408	9.54
2"	SCH40	Flare	E235+N (ST37.4 NBK)	2.375 x 0.154	60.30 x 3.91	2570 (177)	7710 (532)	3.653	5.51
	SCH80	Flare	E355+N (ST52.4 NBK)	2.375 x 0.218	60.30 x 5.54	4200 (290)	12600 (870)	5.022	7.58
	SCH160	Flare & Retain Ring	E355+N (ST52.4 NBK)	2.375 x 0.343	60.30 x 8.74	6750 (465)	20250 (1395)	7.444	11.10
	SCHXXS	Retain Ring	A106 Grade B	2.375 x 0.436	60.30 x 11.07	7373 (508)	22119 (1525)	9.029	13.44
2-1/2"	SCH40	Flare	E235+N (ST 37.4 NBK)	2.875 x 0.203	73.00 x 5.16	2810 (194)	8430 (581)	5.793	8.75
	SCH80	Flare	E355+N (ST52.4 NBK)	2.875 x 0.276	73.00 x 7.01	4500 (310)	13500 (930)	7.661	11.57
	SCH160	Flare & Retain Ring	E355+N (ST52.4 NBK)	2.875 x 0.375	73.00 x 9.53	6030 (415)	18090 (1245)	10.01	14.90
	SCHXXS	Retain Ring	A106 Grade B	2.875 x 0.552	73.00 x 14.02	7763 (535)	23289 (1606)	13.69	20.39
3"	SCH40	Flare	E235+N (ST 37.4 NBK)	3.500 x 0.216	88.9 x 5.49	2440 (168)	7320 (505)	7.576	11.45
	SCH80	Flare	E355+N (ST52.4 NBK)	3.500 x 0.300	88.9 x 7.67	3900 (270)	11700 (810)	10.25	15.48
	SCH160	Retain Ring	A106 Grade B	3.500 x 0.438	88.9 x 11.13	4800 (331)	14400 (993)	14.32	21.30
	SCHXXS	Retain Ring	A106 Grade B	3.500 x 0.600	88.9 x 15.24	6818 (470)	20454 (1410)	18.58	27.65
3-1/2"	SCH40	Flare	E235+N (ST 37.4 NBK)	4.0 x 0.226	101.6 x 5.74	2226 (154)	6678 (461)	9.109	13.96
4"	SCH40	Flare	E235+N (ST 37.4 NBK)	4.500 x 0.237	114.3 x 6.07	2069 (143)	6207 (428)	10.79	16.30
	SCH80	Flare	E355+N (ST52.4 NBK)	4.500 x 0.337	114.3 x 8.56	3420 (236)	10260 (708)	14.98	22.62
	SCH160	Retain Ring	A106 Grade B	4.500 x 0.531	114.3 x 13.49	4502 (310)	13500 (931)	22.51	33.51
	SCHXXS	Retain Ring	A106 Grade B	4.500 x 0.674	114.3 x 17.12	5856 (404)	17568 (1211)	27.54	40.99
5"	SCH40	Flare	E235+N (ST 37.4 NBK)	5.563 x 0.258	141.3 x 6.55	1814 (125)	5442 (375)	14.62	22.09
	SCH160	Retain Ring	A106 Grade B	5.563 x 0.625	141.3 x 15.88	4268 (294)	12804 (883)	27.04	49.04
	SCHXXS	Retain Ring	A106 Grade B	5.563 x 0.750	141.3 x 19.05	5210 (359)	15630 (1078)	32.96	57.37
6"	SCH40	Flare	E235+N (ST 37.4 NBK)	6.625 x 0.280	168.3 x 7.11	1648 (114)	4944 (341)	18.97	28.65
	SCH160	Retain Ring	A106 Grade B	6.625 x 0.718	168.3 x 18.26	4105 (283)	12315 (849)	45.30	67.47
	SCHXXS	Retain Ring	A106 Grade B	6.625 x 0.864	168.3 x 21.95	5023 (346)	15069 (1039)	53.16	79.11
8"	SCH40	Flare	E235+N (ST 37.4 NBK)	8.625 x 0.322	219.1 x 8.18	1450 (100)	4350 (300)	28.55	43.12
	SCH160	Retain Ring	A106 Grade B	8.625 x 0.906	219.1 x 23.00	3968 (274)	11904 (821)	74.69	111.18
	SCHXXS	Retain Ring	A106 Grade B	8.625 x 0.875	219.1 x 22.20	3822 (264)	11466 (790)	72.42	107.80
10"	SCH40	Flare	E235+N (ST 37.4 NBK)	10.750 x 0.365	273.0 x 9.27	1316 (91)	3948 (272)	40.48	61.14
	SCHXS	Retain Ring	A106 Grade B	10.750 x 0.500	273.0 x 12.70	2008 (138)	6024 (415)	54.74	82.67
	SCH160	Retain Ring	A106 Grade B	10.750 x 1.125	273.0 x 28.60	3952 (272)	11856 (817)	115.6	172.01

*Other sizes on request

Note:

1. Working Pressure Rating according to ASME B31.3 includes manufacturing tolerance
2. Material Type E355+N (ST52.4 NBK) Allowable Stress - 24,000 PSI per ASME B31.3
3. Material Type E235+N (ST37.4 NBK) Allowable Stress - 21,000 PSI per ASME B31.3
4. Material Type A106 Grade B Allowable Stress - 20,000 PSI per ASME B31.3

3D step models available upon request

Pressure Rating Guide, NPS Stainless Steel Type 304/316 Pipes, According to ASME B31.3

Nominal Pipe Size (in)	Wall Schedule	Connection Type	Pipe OD x Wall (in)	Pipe OD x Wall (mm)	Working Pressure PSI (bar)	Burst Pressure PSI (bar)	Weight lbs/ft	Weight kg/mtr
1/2"	SCH40	Flare	0.840 x 0.109	21.34 x 2.77	4995 (344)	14985 (1033)	0.851	1.29
	SCH80	Flare	0.840 x 0.147	21.34 x 3.73	6980 (481)	20940 (1444)	1.088	1.64
	SCH160	Retain Ring	0.840 x 0.187	21.34 x 4.78	9230 (636)	27690 (1909)	1.304	1.95
	SCHXXS	Retain Ring	0.840 x 0.294	21.34 x 7.47	16302 (1124)	47064 (3245)	1.714	2.55
3/4"	SCH40	Flare	1.050 x 0.113	26.67 x 2.81	4074 (281)	12222 (843)	1.131	1.71
	SCH80	Flare	1.050 x 0.154	26.67 x 3.91	5721 (394)	17163 (1183)	1.474	2.22
	SCH160	Retain Ring	1.050 x 0.218	26.67 x 5.56	8502(586)	25506 (1793)	1.937	2.89
	SCHXXS	Retain Ring	1.050 x 0.308	26.67 x 7.82	12850 (886)	38550 (2658)	2.441	3.64
1"	SCH40	Flare	1.315 x 0.133	33.40 x 3.38	3810 (263)	11430 (788)	1.679	2.54
	SCH80	Flare	1.315 x 0.179	33.40 x 4.55	5266 (363)	15798 (1089)	2.172	3.28
	SCH160	Retain Ring	1.315 x 0.250	33.40 x 6.35	7675 (540)	23025 (1588)	2.844	4.23
	SCHXXS	Retain Ring	1.315 x 0.358	33.40 x 9.09	11675 (805)	35025 (2415)	3.659	5.45
1-1/4"	SCH40	Flare	1.660 x 0.140	42.16 x 3.56	3137 (216)	9411 (649)	2.273	3.43
	SCH80	Flare	1.660 x 0.191	42.16 x 4.85	4380 (302)	13140 (906)	2.997	4.54
	SCH160	Retain Ring	1.660 x 0.250	42.16 x 6.35	5892 (406)	17676 (1219)	3.765	5.60
	SCHXXS	Retain Ring	1.660 x 0.382	42.16 x 9.70	9601 (662)	28803 (1986)	5.214	7.75
1-1/2"	SCH40	Flare	1.900 x 0.145	48.26 x 3.68	2822 (195)	8466 (584)	2.718	4.11
	SCH80	Flare	1.900 x 0.200	48.26 x 5.08	3977 (274)	11931 (823)	3.631	5.48
	SCH160	Flare & Retain Ring	1.900 x 0.281	48.26 x 7.14	5774 (398)	17322 (1194)	4.859	7.23
	SCHXXS	Retain Ring	1.900 x 0.400	48.26 x 10.16	8642 (596)	25926 (1788)	6.408	9.54
2"	SCH40	Flare	2.375 x 0.154	60.30 x 3.91	2377 (164)	7131 (492)	3.653	5.51
	SCH80	Flare	2.375 x 0.218	60.30 x 5.54	3433 (237)	10299 (710)	5.022	7.58
	SCH160	Flare & Retain Ring	2.375 x 0.343	60.30 x 8.74	5623 (388)	16869 (1163)	7.444	11.10
	SCHXXS	Retain Ring	2.375 x 0.436	60.30 x 11.07	7373 (508)	22119 (1525)	9.029	13.44
2-1/2"	SCH40	Flare	2.875 x 0.203	73.00 x 5.16	2600 (180)	7800 (540)	5.793	8.75
	SCH80	Flare	2.875 x 0.276	73.00 x 7.01	3602 (248)	10806 (745)	7.661	11.57
	SCH160	Flare & Retain Ring	2.875 x 0.375	73.00 x 9.53	5024 (346)	15072 (1039)	10.01	14.90
	SCHXXS	Retain Ring	2.875 x 0.552	73.00 x 14.02	7763 (535)	23289 (1606)	13.69	20.39
3"	SCH40	Flare	3.500 x 0.216	88.9 x 5.49	2258 (156)	6774 (467)	7.576	11.45
	SCH80	Flare	3.500 x 0.300	88.9 x 7.67	3191 (220)	9573 (660)	10.25	15.48
	SCH160	Retain Ring	3.500 x 0.438	88.9 x 11.13	4800 (331)	14400 (993)	14.32	21.30
	SCHXXS	Retain Ring	3.500 x 0.600	88.9 x 15.24	6818 (470)	20454 (1410)	18.58	27.65
3-1/2"	SCH40	Flare	4.0 x 0.226	101.6 x 5.74	2059 (142)	6177 (426)	9.109	13.96
4"	SCH40	Flare	4.500 x 0.237	114.3 x 6.07	1914 (132)	5742 (396)	10.79	16.30
	SCH80	Flare	4.500 x 0.337	114.3 x 8.56	2766 (191)	8298 (572)	14.98	22.62
	SCH160	Retain Ring	4.500 x 0.531	114.3 x 13.49	4502 (310)	13500 (931)	22.51	33.51
	SCHXXS	Retain Ring	4.500 x 0.674	114.3 x 17.12	5856 (404)	17568 (1211)	27.54	40.99
5"	SCH40	Flare	5.563 x 0.258	141.3 x 6.55	1678 (116)	5034 (347)	14.62	22.09
	SCH160	Retain Ring	5.563 x 0.625	141.3 x 15.88	4268 (294)	12804 (883)	27.04	49.04
	SCHXXS	Retain Ring	5.563 x 0.750	141.3 x 19.05	5210 (359)	15630 (1078)	32.96	57.37
6"	SCH40	Flare	6.625 x 0.280	168.3 x 7.11	1524 (105)	4572 (315)	18.97	28.65
	SCH160	Retain Ring	6.625 x 0.718	168.3 x 18.26	4105 (283)	12315 (849)	45.30	67.47
	SCHXXS	Retain Ring	6.625 x 0.864	168.3 x 21.95	5023 (346)	15069 (1039)	53.16	79.11
8"	SCH40	Flare	8.625 x 0.322	219.1 x 8.18	1342 (92.5)	4026 (278)	28.55	43.12
	SCH160	Retain Ring	8.625 x 0.906	219.1 x 23.00	3968 (274)	11904 (821)	74.69	111.18
	SCHXXS	Retain Ring	8.625 x 0.875	219.1 x 22.20	3822 (264)	11466 (790)	72.42	107.80
10"	SCH40	Flare	10.750 x 0.365	273.0 x 9.27	1217 (84)	3651 (252)	40.48	61.14
	SCHXS	Retain Ring	10.750 x 0.500	273.0 x 12.70	2008 (138)	6024 (415)	54.74	82.67
	SCH160	Retain Ring	10.750 x 1.125	273.0 x 28.60	3952 (272)	11856 (817)	115.6	172.01

*Other sizes on request **Note:**

1. Working Pressure Rating according to ASME B31.3 includes manufacturing tolerance
2. Material Grade A312 Type 304 and Type 316 Allowable Stress - 20,000 PSI per ASME B31.3

3D step models available upon request

Pressure Rating Guide, NPS DUPLEX Stainless Steel Pipes,
According to ASME B31.3

Nominal Pipe Size (in)	Wall Schedule	Connection Type	Pipe OD x Wall (in)	Pipe OD x Wall (mm)	Working Pressure PSI (bar)	Burst Pressure PSI (bar)	Weight lbs/ft	Weight kg/mtr
1/2"	SCH40	Flare	0.840 x 0.109	21.34 x 2.77	7729 (533)	23187 (1600)	0.851	1.29
	SCH80	Flare	0.840 x 0.147	21.34 x 3.73	10812 (746)	32436 (2237)	1.088	1.64
	SCH160	Retain Ring	0.840 x 0.187	21.34 x 4.78	14316 (987)	42948 (2962)	1.304	1.95
	SCHXXS	Retain Ring	0.840 x 0.294	21.34 x 7.47	25267 (1743)	75801 (5228)	1.714	2.55
3/4"	SCH40	Flare	1.050 x 0.113	26.67 x 2.81	6300 (435)	18900 (1303)	1.131	1.71
	SCH80	Flare	1.050 x 0.154	26.67 x 3.91	8855 (611)	26565 (1832)	1.474	2.22
	SCH160	Retain Ring	1.050 x 0.218	26.67 x 5.56	13182 (909)	39546 (2727)	1.937	2.89
	SCHXXS	Retain Ring	1.050 x 0.308	26.67 x 7.82	20081 (1385)	60243 (4155)	2.441	3.64
1"	SCH40	Flare	1.315 x 0.133	33.40 x 3.38	5891 (406)	17673 (1219)	1.679	2.54
	SCH80	Flare	1.315 x 0.179	33.40 x 4.55	8149 (562)	24447 (1686)	2.172	3.28
	SCH160	Retain Ring	1.315 x 0.250	33.40 x 6.35	11894 (820)	35682 (2461)	2.844	4.23
	SCHXXS	Retain Ring	1.315 x 0.358	33.40 x 9.09	18285 (1261)	54855 (3783)	3.659	5.45
1-1/4"	SCH40	Flare	1.660 x 0.140	42.16 x 3.56	4849 (334)	14547 (1003)	2.273	3.43
	SCH80	Flare	1.660 x 0.191	42.16 x 4.85	6774 (467)	20322 (1402)	2.997	4.54
	SCH160	Retain Ring	1.660 x 0.250	42.16 x 6.35	9122 (629)	27366 (1887)	3.765	5.60
	SCHXXS	Retain Ring	1.660 x 0.382	42.16 x 9.70	14894 (1027)	44682 (3081)	5.214	7.75
1-1/2"	SCH40	Flare	1.900 x 0.145	48.26 x 3.68	4233 (292)	12699 (876)	2.718	4.11
	SCH80	Flare	1.900 x 0.200	48.26 x 5.08	5966 (411)	17898 (1234)	3.631	5.48
	SCH160	Retain Ring	1.900 x 0.281	48.26 x 7.14	8661 (597)	25983 (1792)	4.859	7.23
	SCHXXS	Retain Ring	1.900 x 0.400	48.26 x 10.16	12963 (984)	38889 (2682)	6.408	9.54
2"	SCH40	Flare	2.375 x 0.154	60.30 x 3.91	3566 (245)	10698 (738)	3.653	5.51
	SCH80	Flare	2.375 x 0.218	60.30 x 5.54	5150 (355)	15450 (1065)	5.022	7.58
	SCH160	Retain Ring	2.375 x 0.343	60.30 x 8.74	8435 (582)	25305 (1745)	7.444	11.10
	SCHXXS	Retain Ring	2.375 x 0.436	60.30 x 11.07	11059 (763)	33177 (2288)	9.029	13.44
2-1/2"	SCH40	Flare	2.875 x 0.203	73.00 x 5.16	3900 (269)	11700 (807)	5.793	8.75
	SCH80	Flare	2.875 x 0.276	73.00 x 7.01	5403 (373)	16209 (1118)	7.661	11.57
	SCH160	Retain Ring	2.875 x 0.375	73.00 x 9.53	7536 (520)	22608 (1559)	10.01	14.90
	SCHXXS	Retain Ring	2.875 x 0.552	73.00 x 14.02	11645 (803)	34935 (2409)	13.69	20.39
3"	SCH40	Flare	3.500 x 0.216	88.9 x 5.49	3386 (234)	10158 (700)	7.576	11.45
	SCH80	Flare	3.500 x 0.300	88.9 x 7.67	4787 (330)	14361 (990)	10.25	15.48
	SCH160	Retain Ring	3.500 x 0.438	88.9 x 11.13	7201 (497)	21603 (1490)	14.32	21.30
	SCHXXS	Retain Ring	3.500 x 0.600	88.9 x 15.24	10227 (705)	30681 (2116)	18.58	27.65

*Other sizes on request

Note:

1. Working Pressure Rating according to ASME B31.3 includes manufacturing tolerance
2. Material Type DUPLEX UNS S32205 (EN1.4462) Allowable Stress - 30,000 PSI per ASME B31.3

3D step models available upon request

Pressure Rating Guide, Metric Carbon Steel Tubes

Type E235+N (ST 37.4 NBK)

According to DNV Rules for Marine and Offshore Applications

Cr (VI) Free plated or phosphated and oiled inside and outside.

Tube OD x Wall mm	Connection Type	1. DNV Working Pressure bar	2. DNV Working Pressure bar	3. Burst Pressure bar	Weight kg/mtr
20 x 2.0	Flare	185	212	702	0.89
20 x 2.5	Flare	246	282	878	1.08
20 x 3.0	Flare	309	356	1053	1.26
25 x 2.5	Flare	193	221	702	1.39
25 x 3.0	Flare	242	277	842	1.63
25 x 4.0	Flare	344	397	1123	2.07
30 x 3.0	Flare	198	227	702	2.00
30 x 4.0	Flare	281	323	936	2.56
30 x 5.0	Flare	368	425	1170	3.08
38 x 3.0	Flare	154	176	554	2.59
38 x 4.0	Flare	217	248	739	3.35
38 x 5.0	Flare	282	324	924	4.07
42 x 3.0	Flare	139	158	501	2.89
42 x 4.0	Flare	194	223	669	3.75
50 x 3.0	Flare	115	132	421	3.58
60 x 3.0	Flare	95	109	351	4.22
75 x 3.0	Flare	76	86	281	5.32
90 x 3.5	Flare	75	85	273	7.47
100 x 4.0	Flare	78	89	281	9.47
115 x 4.0	Flare	68	77	244	10.98
140 x 4.5	Flare	63	72	226	15.04
165 x 5.0	Flare	60	68	213	19.73
220 x 6.0	Flare	55	62	191	31.66
273 x 6.0	Flare	44	50	154	39.51

*Other sizes on request

Note:

1. Working Pressure for bent pipe including manufacturing and corrosion tolerances.
2. Working Pressure for straight pipe including manufacturing and corrosion tolerances.
3. Burst Pressure including manufacturing tolerances.

Pressure Rating Guide, Metric Carbon Steel Tubes

Type E235+N (ST 37.4 NBK)

Pressure Rating according to DIN Rules for Land Based & Industrial Application

Cr (VI) Free plated or phosphated and oiled inside and outside.

Tube OD x Wall mm	Connection Type	1. DIN 2413 I Working Pressure bar	2. DIN 2413 III Working Pressure bar	3. Burst Pressure bar	Weight kg/mtr
20 x 2.0	Flare	282	248	702	0.89
20 x 2.5	Flare	353	303	878	1.08
20 x 3.0	Flare	423	357	1053	1.26
25 x 2.5	Flare	282	248	702	1.39
25 x 3.0	Flare	338	292	842	1.63
25 x 4.0	Flare	451	378	1123	2.07
30 x 3.0	Flare	282	248	702	2.00
30 x 4.0	Flare	376	321	936	2.56
30 x 5.0	Flare	470	391	1170	3.08
38 x 3.0	Flare	223	199	554	2.59
38 x 4.0	Flare	297	260	739	3.35
38 x 5.0	Flare	371	318	924	4.07
42 x 3.0	Flare	201	181	501	2.89
42 x 4.0	Flare	269	237	669	3.75
50 x 3.0	Flare	169	154	421	3.58
60 x 3.0	Flare	141	129	351	4.22
75 x 3.0	Flare	113	104	281	5.32
90 x 3.5	Flare	110	101	273	7.47
100 x 4.0	Flare	113	104	281	9.47
115 x 4.0	Flare	98	91	244	10.98
140 x 4.5	Flare	91	84	226	15.04
165 x 5.0	Flare	85	80	213	19.73
220 x 6.0	Flare	77	72	191	31.66
273 x 6.0	Flare	62	58	154	39.51

*Other sizes on request

Note:

1. Static Working Pressure for straight pipe including manufacturing tolerances.
2. Dynamic Working Pressure for straight pipe including manufacturing tolerances.
3. Burst Pressure including manufacturing tolerances.

3D step models available upon request

Pressure Rating Guide, Metric Carbon Steel Tubes

Type E355+N (ST 52.4 NBK)

Pressure Rating according to DNV Rules for Marine and Offshore Applications

Cr (VI) Free plated or phosphated and oiled inside and outside.

Tube OD x Wall mm	Connection Type	1. DNV Working Pressure bar	2. DNV Working Pressure bar	3. Burst Pressure bar	Weight kg/mtr
20 x 2.5	Flare	371	426	1199	1.08
20 x 3.0	Flare	467	537	1439	1.26
25 x 3.0	Flare	365	418	1151	1.63
25 x 4.0	Flare	519	599	1535	2.07
30 x 4.0	Flare	424	487	1279	2.56
30 x 5.0	Flare	555	641	1599	3.08
38 x 3.0	Flare	233	266	757	2.37
38 x 4.0	Flare	327	375	1010	3.35
38 x 5.0	Flare	426	490	1262	4.07
42 x 3.0	Flare	209	239	685	2.89
42 x 4.0	Flare	294	336	914	3.75
50 x 5.0	Flare	315	361	959	5.55
50 x 6.0	Flare	390	448	1151	6.50
56 x 8.5	Flare & Retain Ring	516	595	1456	9.96
60 x 5.0	Flare	259	297	800	6.78
60 x 6.0	Flare	319	366	959	7.97
66 x 8.5	Flare & Retain Ring	429	494	1236	12.05
73 x 7.0	Flare	309	353	920	11.22
75 x 5.0	Flare	205	234	640	8.63
80 x 10	Flare & Retain Ring	418	481	1199	17.21
90 x 5.0	Flare	169	193	533	10.48
90 x 9.0	Flare	326	374	959	17.98
97 x 12	Flare & Retain Ring	416	478	1187	25.15
115 x 15	Retain Ring	444	511	1251	36.95
130 x 15	Retain Ring	388	445	1107	42.54
150 x 15	Retain Ring	332	380	959	49.94
190 x 20	Retain Ring	353	405	1010	83.84
250 x 25	Retain Ring	335	384	959	138.72

*Other sizes on request

Note:

1. Working Pressure for bent pipe including manufacturing and corrosion tolerances.
2. Working Pressure for straight pipe including manufacturing and corrosion tolerances.
3. Burst Pressure including manufacturing tolerances.

Pressure Rating Guide, Metric Carbon Steel Tubes

Type E355+N (ST 52.4 NBK)

Pressure Rating according to DIN Rules for Land Based and Industrial Applications

Cr (VI) Free plated or phosphated and oiled inside and outside.

Tube OD x Wall mm	Connection Type	1. DIN 2413 I Working Pressure bar	2. DIN 2413 III Working Pressure bar	3. Burst Pressure bar	Weight kg/mtr
20 x 2.5	Flare	533	357	1199	1.08
20 x 3.0	Flare	639	420	1439	1.26
25 x 3.0	Flare	511	344	1151	1.63
25 x 4.0	Flare	682	445	1535	2.07
30 x 4.0	Flare	568	379	1279	2.56
30 x 5.0	Flare	710	461	1599	3.08
38 x 3.0	Flare	336	234	757	2.37
38 x 4.0	Flare	448	306	1010	3.35
38 x 5.0	Flare	561	374	1262	4.07
42 x 3.0	Flare	304	213	685	2.89
42 x 4.0	Flare	406	279	914	3.75
50 x 5.0	Flare	426	292	959	5.55
50 x 6.0	Flare	511	344	1151	6.50
56 x 8.5	Flare & Retain Ring	647	425	1456	9.96
60 x 5.0	Flare	355	247	800	6.78
60 x 6.0	Flare	426	292	959	7.97
66 x 8.5	Flare & Retain Ring	549	367	1236	12.05
73 x 7.0	Flare	408	281	920	11.22
75 x 5.0	Flare	284	200	640	8.63
80 x 10	Flare & Retain Ring	533	357	1199	17.21
90 x 5.0	Flare	237	168	533	10.48
90 x 9.0	Flare	426	292	959	17.98
97 x 12	Flare & Retain Ring	527	354	1187	25.15
115 x 15	Retain Ring	556	371	1251	36.95
130 x 15	Retain Ring	492	332	1107	42.54
150 x 15	Retain Ring	426	292	959	49.94
190 x 20	Retain Ring	448	306	1010	83.84
250 x 25	Retain Ring	426	292	959	138.72

*Other sizes on request

Note:

1. Static Working Pressure for straight pipe including manufacturing tolerances.
2. Dynamic Working Pressure for straight pipe including manufacturing tolerances.
3. Burst Pressure including manufacturing tolerances.

3D step models available upon request

Pressure Rating Guide, Metric Stainless Steel Tubes

Type ASTM A269 Type 316/316L

Pressure Rating according to DNV Rules for Marine and Offshore Applications

Tube OD x Wall mm	Connection Type	1. DNV Working Pressure bar	2. Burst Pressure bar	Weight kg/mtr
20 x 2.0	Flare	298	954	0.90
20 x 2.5	Flare	380	1193	1.10
20 x 3.0	Flare	467	1431	1.28
25 x 2.5	Flare	298	954	1.41
25 x 3.0	Flare	363	1145	1.65
25 x 4.0	Flare	476	1524	2.07
30 x 3.0	Flare	298	954	2.03
30 x 4.0	Flare	409	1272	2.60
30 x 5.0	Flare	498	1590	3.08
38 x 3.0	Flare	231	753	2.63
38 x 4.0	Flare	315	1004	3.41
38 x 5.0	Flare	403	1255	4.12
42 x 3.0	Flare	207	681	2.89
42 x 4.0	Flare	277	908	3.75
50 x 3.0	Flare	115	572	3.53
50 x5.0	Flare	173	954	5.63
50 x 6.0	Flare	363	1145	6.61
56 x 8.5*	Flare & Retain Ring	446	1447	9.97
60 x 3.0	Flare	143	477	4.28
60 x 5.0	Flare	244	795	6.89
60 x 6.0	Flare	297	954	8.00
66 x 8.5*	Flare & Retain Ring	393	1229	12.24
73 x 7.0	Flare	284	915	11.57
75 x 3.0	Flare	113	382	5.41
75 x 5.0	Flare	193	636	8.76
75 x 7.0	Flare	274	889	12.00
80 x 10*	Flare & Retain Ring	380	1193	17.53
90 x 3.5	Flare	110	370	7.48
90 x 5.0	Flare	159	582	10.49
90 x 9.0	Flare	294	954	17.98
97 x 12*	Flare & Retain Ring	376	1180	25.54

Other sizes on request

* Non-stock in stainless steel, special order.

Note:

1. Working Pressure for bent pipe including manufacturing and corrosion tolerances.
2. Burst Pressure including manufacturing tolerances.

Pressure Rating Guide, Metric Stainless Steel Tubes

Type ASTM A269 Type 316/316L

Pressure Rating according to DIN Rules for Land Based and Industrial Applications

Tube OD x Wall mm	Connection Type	1. DIN 2413 I Working Pressure bar	2. Burst Pressure bar	Weight kg/mtr
20 x 2.0	Flare	294	954	0.90
20 x 2.5	Flare	368	1193	1.10
20 x 3.0	Flare	441	1431	1.28
25 x 2.5	Flare	294	954	1.41
25 x 3.0	Flare	353	1145	1.65
25 x 4.0	Flare	470	1524	2.07
30 x 3.0	Flare	294	954	2.03
30 x 4.0	Flare	392	1272	2.60
30 x 5.0	Flare	490	1590	3.08
38 x 3.0	Flare	232	753	2.63
38 x 4.0	Flare	309	1004	3.41
38 x 5.0	Flare	387	1255	4.12
42 x 3.0	Flare	210	681	2.93
42 x 4.0	Flare	280	908	3.75
50 x 3.0	Flare	176	572	3.53
50 x5.0	Flare	294	954	5.63
50 x 6.0	Flare	353	1145	6.61
56 x 8.5*	Flare & Retain Ring	446	1447	9.97
60 x 3.0	Flare	147	477	4.28
60 x 5.0	Flare	245	795	6.89
60 x 6.0	Flare	294	954	8.00
66 x 8.5*	Flare & Retain Ring	379	1229	12.24
73 x 7.0	Flare	282	915	11.57
75 x 3.0	Flare	118	382	5.41
75 x 5.0	Flare	196	636	8.76
75 x 7.0	Flare	274	889	12.00
80 x 10*	Flare & Retain Ring	368	1193	17.53
90 x 3.5	Flare	114	370	7.48
90 x 5.0	Flare	163	582	10.49
90 x 9.0	Flare	294	954	17.98
97 x 12*	Flare & Retain Ring	364	1180	25.54

Other sizes on request

* Non-stock in stainless steel, special order.

Note:

1. Static Working Pressure for straight pipe including manufacturing tolerances.
2. Burst Pressure including manufacturing tolerances.

3D step models available upon request

Pressure Calculations for Marine & Offshore Applications

According to DNV Rules Part 4, Chapter 6, Section 6.

Working Pressure of Carbon Steel and Stainless Steel tubes acc. to DNV Rules

$$P = \frac{20 \times \delta t \times e \times t_o}{D - t_o}$$

P = permissible working pressure (bar)

δt = permissible stress (N/mm2) calculated from the lower value of:

Carbon Steel:

$$\delta t = \frac{R_m}{2.7} \text{ or } \frac{K}{1.8}$$

Stainless Steel:

$$\delta t = \frac{R_m}{2.7} \text{ or } \frac{K}{1.6}$$

to = tube wall thickness without allowances (mm)

to = tn x a-c-b

where;

tn = tube wall thickness (mm)

a = factor for wall thickness allowance (mm)

= 0.9 for tubes with an OD ≥ 10 mm

= 0.9 for all stainless steel tubes

b = bending allowance

$$B = 0.1333 \times t_o \text{ (at R/D=3)} \longrightarrow t_o = \frac{t_n \times a - c}{1.13333}$$

c = corrosion tolerance, c = 0.3mm for hydraulic steel tube and c = 0 mm for stainless steel

e = strength ratio. Note for seamless tubes e = 1

D = tube outside diameter (mm)

Rm = minimum tensile strength (N/mm2)

K = minimum yield strength or minimum 0.2% proof stress (N/mm^2)

Material Type	Specification	Yield (minimum)	Tensile (minimum)	Permissible Stress
E235+N (St 37.4)	DIN EN 10305-4	235 N/mm^2	340 N/mm^2	126 N/mm^2 (tensile strength/2.7)
E355+N (St 52.4)	DIN EN 10305-4	355 N/mm^2	490 N/mm^2	181 N/mm^2 (tensile strength/2.7)
Dual Spec 316/316L Metric Tube	DIN EN 10216-5 ASTM 269/A213	210 N/mm^2	500 N/mm^2	131 N/mm^2 (0.2% proof stress/1.6)[1]
Dual Spec 316/316L Schedule Pipe	ASTM A312	234 N/mm^2	515 N/mm^2	146 N/mm^2 (0.2% proof stress/1.6)[1]

1. Pressure rating calculation based on manufacturers certification according to 3.1 EN 10204 that confirms the mechanical properties.

Pressure Calculations for Land Based & Industrial Applications

According to DIN Rules. Corrosion allowances are not considered in the calculations.

DIN 2413 I, for static load

$$P = \frac{20 \times K \times s \times c}{S \times D}$$

where;
P = permissible working pressure (bar)
K = minimum yield strength (N/mm2)
s = tube wall thickness (mm)
c = factor for wall thickness allowance (mm)
= 0.9 for tubes with an OD ≥ 10 mm
= 0.9 for all stainless steel tubes
S = Safety Factor of 1.5
D = tube outside diameter (mm)

DIN 2413 III, for dynamic load

$$P = \frac{20 \times K \times s \times c}{S \times (D + s \times c)}$$

where;
P = permissible working pressure (bar)
K = fatigue strength (N/mm2)
s = tube wall thickness (mm)
c = factor for wall thickness allowance (mm)
= 0.9 for tubes with an OD ≥ 10 mm
= 0.9 for all stainless steel tubes
S = Safety Factor of 1.5
D = tube outside diameter (mm)

Burst Pressure Calculations

$$BP = \frac{20 \times Rm \times s \times c}{D}$$

where;
BP = Burst Pressure
Rm = minimum tensile strength
s = tube wall thickness
c = factor for wall thickness allowance (mm)
= 0.9 for tubes with an OD ≥ 10 mm
= 0.9 for all stainless steel tubes
D = tube outside diameter (mm)

Material Type	Specification	Yield (minimum)	Tensile (minimum)	Fatigue Strength	Elongation
E235+N (St 37.4)	DIN EN 10305-4	235 N/mm²	340 N/mm²	225 N/mm2	Min. 25%
E355+N (St 52.4)	DIN EN 10305-4	355 N/mm²	490 N/mm²	265 N/mm2	Min. 22%
Dual Spec 316/316L Metric Tube	DIN EN 10216-5 ASTM 269/A213	210 N/mm²	500 N/mm²	220 N/mm2	Min. 35%
Dual Spec 316/316L Schedule Pipe	ASTM A312	234 N/mm²	515 N/mm²	146 N/mm2	Min 40%

Note:
All tube and pipes are cold drawn, seamless, materials.

3D step models available upon request

Pressure Calculations for NPS Pipe

According to ASME B31.3 Rules includes manufacturing tolerance.

Corrosion allowances are not considered in the calculations.

$$P = \frac{2S \times t \times E}{D - (2Y \times t)}$$

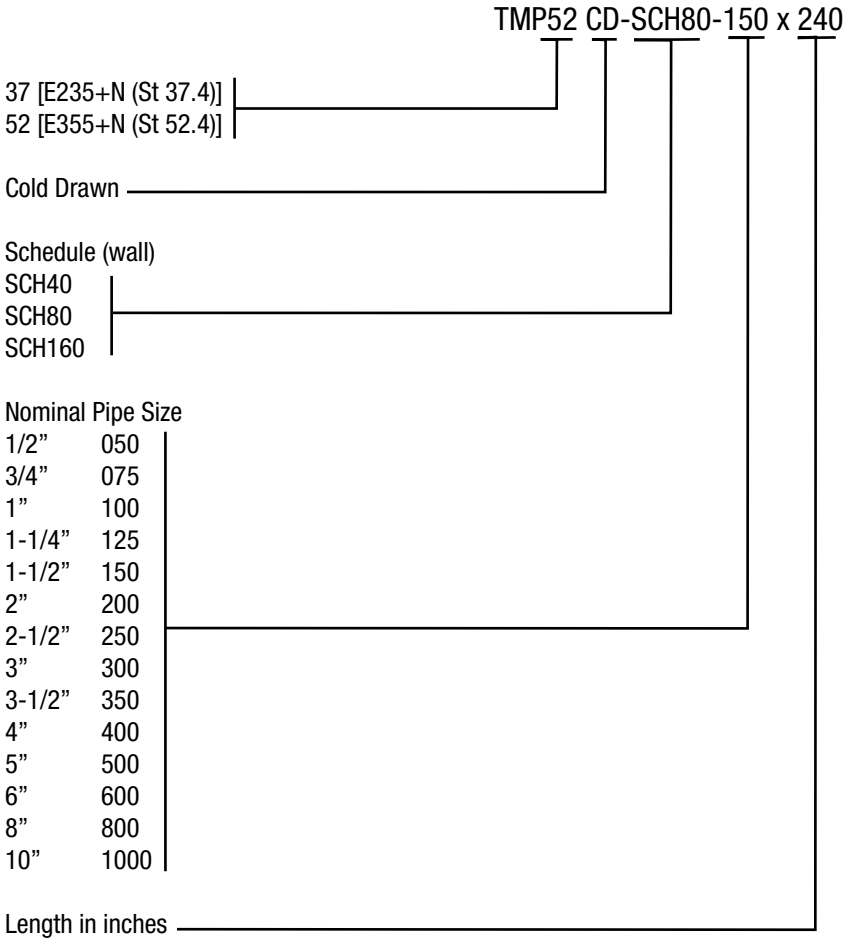
where;
P = permissible working pressure (PSI)
S = allowable stress (PSI)
E = quality factor
Y = co-efficient factor
t = nominal wall thickness less manufacturing tolerance (inches)
D = tube outside diameter (inches)

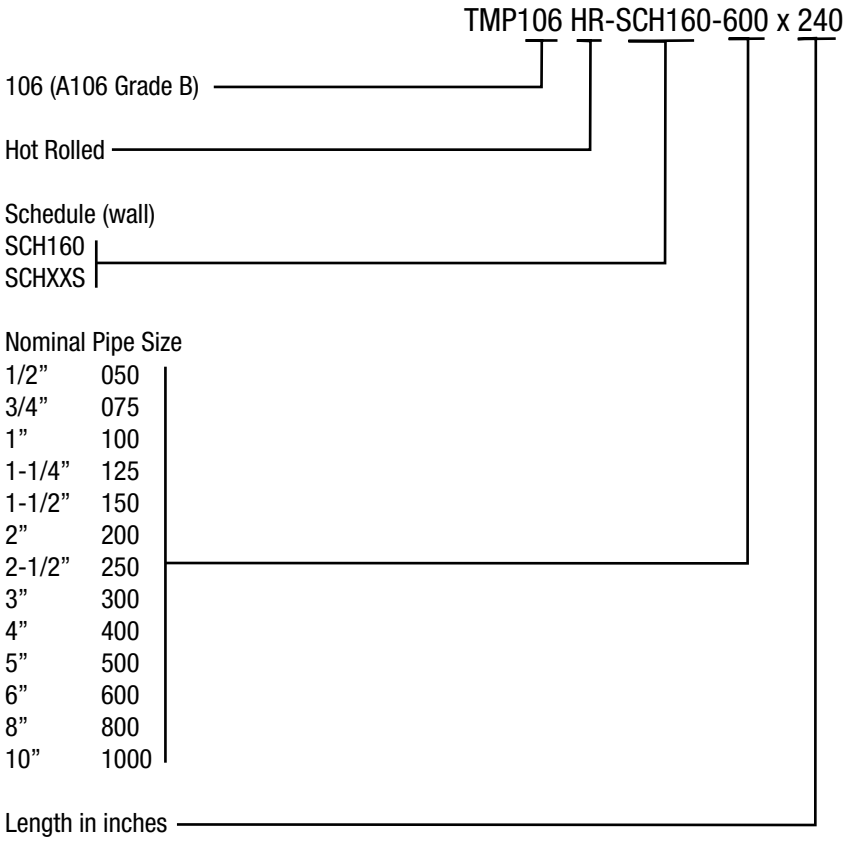
	Carbon Steel	
	E235+N (St 37.4)	**E355+N (St 52.4)**
S = allow stress (PSI)	20000	24000
E = Quality Factor	1.00	1.00
Y = co-efficient factor	0.40	0.40
T = wall thickness (inches) less % manufacturing tolerance	-12.5%	-10%
D = pipe OD (inches)	See Page C5	

Stainless Steel			
ASTM A312 304L & 316L	**ASTM A312 304 & 316**	**Duplex UNS S32205 1/2" up to 1-1/4"**	**Duplex UNS S32205 1-1/2" and larger**
16700	20000	30000	30000
1.00	1.00	1.00	1.00
0.40	0.40	0.40	0.40
-12.5%	-12.5%	-10%	-12.5%
See Page C6 and C7			

3D step models available upon request

Ordering Examples for NPS Carbon Steel Pipe

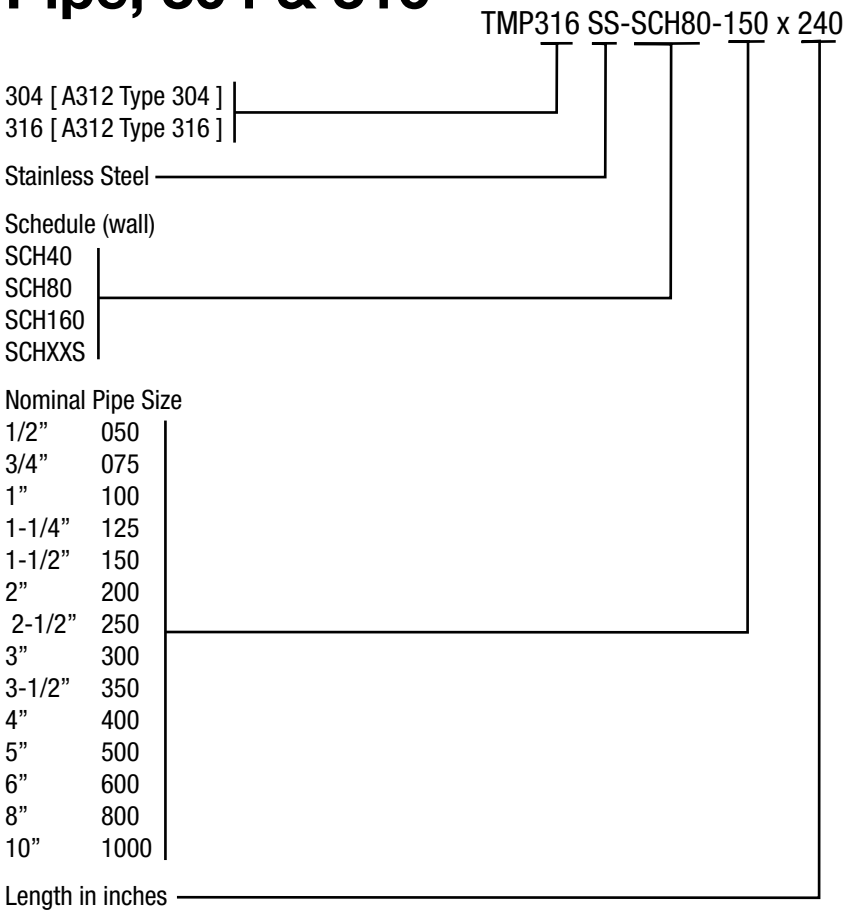




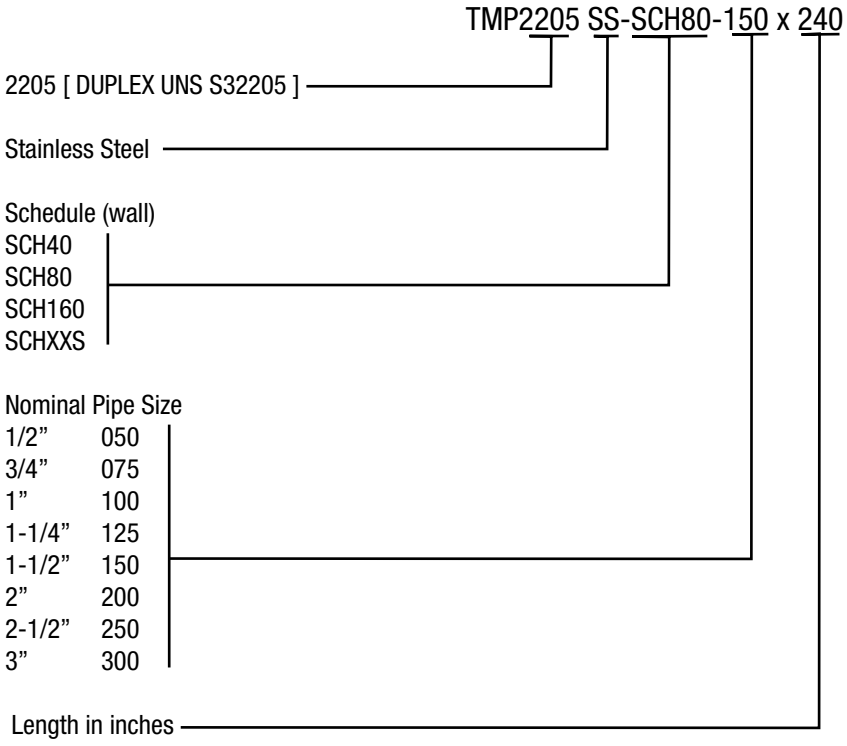
*ASTM A106 Grade B are mechanically cleaned & oiled. Recommended for Retain Ring piping connection system only

3D step models available upon request

Ordering Examples for NPS Stainless Steel Pipe, 304 & 316

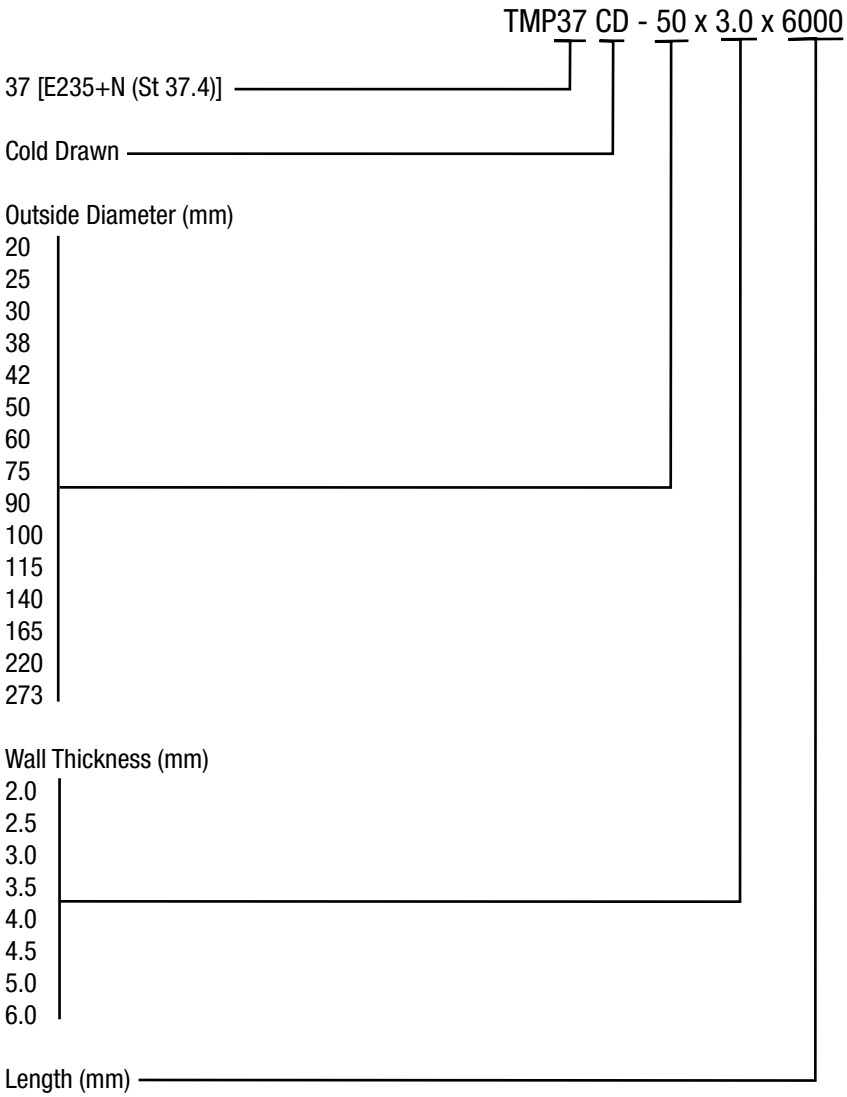


Ordering Examples for NPS Stainless Steel Pipe, DUPLEX



3D step models available upon request

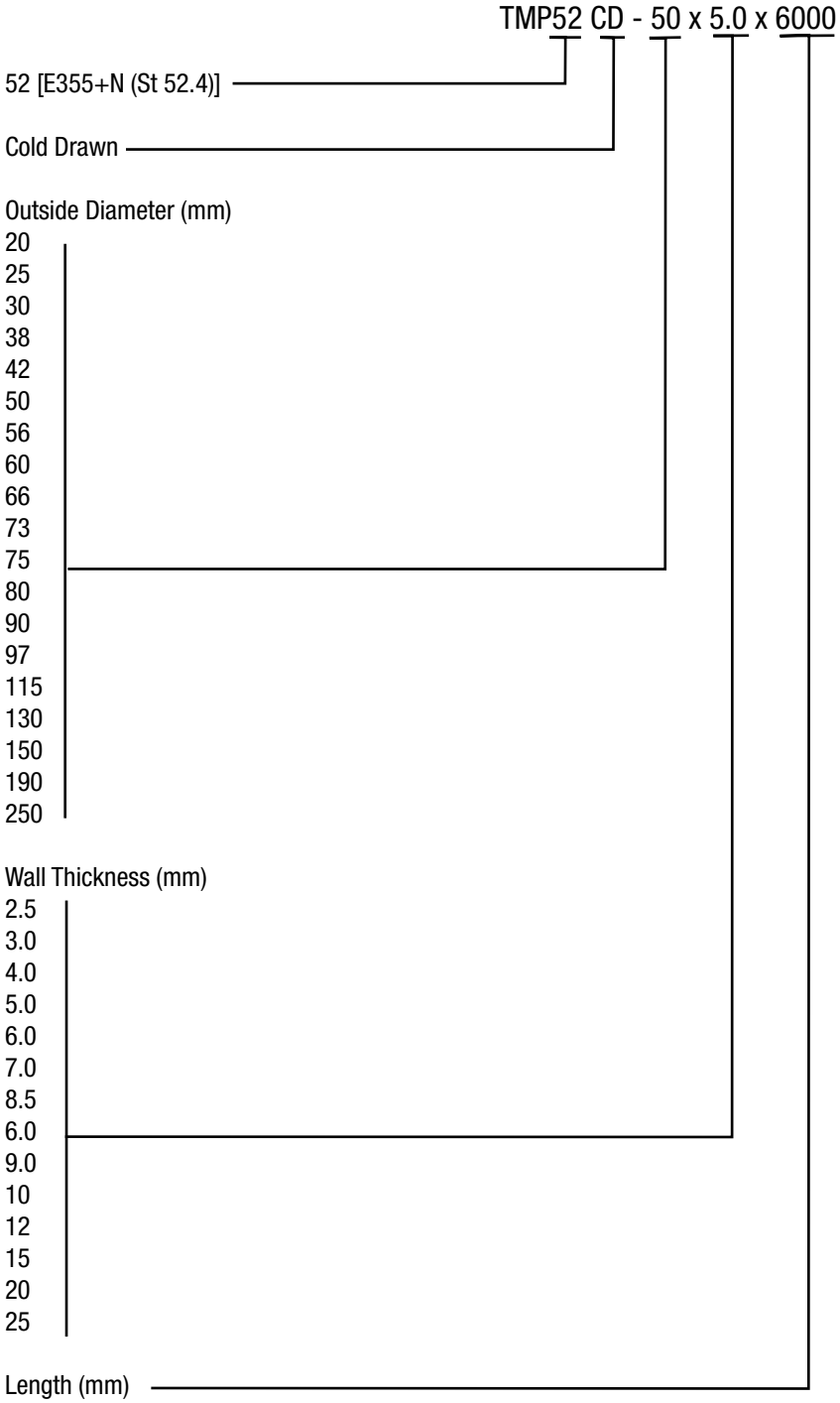
Ordering Examples for Carbon Steel Metric Tubes, St 37.4



Note:
For the correct OD x Wall selection please refer to the Pressure Rating Guide on Pages C8 and C9.

3D step models available upon request

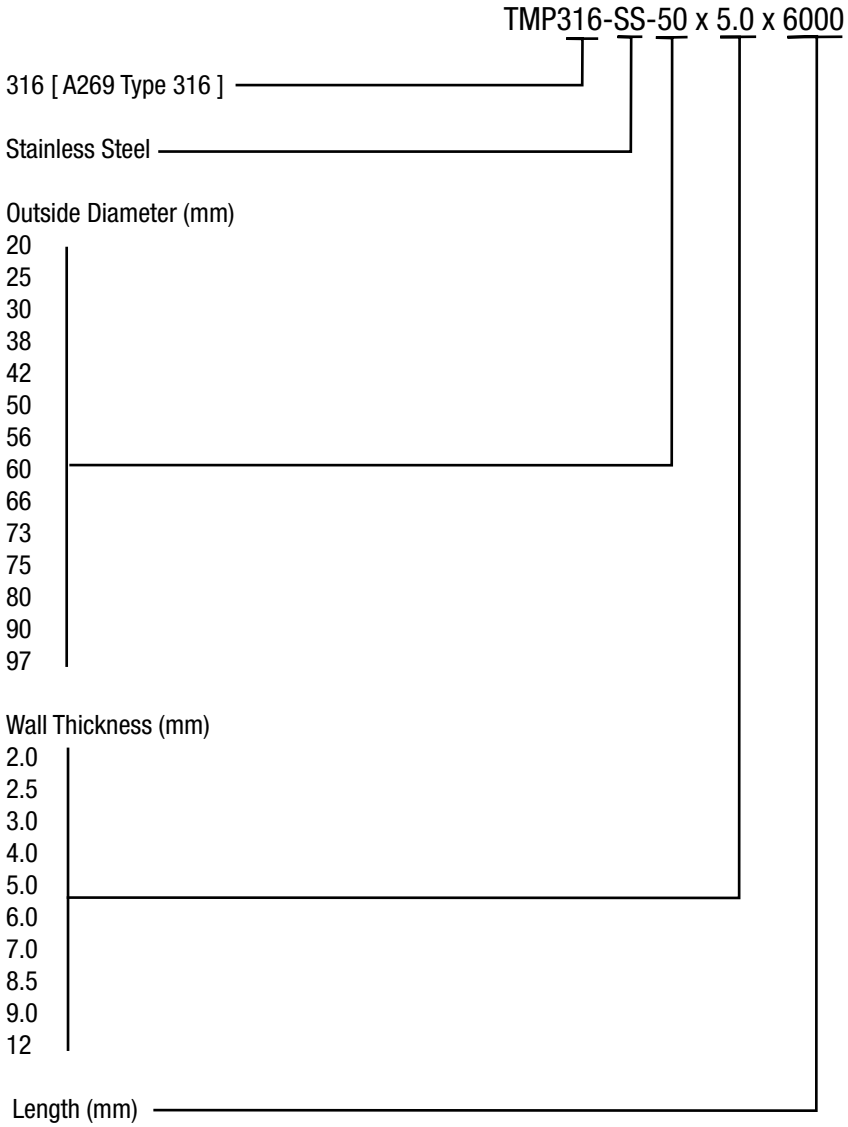
Ordering Examples for NPS Stainless Steel Pipe, 304 & 316



Note:
For the correct OD x Wall selection please refer to the Pressure Rating Guide on Pages C10 and C11.

3D step models available upon request

Ordering Examples for Stainless Steel Metric Tubes Dual Spec 316/316L



Note:
For the correct OD x Wall selection please refer to the Pressure Rating Guide on Page C12.

3D step models available upon request

Notes

Notes