

咱们国内常用的不锈钢为 304（下表中 0Cr18Ni9），其常温下许用应力为 137MPa。

钢号	钢板标准	使用状态	厚度 mm	在下列温度(C)下的许用应力,MPa																	注			
				≤20	100	150	200	250	300	350	400	425	450	475	500	525	550	575	600	625		650	675	700
高合金钢板																								
0Cr13Al	GB 4237	退火	2~15	118	105	101	100	99	97	95	90	87	—	—	—	—	—	—	—	—	—	—		
0Cr13	GB 4237	退火	2~60	137	126	123	120	119	117	112	109	105	100	89	72	53	38	26	16	—	—	—	—	
0Cr18Ni9	GB 4237	固溶	2~60	137	137	137	130	122	114	111	107	105	103	101	100	98	91	79	64	52	42	32	27	4)
				137	114	103	96	90	85	82	79	78	76	75	74	73	71	67	62	52	42	32	27	
0Cr18Ni10Ti	GB 4237	固溶, 稳定化	2~60	137	137	137	130	122	114	111	108	106	105	104	103	101	83	58	44	33	25	18	13	4)
				137	114	103	96	90	85	82	80	79	78	77	76	75	74	73	71	67	62	52	42	32

根据公式：壁厚 $\delta$ =设计压力 P×内径 D/（2×许用应力 $\sigma$ ×焊缝系数 $\phi$ —设计压力 P），如果设计压力 P=2000 psi（约 13.8MPa），内径 D=20mm，焊缝系数 $\phi$ =1，温度为 500 度（许用应力为 100MPa），计算出壁厚 $\delta$ 为：

$$\delta = 13.8 \times 20 / (200 - 13.8) = 1.5 \text{ mm}$$

壁厚跟内径成正比，内径减小一半，则壁厚相应减小一半。大家可以根据上面的计算简单得出答案。

另外，由于我们所用的很多样品管为 Swagelok 316 不锈钢管，工作压力可参考以下数据：

**Suggested Allowable Working Pressure for Stainless Steel Tubing**

**Table 3—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.

Tube OD in.	Tube Wall Thickness, in.															Swagelok Fitting Series	
	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
Working Pressure, psig Note: For gas service, select a tube wall thickness outside of the shaded area. (See Gas Service, page 2.)																	
1/16	5600	6800	8100	9400	12 000												100
1/8						8500	10 900										200
3/16						5400	7 000	10 200									300
1/4						4000	5 100	7 500	10 200 <sup>①</sup>								400
5/16							4 000	5 800	8 000								500
3/8							3 300	4 800	6 500	7500 <sup>①②</sup>							600
1/2							2 600	3 700	5 100	6700							810
5/8								2 900	4 000	5200	6000						1010
3/4								2 400	3 300	4200	4900	5800					1210
7/8								2 000	2 800	3600	4200	4800					1410
1									2 400	3100	3600	4200	4700				1610
1 1/4										2400	2800	3300	3600	4100	4900		2000
1 1/2											2300	2700	3000	3400	4000	4900	2400
2												2000	2200	2500	2900	3600	3200

① For higher pressures, see the Swagelok *Medium-Pressure Fittings* catalog, MS-02-335, or the Swagelok *High-Pressure Fittings* catalog, MS-01-34.

② Rating based on repeated pressure testing of the Swagelok tube fitting with a 4:1 design factor based upon hydraulic fluid leakage.

温度因子见下表，如在 537 度下上表中的工作压力需乘以 0.76：

°F	°C	Al	Copper	Carbon Steel <sup>①</sup>	304, 304L <sup>②</sup>	316, 316L/316L <sup>②</sup>
200	93	1.00	0.80	0.95	1.00	1.00
400	204	0.40	0.50	0.87 <sup>①</sup>	0.93	0.96
600	315				0.82	0.85
800	426				0.76	0.79
1000	537				0.69	0.76