STAINLESS STEEL DATA

	Austenitic									Martensitic				Ferritic
	302	303	304	304L	310S	316	316L	321	347	409	410	420	431	430

Usual Form Available

Sheet			•	•	▲	•	•	▲	▲	▲				▲
Plate			•	•	▲	•	•	▲	▲					
Coil			•	•	▲	•	•	▲	▲	▲				▲
Treadplate			•	▲		▲	▲		▲					
Sections	▲	▲	•	•	▲	•		▲	▲		▲	▲	▲	
Tube			•	▲		•	▲		▲	▲		▲		▲
Pipe			•	•	▲	•	•	▲	▲					

• Available as a normal stock item
▲ Available on indent only

Nearest Relevant Specifications

BS Number	S25	S21	S15	S12	S24	S16	S11/S12	S12/S31	S17/S31	S19	S21	S45	S29	S15
German DIN	X 12 C rNi 18 8	X 10 CrNiS 18 9	X 5 CrNi 18 10	X 2 CrNi 19 11	X 12 CrNi 25 21	X 5 CrNiMo 17 12 2	X 2 CrNiMo 18 14 3	X 6 CrNiTi 18 10	X 6 CrNiNb 18 10	X 12 Cr 13	X CRTI 12	X 20 Cr 13	X 20 Cr Ni 17 2	X 6 Cr 17
Werkstoff	1.4300	1.4305	1.4301	1.4306	1.4845	1.4436	1.4435	1.4541	1.4550	1.4512	1.4006	1.4021	1.4057	1.4016

Chemical Composition to AISI in % (Figures are approximate only)

Chromium	Cr	17-19	17-19	18-20	18-20	24-26	16-18	16-18	17-19	17-19	10.5-11.75	11.5-13.5	12-14	15-17	16-18
Nickel	Ni	8-10	8-10	8-10.5	8-12	19-22	10-14	10-14	9-12	9-13	-	-	-	1.25-2.50	-
Carbon	C	0.15	0.15	0.08	0.03	0.08	0.08	0.03	0.08	0.08	0.08	0.15[a]	0.15[a]	0.20	0.12
Manganese	Mn	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00
Phosphorus	P	0.045	0.20	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.04	0.04	0.04	0.04
Sulphur	S	0.03	0.15[a]	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.045	0.03	0.03	0.03	0.03
Silicon	Si	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Molybdenum	Mo		0.6*	-	-	-	2-3	2-3	-	-	-	-	-	-	-
Nitrogen	N	-	-	0.1	0.1	-	-	0.1	-	-	-	-	-	-	-
Titanium	Ti	-	-	-	-	-	-	-	-	-	6 x C	-	-	-	-
Columbium + Tantalum	Cb+Ta	-	-	-	-	-	-	-	-	10 x C	-	-	-	-	-

a = minimum, * = optional

Typical Mechanical Properties (NOTE: All the values below are given for sheet/plate/bar in the annealed condition at room temperature)

Tensile Strength	MPa	Sheet	621	-	579	558	655	579	558	621	655	448	483	-	517	-
	PSi		90000	-	84000	81000	95000	84000	81000	90000	95000	65000	70000	-	75000	-
		Plate	621	-	565	545	655	565	558	586	621	448	483	-	517	-
			90000	-	82000	79000	95000	82000	81000	85000	90000	65000	70000	-	75000	-
		Bar	586	621	586	517	655	552	517	586	621	448	517	625	517	862
			85000	90000	85000	75000	95000	80000	75000	85000	90000	65000	75000	95000	75000	125000
Yield Strength	MPa	Sheet	276	-	290	269	310	290	290	241	276	241	310	-	345	-
	PSi		40000	-	42000	39000	45000	42000	42000	35000	40000	35000	45000	-	50000	-
		Plate	241	-	241	228	310	248	234	241	241	241	241	-	276	-
			35000	-	35000	33000	45000	36000	34000	35000	35000	35000	35000	-	40000	-
		Bar	241	241	234	207	310	241	207	241	241	241	276	345	310	655
			35000	35000	34000	30000	45000	35000	30000	35000	35000	35000	40000	50000	45000	95000
Elongation in		Sheet	50	-	55	55	45	50	50	45	45	25	25	50	25	-
50.8mm (2")		Plate	60	-	60	60	50	55	55	55	50	25	30	-	30	-
		Bar	60	50	60	60	50	60	60	55	50	25	35	25	30	20
Free Bend		Sheet	180	-	180	180	180	180	180	180	180	-	180	-	180	-
Degrees		Plate	-	-	180	180	180	180	180	180	180	-	180	-	180	-
		Bar	-	-	-	180	-	-	180	-	-	-	-	-	-	-
Hardness	HB	Sheet	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HR		B85	-	B80	B79	B85	B79	B79	B80	B85	B75	B80	-	B85	-
	HB	Plate	-	-	149	143	170	149	146	160	160	-	150	-	160	-
	HR		B80	-	-	-	-	-	-	-	-	B75	-	-	-	-
	HB	Bar	150	160	149	149	185	149	149	150	160	-	155	195	155	260
	HR		-	-	-	-	B89	B78	-	-	-	B75	B82	B92	-	C24
Endurance Limit	MPa	Sheet	-	-	241	-	-	269	-	-	-	-	-	-	-	-
(Fatigue)	PSI		-	-	35000	-	-	39000	-	-	-	-	-	-	-	-
		Plate	-	-	241	-	-	269	-	-	-	-	-	-	-	-
			-	-	35000	-	-	39000	-	-	-	-	-	-	-	-
		Bar	234	241	234	-	-	262	-	262	269	-	276	-	276	-
			34000	35000	34000	-	-	38000	-	38000	39000	-	40000	-	40000	-
Specific Electrical Resistance at Room Temperature in μΩcm			72	72	72	-	78	74	-	72	73	-	57	55	60	72
Thermal Conductivity μm/m°C		at 100°C	12.5	-	12.5	12.5	15.5	16.5	16.5	17.0	12.5	-	-	-	-	10.4
		at 300°C	13.0	-	13.0	13.0	16.5	17.5	17.5	17.8	13.0	-	-	-	-	11.0
		at 500°C	13.8	-	13.8	13.8	17.25	18.25	18.25	18.25	13.8	-	-	-	-	11.3

Note: Typical Mechanical Properties shown here are taken from AISI Stainless & Heat Resisting Manual 1994.

STAINLESS STEEL DATA

	Austenitic								Martensitic				Ferritic
	302	303	304	304L	310S	316	316L	321	347	409	410	420	431	430

Heat Resistance - Maximum Operating Temperatures

Continuous Service	°F	1700	1600	1700	1700	2100	1700	1700	1700	1700	-	1300	1150	1600	1500
	°C	925	870	925	925	1150	925	925	925	925	-	705	620	870	815
Intermittent Service	°F	1600	1400	1600	1600	1900	1600	1600	1600	1600	-	1500	1350	-	1600
	°C	870	760	870	870	1035	870	870	870	870	-	815	735	-	870

Relative Fabrication Properties

Machining (machinability taking mild steel at 100)		51	75	49	70	75	48	60	55	100	150	145	115	49	60
Spinning		G	G	VG	G	G	G	F	G	G	F	F	F	F	G
Welding		G	U	G	VG	G	G	VG	VG	VG	VG	G	F	G	VG
Cold Working	Roll Threading		F	G	G	F	F	F	F	F	E	E	F	G	E
	Upsetting		F	F	F	G	F	F	F	F	G	G	F	G	E
	Swaging		G	G	G	F	F	F	F	F	G	G	F	G	G
Hot Working	Forging		P	G	G	G	G	G	F	F	G	G	G	F	G
	Heading		F	G	G	G	G	G	F	F	G	G	G	G	G
	Upsetting		F	G	G	G	G	G	F	F	G	G	G	G	G
Joining	Brazing		G	G	G	VG	G	G	VG	VG	G	G	F	F	VG
	Hard Soldering		G	VG	VG	F	F	F	F	F	F	F	F	F	G
	Soft Soldering		G	VG	VG	F	F	F	F	F	G	G	G	G	G
	Welding		P	E	E	E	E	E	E	E	G	G	F	F	F
Metal Removal	Electro Polishing		F	E	E	E	E	E	G	G	G	G	F	G	E
	Grinding		VG	F	F	F	F	F	F	F	VG	VG	VG	G	G
	Machining		VG	F	F	P	F	F	F	F	G	G	F	F	G
	Polishing		G	E	E	E	E	E	E	E	VG	VG	VG	E	E

Material Condition Annealed E = Excellent VG = Very Good G = Good F = Fair P = Poor U = Unsuitable

A Guide for Type 304 & T316 in the annealed condition:

Radius of Bend	Amount of Overbending in Degrees
1 x thickness	2
6 x thickness	4
20 x thickness	15

Thermal Expansion

Approximate amount of thermal expansion that occurs in T316 & T304 stainless steels subjected to temperature changes in the range 0-100˚C

Length (m)	Expansion (mm)										
10	0	2	3	5	6	8	10	11	13	15	16
9	0	1	3	4	6	7	9	10	12	13	15
8	0	1	3	4	5	6	8	9	10	12	13
7	0	1	2	3	5	6	7	8	9	10	11
6	0	1	2	3	4	5	6	7	8	9	10
5	0	1	2	2	3	4	5	6	6	7	8
4	0	1	1	2	3	3	4	5	5	6	6
3	0	0	1	1	1	2	3	3	4	4	5
2	0	0	1	1	1	2	2	2	3	3	3
1	0	0	0	0	1	1	1	1	1	1	2
Temperature Change (˚C)	0	10	20	30	40	50	60	70	80	90	100

TYPES OF STAINLESS STEELS

Stainless Steel is a name given to a group of steel alloys that contain more than 12% Chromium. Chromium has a high affinity for oxygen and forms a stable oxide film on the surface of the stainless steel. This film is called the passive oxide layer and forms instantaneously in ordinary atmospheres. The film is self healing and rebuilds when it has been removed. It is this film that gives Stainless Steel its corrosion resistance.
The large group of stainless steels can be divided into two groups - Austenitic and Ferritic, the Ferritic group being split again into two groups, Martensitic and Ferritic.

AUSTENITIC GRADES

This group of stainless steels contains 17 - 25% Chromium and 8 - 20% Nickel with various additional elements to achieve the desired properties. In the fully annealed condition Austenitic stainless steels exhibit a useful range of mechanical and physical properties (shown on the accompanying table). Mechanical properties can be increased with cold working. Welding of this group must be carried out with correct methods but the low Carbon content results in fewer problems than with the Ferritic and Martensitic grades. Normally these stainless steels are non-magnetic but will become slightly magnetic when cold worked. Basic grades of Austenitic stainless steels are listed below...

Descriptions and General Uses

T302	This grade is the original general purpose 18/8 stainless steel (18% Chromium 8% Nickel) from which the majority of other forms have been developed. It has good corrosion resistance combined with good typical physical properties - it has excellent ductility and welding characteristics. Non-magnetic when annealed and becomes slightly magnetic when cold worked.
T303	Specially developed for machining purposes where production involves extensive machining in automatic screw machines. Sulphur or Selenium is added to give excellent free machining and nonseizing properties. Due to the addition of Sulphur or Selenium the corrosion resistance is lowered to slightly below that of T304. T303 is Non hardenable and not recommended for welding. Non-magnetic when annealed but becomes slightly magnetic when cold worked.
T304	The most versatile and widely used stainless steel with the best all round performance. It's Carbon content is lower and its corrosion resistance somewhat higher that T302. It is less susceptible to intergranular corrosion after welding. Non-magnetic but become slightly magnetic when cold worked.
T304L	Type 304L is a very low Carbon stainless steel with general corrosion resistance similar to T304 but with superior resistance to intergranular corrosion following welding or stress relieving. It is recommended for use in parts which are fabricated by welding and which cannot be subsequently annealed. Parts made from this type are generally limited to service at temperatures up to 426˚C. The physical properties and thermal treatments of T304L are similar but not necessarily identical to those of T304. Non-magnetic when annealed but becomes slightly magnetic when cold worked.
T310S	Type 310S has been developed for high temperature service where high creep strength is required, it's maximum service temperature is approximately 1100˚C but it is not recommended for applications of prolonged service as brittleness may occur. Non magnetic when annealed or cold worked.
T316	Known as the marine alloy - T316 has a 2-3% addition of Molybdenum which improves the corrosion resistance. T316 has superior corrosion resistance to other Austenitic steels when exposed to many types of chemical corrodents as well as marine atmospheres - T316 also has applications in the chemical, textile, and paper industries. It has better strength and creep resistance at high temperatures than T304 and greater work hardening properties. Non-magnetic but becomes slightly magnetic when cold worked.
T316L	T316L is a very low Carbon stainless steel with general corrosion resistance similar to T316 but with superior resistance to intergranular corrosion following welding or stress relieving. It is recommended for use in parts which cannot be subsequently annealed. Parts made from this type are generally limited to service temperatures up to 426˚C. The physical properties and thermal treatments of Type 316L are similar but not necessarily identical to those of T316. Non-magnetic when annealed but becomes slightly magnetic when cold worked
T321	Basically T302 (basic 18/8) stabilised by the addition of Titanium to five times the Carbon content. This prevents intergranular corrosion and offers scale resistance at higher temperatures, up to 850˚C. Corrosion resistance is slightly lower that T304. This grade is not recommended for bright or mirror polishing. Non-magnetic when annealed but becomes slightly magnetic when cold worked.
T347	This is a modification of T304 and is stabilised with Columbium and Tantalum similar in analysis to T321. The Columbium content acts to curb precipitation of harmful carbides into the grain boundary and it's resistance to intergranular corrosion after welding, or after treatment for stress removal, is therefore excellent. Its heat resistance is also excellent, and it is suitable for use between 426-898˚C. T347 is recommended for parts fabricated by welding which cannot be subsequently annealed. Non-magnetic when annealed, but becomes slightly magnetic when cold worked.

MARTENSITIC GRADES GRADES

This group contains a 12% - 14% Chromium and 0.08%-2.00% Carbon. The high Carbon content of the Martensitic stainless steels allows them to respond well to heat treatment to give various mechanical strengths such as hardness as shown on the accompanying table. However, the Carbon is detrimental when welding and care must be taken. In the heat treated condition, this group of stainless steels show a useful combination of corrosion resistance and mechanical properties that qualify them for a wide range of applications...

Descriptions and General Uses

T409	T409 is a general purpose construction stainless steel. It is primarily intended for automotive exhaust systems, structural and other applications where appearance is secondary to mechanical and corrosion resistance properties.
T410	T410 is the general purpose corrosion and heat resisting martensitic stainless steel. It has good corrosion resistance and can be easily forged and machined, it exhibits good cold working properties. It is the most inexpensive corrosion resistant steel for general purposes, but is not suitable under severe corrosion conditions. T410 is magnetic in all conditions. Frequently used for stainless steel cutlery.
T420	Type 420 has a higher Carbon content than T410 to increase hardness to a maximum of approximately 500 Brinell. It has optimum corrosion resisting qualities in the hardened and tempered conditions. Magnetic in all conditions.
T431	T431 is a Nickel bearing martensitic stainless steel designed for heat treatment to the highest mechanical properties. Its corrosion resistance is superior to that of types 410 and 430. Magnetic in all conditions.

FERRITIC GRADES

This group contains a minimum of 17% Chromium and 0.08 - 2.00% Carbon. The increase in Chromium imparts increased resistance to corrosion at elevated temperatures, however the lack of mechanical properties due to the fact that it cannot be heat treated, limits its applications. Like Martensitics they are magnetic and the welding of the group should be carried out with care.

Descriptions and General Uses

T430	T430 is a corrosion and heat resisting stainless steel with superior corrosion and heat resistance compared with T410. T430 is non hardenable and possesses only mild cold working properties due to high chromium content. It's weldibility is excellent and it does not require subsequent annealing. Magnetic in all conditions.

TABLE 2. DIMENSIONS & THEORETICAL WEIGHTS OF ASTM SCHEDULE PIPE

All Grades of Welded & Seamless Stainless Steel Pipe to ASTM A312, A409
Upper figures - Wall thickness in millimetres and inches. **Lower figures** - weight per metre in kilograms and per foot in pounds.

Nominal Pipe Size		Outside Diameter		Schedule 5S		Schedule 10S		Schedule 40S		Schedule 80S	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
3.17	1/8	10.29	.405	.89	.035	1.24	.049	1.73	.068	2.41	.095
				.21	.14	.28	.19	.36	.24	.46	.31
6.35	1/4	13.72	.540	1.24	.049	1.65	.065	2.24	.088	3.02	.119
				.39	.26	.49	.33	.63	.42	.80	.54
9.52	3/8	17.15	.675	1.24	.049	1.65	.065	2.31	.091	3.20	.126
				.49	.33	.63	.42	.85	.57	1.10	.74
12.70	1/2	21.34	.840	1.65	.065	2.11	.083	2.77	.109	3.73	.147
				.80	.54	1.00	.67	1.27	.85	1.62	1.09
19.05	3/4	26.67	1.050	1.65	.065	2.11	.083	2.87	.113	3.91	.154
				1.03	.69	1.28	.86	1.68	1.13	2.19	1.47
25.40	1	33.41	1.315	1.65	.065	2.77	.109	3.38	.133	4.55	.179
				1.30	.87	2.09	1.40	2.50	1.68	3.23	2.17
31.80	1-1/4	42.16	1.660	1.65	.065	2.77	.109	3.56	.140	4.85	.191
				1.65	1.11	2.70	1.81	3.38	2.27	4.47	3.00
38.10	1-1/2	48.26	1.900	1.65	.065	2.77	.109	3.68	.145	5.08	.200
				1.91	1.28	3.11	2.09	4.05	2.72	5.41	3.63
50.80	2	60.03	2.375	1.65	.065	2.77	.109	3.91	.154	5.54	.218
				2.40	1.61	3.93	2.64	5.44	3.65	7.48	5.02
63.50	2-1/2	73.03	2.875	2.11	.083	3.05	.1220	5.16	.203	7.01	.276
				3.69	2.48	5.26	3.53	8.62	5.79	11.41	7.66
75.20	3	88.90	3.500	2.11	.083	3.05	.120	5.49	.216	7.62	.300
				4.51	3.03	6.45	4.33	11.29	7.58	15.27	10.25
88.90	3-1/2	101.60	4.000	2.11	.083	3.05	.120	5.74	.226	8.08	.318
				5.18	3.48	7.40	4.97	13.57	9.11	18.63	12.51
101.60	4	114.30	4.500	2.11	.083	3.05	.120	6.02	.237	8.56	.337
				5.84	3.92	8.36	5.61	16.07	10.79	22.31	14.98
127.00	5	141.30	5.563	2.77	.109	3.40	.134	6.55	.258	9.52	.375
				9.47	6.36	11.57	7.77	21.78	14.62	30.95	20.78
152.40	6	168.28	6.625	2.77	.109	3.40	.134	7.11	.280	10.97	.432
				11.32	7.60	13.84	9.29	28.26	18.97	42.56	28.57
203.20	8	219.18	8.625	2.77	.109	3.76	.148	8.18	.322	12.70	.500
				14.79	9.93	19.96	13.40	42.53	28.55	64.63	43.39
254.00	10	273.05	10.750	3.40	.134	4.19	.165	9.27	.365	12.70	.500
				22.63	15.19	27.78	18.65	60.29	40.48	81.54	54.74
304.80	12	323.85	12.750	3.96	.156	4.57	.180	9.52	.375	12.70	.500
				31.25	20.98	36.00	24.17	73.82	49.56	97.44	65.42

NOMINAL BURSTING, TEST AND WORKING PRESSURES FOR STAINLESS STEEL TUBE/PIPE

(based on Barlow's Formula)

Bursting Pressure Rating: (Ref ASTM A530M)

$$P = \frac{(2 \times S \times t)}{OD}$$

P = Bursting pressure in MPa (x 1000 to get KPa)
t = wall thickness (mm)
OD = Outside Diameter (mm)
S = Minimum Ultimate Tensile Strength in MPa

Test Pressure:

substitute:
S = 50-60% of minimum material 0.2% yield stress in MPa

Working Pressure:

divide the bursting pressure (P) by the following safety factor:
For nominal working pressures apply safety factor of
- 5 to bursting pressure for no pressure fluctuations
- 8 to bursting pressure for small/regular pressure fluctuations
- 12 to bursting pressure for large/prolonged pressure fluctuations
  (ref. ANSI B313, 1976)

Example

Bursting Pressure of 25.4mm OD, 0.9mm wall thickness, 316 tube.
Wall thickness (t) = 0.9mm
Outside Diameter (D) = 25.4mm
Ultimate Tensile Strength (S) = 587MPa

$$P = \frac{(2 \times 587 \times 0.9)}{25.4}$$

P = 41MPa

TABLE 3. THEORETICAL BURSTING PRESSURE (MPA) OF STAINLESS STEEL PIPE

Size		Outside Diameter	Schedule 10S		Schedule 40S		Schedule 80S	
mm	inch	mm	Wall	MPa	Wall	MPa	Wall	MPa
3.17	1/8	10.28	1.24	125	1.73	174	2.41	242
6.35	1/4	13.72	1.65	124	2.24	169	3.02	228
9.52	3/8	17.15	1.65	100	2.31	139	3.20	193
12.7	1/2	21.34	2.11	102	2.77	134	3.73	181
19.0	3/4	26.67	2.11	82	2.87	111	3.91	152
25.4	1	33.41	2.77	86	3.38	105	4.55	141
31.8	1-1/4	42.16	2.77	68	3.56	87	4.85	119
38.1	1-1/2	48.26	2.77	59	3.68	79	5.08	109
50.8	2	60.03	2.77	47	3.91	67	5.54	95
63.5	2-1/2	73.03	3.05	43	5.16	73	7.01	99
76.2	3	88.90	3.05	36	5.49	64	7.62	88
88.9	3-1/2	101.60	3.05	31	5.74	58	8.08	82
101.6	4	114.30	3.05	28	6.02	55	8.56	77
127	5	141.30	3.40	25	6.55	48	9.53	70
152.4	6	168.28	3.40	21	7.11	44	10.97	67
203.2	8	219.18	3.76	18	8.18	39	12.7	60
254.8	10	273.05	4.19	16	9.27	35	12.7	48
305	12	323.85	4.57	15	9.53	30	12.7	40
356	14	355.60	4.78	14	9.53	28	12.7	37
407	16	406.40	4.78	12	9.53	24	12.7	32
458	18	457.20	4.78	11	9.53	21	12.7	28
508	20	508.00	5.54	11	9.53	19	12.7	26
610	24	635.00	6.35	11	9.53	16	12.7	21
762	30	762.00	7.92	11	-	-	-	-

Bursting pressures shown are based on a minimum tensile strength of 517 MPa (75,000 psi). Pressures are calculated using Barlow's Formula

TABLE 4. THEORETICAL INTERNAL BURSTING PRESSURES (MPA) FOR STAINLESS STEEL TUBE

OD		Wall Thickness in mm					
mm	inch	0.7	0.9	1.2	1.5	2.0	2.5
4.76	3/16	172.65	221.97	295.97	369.96	-	-
6.35	1/4	129.42	164.39	221.86	277.32	-	-
7.94	5/16	103.50	133.07	177.43	221.79	-	-
9.52	3/8	86.32	110.99	147.98	184.98	-	-
12.7	1/2	64.71	83.20	110.93	138.66	-	-
15.9	5/8	51.69	66.45	88.60	110.75	-	-
19.0	3/4	43.25	55.61	74.15	92.68	-	-
22.2	7/8	37.02	47.59	63.46	79.32	-	-
25.4	1	32.35	41.60	55.46	69.33	-	-
28.6	1-1/8	28.73	36.94	49.26	61.57	82.10	-
31.8	1-1/4	25.84	33.22	44.30	55.38	73.84	-
38.1	1-1/2	21.57	27.73	36.98	46.22	61.63	-
44.5	1-3/4	18.47	23.74	31.66	39.57	52.76	-
50.8	2	-	20.80	27.73	34.67	46.22	57.78
57.2	2-1/4	-	18.47	24.63	30.79	41.05	51.31
63.5	2-1/2	-	16.64	22.19	27.73	36.98	46.22
69.8	2-3/4	-	15.14	20.18	25.23	33.64	42.05
76.2	3	-	13.87	18.49	23.11	30.81	38.52
82.6	3-1/4	-	12.79	17.06	21.32	28.43	35.53
88.9	3-1/2	-	11.89	15.85	19.81	26.41	33.01
95.2	3-3/4	-	11.10	14.80	18.50	24.66	30.83
101.6	4	-	-	13.81	17.26	23.02	28.77
108.4	4-1/4	-	-	13.0	16.25	21.66	27.08
114.7	4-1/2	-	-	12.28	15.35	20.47	25.59
121	4-3/4	-	-	11.64	14.55	19.40	24.26
127	5	-	-	11.09	13.87	18.49	23.11
133.4	5-1/4	-	-	-	13.20	17.60	22.00
140	5-1/2	-	-	-	12.58	16.77	20.96
146	5-3/4	-	-	-	12.06	16.08	20.10
152.4	6	-	-	-	-	15.45	19.31
158.4	6-1/4	-	-	-	-	14.82	18.53
165	6-1/2	-	-	-	-	-	17.79
167.9	6-5/8	-	-	-	-	-	17.48

Bursting pressures shown are based on basis of minimum tensile strength of 587MPa (85,000 psi). Pressures are calculated using Barlow's Formula.

CORROSION RATINGS FOR STAINLESS STEEL

These corrosion tables are intended to provide an initial guide to the selection of materials.

The corrosion data applies to annealed materials with normal microstructure and clean surfaces. The data is mainly based on results of laboratory tests carried out with pure chemicals and water solutions nearly saturated with air.

These tables should not be used for design purposes as laboratory tests are not strictly comparable with actual service conditions. In actual service, corroding mediums often contain impurities and the performance of stainless steel can be profoundly affected by minor changes in environment or use.

Key

BP = Boiling solution
Sat. = Saturated
0 = Corrosion rate less than 0.1 mm/year. The material is corrosion proof.
1 = Corrosion rate 0.1 - 1.0 mm/year. The material is not corrosion proof, but useful in some cases.
2 = Corrosion rate over 1.0 mm/year. Serious corrosion. The material is not usable.
p, P = Risk (severe risk) of pitting and crevice corrosion.
c, C = Risk (severe risk) of crevice corrosion. Used when there is a risk of localised corrosion only if cervices are present. Under more severe conditions, when there is also a risk of pitting corrosion, the symbols p or P are used instead.
s, S = Risk (severe risk) of stress corrosion cracking.
ig = Risk of intergranular corrosion.
Note that the remarks ig, p and s are normally used only where the symbol for general corrosion rate is 0 or 1.

Test Solution	Concentration %	Temperature °C	T304	T316	T430
A					
Abietic Acid	100	275	0	0	-
Acetic Acid	1	90	0	0	0
	1	100=BP	0	0	1
	5	20	0	0	1
	5	50	0	0	2
	5	75	0	0	2
	5	100=BP	0	0	2
	10	20	0	0	1
	10	75	0	0	2
	10	100=BP	1	0	2
	20	20	0	0	1
	20	80	0	0	2
	20	90	1	0	2
	20	100=BP	2	0	2
	50	20	0	0	2
	50	80	0	0	2
	50	90	1	0	2
	50	100	2	0	2
	80	20	0	0	2
	80	40	0	0	2
	80	85	1	0	2
	80	106=BP	1p	0	-
	99.5	200	2	1	2
	100	20	0	0	1
	100	80	0	0	2
	100	100	1p	0	2
Acetone	100	BP	0	0	1
Acetyl Chloride	Dry (100)	BP	1	0	2
	Moist	BP	1ps	0ps	2
Adipic Acid	All	100	0	0	-
		200	0	0	-
Alum	2.5	90	0	0	1
	2.5	BP	1	0	2
	5.5	20-90	0	0	2
	5.5	BP	1	1	2
	10	20	0	0	2
	10	50	0	0	2
	10	80	1	0	2
	10	BP	1	1	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
	15	50	0	0	2
	15	BP	2	2	2
	Saturated	BP	2	2	2
Aluminium	Molten	700	2	2	2
Aluminium Acetate	Saturated	BP	0	0	0
Aluminium Chloride	5	50	0ps	0ps	-
	5	100	2	2	-
	10	100	2	2	2
	10	150	2	2	2
	20	100	2	2	2
	20	150	2	2	2
	25	20	2	2	2
	25	60	2	2	2
	27.5	110	2	2	2
Aluminium Nitrate	All	20	0	0	0
Aluminium Sulphate	0.5	50	0	0	2
	1.0	20	0	0	0
	2.3	101=BP	2	0	2
	5	101=BP	2	0	2
	10	20	0	0	2
	10	50	0	0	2
	10	102=BP	2	1	2
	23	20	2	0	2
	23	100	2	1	2
	27	20	2	0	2
	27	102=BP	2	1	2
	Saturated	105=BP	2	2	2
Ammonium Alum	10	BP	2	0	2
Ammonium Bicarbonate	All	20	0	0	0
Ammonium Bifluoride	10	25	2	1	2
Ammonium Bisulphite	10	20	0	0	1
	10	BP	1	0	2
Ammonium Bromide	1-5	20-50	0p	0p	2
Ammonium Carbonate	All	20	0	0	0
	All	100	0	0	-
Ammonium Chloride	1	20	0p	0p	0p
	1	100	0ps	0ps	0p
	5	BP	0ps	0ps	0p
	10	20-50	0p	0p	1p
	10	90-100	0ps	0ps	1p

Test Solution	Concentration %	Temperature °C	T304	T316	T430
	10	BP	1ps	0ps	1p
	10	135	1ps	0ps	1p
	20	20-50	0p	0p	0p
	20	90	1ps	0ps	1p
	20	BP	1ps	1ps	2
	50	115	2	1ps	2
Ammonium Chlorostannate	Saturated	20	1p	0p	2
		60	2	2	2
Ammonium Fluoride	10	25	0	0	1
Ammonium Hydroxide	All	0-BP	0	0	0
Ammonium Oxalate	1-8	20	0	0	-
	5-20	100	1	0	-
Ammonium Perchlorate	10	20	0	0	-
	10	BP	0	0	2
	20	30	0	0	-
Ammonium Persulphate	All	20	0	0	-
	All	70	0	0	-
Ammonium Phosphate	All	20-100	0	0	0
Ammonium Sulphate	All	20-BP	0	0	2
Ammonium Sulphide	All	20	0	0	1
Ammonium Sulphite	Saturated	20-BP	0	0	-
Ammonium Thiocyanate	All	100	0	0	0
Amyl Alcohol	100	20-100	0	0	0
Amyl Chloride	All	20	0p	0p	-
Aniline	100	20	0	0	0
Aniline Hydrochloride	All	20	2	2	2
	5	100	2	2	2
Antimony	Molten	650	2	2	2
Antimony Chloride	All	20	0p	0p	-
B					
Barium Chloride	6	100	0ps	0ps	0p
	23	100	0ps	0ps	1p
	Molten		2	2	2
Barium Hydroxide	All	0-BP	0	0	0
Barium Nitrate	All	BP	0	0	0
Barium Peroxide	10	95	0	0	-
Beer		20-70	0	0	-
Benzaldehyde	100		0	0	0
Benzene		20-BP	0	0	0
Benzenesulphonic Acid	5	40	0	0	1
	5	50	0	0	2
	5	60	2	1	2
	10	40	0	0	1
	10	50	1	0	2
	10	80	2	1	2
	10	100	2	2	2
	20	50	2	2	2
	100	20	0	0	-
Benzoic Acid	All	20-BP	0	0	0
Benzyl Chloride	All	100	0ps	0ps	-
Beryllium Chloride	All	100	0ps	0ps	-
Bismuth	Molten	500	0	0	-
		550	1	1	-
		650	2	1	-
Blood		20	0	0	0p
		37	-	0p	-
Borax	All	20-BP	0	0	0
	Molten		2	2	2
Boric Acid	4	BP	0	0	0
	20	BP	0	0	1
Boron Trichloride	100	20	0	0	-
Bromine	100	20	2	2	2
	0.03	20	Op	Op	2
	0.3	20	1p	0p	2
	1	20	2	1p	2
Butyl Acetate	25	BP	0	0	0
Butyl Alcohol	20	BP	0	0	0
Butyric Acid	100	20	0	0	2
	100	BP	1	0	2
C					
Calcium Arsenate	All	BP	0	0	0
Calcium Bisulphite	10	20	0	0	1
	10	BP	1	0	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
Calcium Chloride	5	20	0p	0p	0p
	5	50	0p	0p	1p
	5	100	0ps	0ps	1p
	10	20	0p	0p	1p
	10	50	0p	0p	1p
	10	100-BP	0ps	0ps	1p
	25	100	0ps	0ps	1p
	40	100	0ps	0ps	2
Calcium Hydroxide	All	20-BP	0	0	0
Calcium Hypochlorite	1	20	1p	0p	-
	2	100	1ps	1ps	2
	6	20	1p	1p	2
	6	100	2	1ps	2
Calcium Hypophosphite	5	BP	0	0	-
Calcium Nitrate	All	100	0	0	-
	Molten	148	-	0	-
Calcium Sulphate	All	100	0	0	0
Calcium Sulphide	All	100	0	0	0
Camphor		20	0	0	0
Carbon Disulphide	100	20-46	0	0	0
Carbon Monoxide		100	0	0	0
Carbon Tetrachloride	100	20	0	0	0
	100	76-BP	0	0	0
Carnallite	Saturated	20	0p	0p	2
		BP	1ps	0ps	2
Celluloid		20-BP	0	0	1
Cellulose Acetate	20	20	0	0	1
Chloramine	All	20	0p	0p	-
Chloric Acid	100	20	2	2	2
Chloride of Lime	0.8	20	1p	0p	2
	1	BP	-	0ps	-
	20	35	-	0p	-
	30	20	1	1	2
Chlorine	Dry Gas	70	0	0	0
	Moist Gas	20-60	2	2	2
Chlorine Dioxide	Dry Gas	20	-	0	-
	Moist Gas	20	-	2	-
Chloroacetic Acid	80	30	-	0	-
	80	35	-	0	-
	80	40	-	0c	-
	80	80	-	2	-
Chlorobenzene	100	20	0	0	-
	100	132=BP	0	0	-
Chloroform	All	20	Op	Op	Op
	All	BP	0ps	0ps	0p
	Dry 100	62=BP	0	0	0
Chlorohydrin	All	BP	0ps	0ps	0p
	Dry 100	BP	0	0	0
Chlorosulphonic Acid	0.5	20	1p	0p	2
	10	25	2	2	2
	100	25	0p	0p	2
Chlorotoluene	Dry 100	BP	0	0	0
	Moist	BP	2	2	2
Chromic Acid	2	75	0	0	-
	2	100=BP	2	2	2
	5	80	0	0	-
	5	100=BP	1	2	2
	10	40	0	0	0
	10	BP	2	2	2
	20	20	0	0	-
	20	50	1	1	2
	20	BP	2	2	2
	40	20	1	1	-
	40	40	2	2	2
	50	20	2	2	2
Citric Acid	1	20	0	0	1
	1	BP	0	0	2
	5	20-50	0	0	2
	5	85-BP	0	0	2
	5	140	1	0	2
	10	20-40	0	0	2
	10	85-BP	0	0	2
	25	20	0	0	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
	25	40	0	0	2
	25	85	1	0	2
	25	100	2	0	2
	25	BP	2	0	2
	50	20	0	0	2
	50	40	0	0	2
	50	100	2	0	2
	50	BP	2	0	2
	70	BP	2	1	2
Coffee	All	BP	0	0	0
Copper Acetate	All	BP	0	0	-
Copper Carbonate	Sat. in 50% Amonnia Solution	20	0	0	0
Copper Chloride	0.05	100=BP	0p	0p	-
	1	60	1ps	1ps	-
	2-5	60	2	1ps	-
	8	20	0p	0p	-
	8	BP	2	2	2
	8	135	2	2	2
Copper Cyanide	Saturated	BP	0	0	2
Copper Nitrate	All	20-BP	0	0	0
Copper Sulphate	All	20-BP	0	0	0
Creosote Oil		20	0	0	1
		BP	0	0	2
D					
Detergents	1	80	0	0	0
Developers		20	0	0	-
Dextrose		20	0	0	-
Dichloroethylene	100	20-BP	0	0	0
E					
Ether		20-BP	0	0	0
Ethyl Alcohol	All	20-BP	0	0	0
Ethyl Chloride	100	20-BP	0	0	0
Ethyl Nitrate		20	0	0	0
Ethylene Bromide	100	20	0	0	-
Ethylene Chloride	100	20-BP	0	0	0
F					
Fatty Acids	100	20	0	0	0
	100	80-130	0	0	0
	100	150	0	0	1
	100	180	1	0	2
	100	235	1	0	2
	100	300	2	0	2
Fluorine Gas	Dry	20	0	0	0
	Moist	20	2	2	2
Fluosilicic Acid	1	60	-	1	-
	20	60	1	1	2
Formaldehyde	All	20-BP	0	0	0
Formic Acid	0.5	70	0	0	0
	1	20	0	0	2
	1	40	0	0	2
	2	20	0	0	2
	2	40	0	0	2
	2	100	1	0	2
	5	20	0	0	2
	5	80	1	0	2
	5	95	2	1	2
	5	100=BP	2	1	2
	10	20	0	0	2
	10	60	1	0	2
	10	90	2	1	2
	10	101=BP	2	1	2
	25	20	0	0	2
	25	80	2	0	2
	25	90	2	1	2
	25	100	2	1	2
	50	20	0	0	2
	50	50	1	0	2
	50	70	2	0	2
	50	80	2	0	2
	50	100	2	1	2
	65	60	2	0	2
	65	100	2	1	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
	80	20	0	0	2
	80	107=BP	2	1	2
	90	20	0	0	1
	90	40	0	0	2
	90	60	1	0	2
	90	80	2	0	2
	90	100	2	1	2
	90	106=BP	2	2	2
	100	20	0	0	1
	100	60	0	0	1
	100	101=BP	1	1	2
Freon		<200	0	0	0
Fruit Juices/Wines		20	0	0	0
		BP	0	0	1
Furfural	100	162=BP	0	0	0
	Vapour	200	0	0	-
G					
Gallic Acid	25	BP	0	0	0
Gelatine	All	20-BP	0	0	0
Glucose	All	20	0	0	-
Glycerine	All	20	0	0	-
Glycol	All	20	0	0	-
Guano	Dry & Moist	20	0	0	-
H					
Hydrobromic Acid	30	25	2	2	2
	100	25	0	0	0
Hydrochloric Acid	0.1	20-50	1p	0p	1p
	0.1	100=BP	1ps	0ps	1p
	0.2	20	1p	0p	1p
	0.2	50	1p	0p	1p
	0.5	20	1p	0p	2
	0.5	50	1p	0p	2
	0.5	100=BP	2	2	2
	1	20	1p	0p	2
	1	50	2	1p	2
	1	60	2	2	2
	1	80	2	2	2
	1	100=BP	2	2	2
	2	20	2	1p	2
	2	60	2	2	2
	2	100=BP	2	2	2
	3	20	2	1p	2
	3	60	2	2	2
	3	70	2	2	2
	3	80	2	2	2
	3	100	2	2	2
	5	20	2	2	2
	5	35	2	2	2
	5	50	2	2	2
	5	60	2	2	2
	5	70	2	2	2
	5	102=BP	2	2	2
	8	60	2	2	2
	10	20-35	2	2	2
	10	60	2	2	2
	20	20-35	2	2	2
	30-37	20	2	2	2
Hydrocyanic Acid	100	20	0	0	2
Hydrofluoric Acid	1	20	1	0	2
	10	20	2	2	2
	75	30	2	2	2
	100	20	1	1	1
Hyrdrogen Chloride Gas	Dry	20-40	0	0	0
		100	1	1	1
		250	1	1	2
		400-500	2	2	2
	Moist	20	-	1	-
Hydrogen Iodide	10	20	2	1	2
	100	20	0	0	0
Hydrogen Peroxide	1-2	50	0	0	0
	5	20	0	0	0
	5	40-50	0	0	-
	10	23	0	0	0
	10	40	0	0	-

Test Solution	Concentration %	Temperature ˚C	T304	T316	T430
	10	60-80	0	0	-
	15	22	0	0	0
	15	30-40	0	0	-
	15	50-80	0	0	-
	30	27	0	0	-
	30	40-80	0	0	-
	50	40	0	0	-
Hydrogen Sulphide Gas	4 Dry Gas	100	0	0	0
	4 Dry Gas	200	0	0	0
	Moist Gas	20	1ps	0	2
I					
Ink-Iron Tannate		20-BP	0p	0p	1p
Ink-Synthetic (chloride free)		20-BP	0	0	-
Iodine	Dry	20	0	0	0
	Moist	20	2	2	2
Idoform-Crystallised		20	0p	0p	0p
Idoform-Vapour		50	0p	0p	-
Iron (II) Chloride	10	20	0p	0p	-
Iron (III) Chloride	0.5-50	20-100	2	2	2
Iron (III) Nitrate	All	20	0	0	0
Iron (II) Sulphate	10	20	0	0	0
	10	90-BP	1	0	1
Iron (III) Sulphate	10	20-BP	0	0	-
L					
Lactic Acid	1	20-50	0	0	1
	1.5	20	0	0	1
	1.5	100=BP	0	0	2
	5	20-100	0	0	2
	10	20-100	0	0	2
	10	101=BP	1	0	2
	20	80	0	0	2
	20	101=BP	1	0	2
	25	20-50	0	0	2
	25	75-90	1	0	2
	25	100	2	0	2
	30	20-70	0	0	2
	30	75-100	1	0	2
	30	102=BP	2	1	2
	50	20-70	0	0	2
	50	75-90	1	0	2
	50	95-104	2	1	2
	75	20-90	0	0	2
	75	100	1	0	2
	75	110	1	0	2
	80	20-95	0	0	2
	80	100	1	0	2
	80	117=BP	2	1	2
	90	20	0	0	2
	90	40	1	0	2
	90	50-100	2	0	2
	90	127=BP	2	1	2
Lead - Molten	In Pressence	400	1	0	2
	Of Oxygen	900	2	2	2
	Melt with Oxidation inhibiting surface layer of charcoal	900	0	0	0
Lead Acetate	All	20-90	0	0	0
	All	BP	0	0	1
Lead Nitrate	All	BP	0	0	-
Lithium Chloride	10	BP	0ps	0ps	2
	10	135	1ps	0ps	2
	40	115	1ps	1ps	2
Lithium Hydroxide	2.5	220	1s	1s	2
Lysol	2	20	0	0	0
	100	20-BP	0	0	0
M					
Magnesium Bisulphate	10	20	0	0	1
	10	BP	1	0	2
Magnesium Carbonate	All	20	0	0	0
Magnesium Chloride	2.5	20	0p	0p	0p
	5	BP	0ps	0ps	1p
Magnesium Sulphate	5	20	0	0	0
	5	60	0	0	1
	10	20	0	0	0

Test Solution	Concentration %	Temperature ˚C	T304	T316	T430
	10	60	0	0	1
	20	20	0	0	1
	20	BP	0	0	2
	26	BP	0	0	2
Malic Acid	1	20	0	0	0
	5-50	100	0	0	2
Manganese Chloride	5	100	0ps	0ps	1p
	10	BP	0ps	0ps	-
	10	135	0ps	0ps	-
	20	100	1ps	0ps	2
	50	BP	1ps	0ps	2
Manganese Sulphate	All	20	0	0	0
	23	BP	0	0	-
Mercuric Chloride	0.1	20	1p	0p	2
	0.1	BP	1ps	0ps	2
	0.7	20	1p	0p	2
	0.7	BP	2	2	2
Mercuric Cyanide	5	20	0	0	2
Mercuric Nitrate	5	20	0	0	0
Mercury		20-400	0	0	0
Mayonnaise	-	BP	0	0	-
Methyl Alcohol	100	65=BP	0	0	0
Methyl Chloride	100 Dry	20	0	0	-
Methylene Chloride	All	BP	0ps	0ps	0p
	100 Dry	40=BP	0	0	0
Milk	Fresh	20	0	0	0
		BP	0	0	1
	Sour	20	0	0	1
Mustard		20	0p	0p	1p
N					
Naphalene		25	0	0	-
Nickel Chloride	10	20	0p	0p	1p
	10	100	0ps	0ps	1p
Nickel Nitrate	5-10	20	0	0	0
Nickel Sulphate	All	BP	0	0	2
Nitric Acid	0.5	250	0	0	-
	1	20	0	0	0
	1	50	0	0	1
	1	100=BP	0	0	2
	5	20	0	0	0
	5	50	0	0	1
	5	100=BP	0	0	2
	5	150	1	1	2
	5	290	2	2	2
	10	20	0	0	0
	10	50	0	0	1
	10	101=BP	0	0	2
	10	145	2	2	2
	20	20	0	0	0
	20	50	0	0	1
	20	103=BP	0	0	2
	20	120	1	1	2
	30	20	0	0	0
	30	70	0	0	1
	30	106=BP	0	0	2
	30	120	1	1	2
	50	20	0	0	0
	50	70	0	0	1
	50	90	0ig	0ig	1ig
	50	110	1ig	1ig	2
	50	117=BP	1ig	1ig	2
	60	20	0	0	0
	60	60	0	0	1
	60	100	1ig	1ig	2
	60	121=BP	1ig	1ig	2
	65	20	0	0	0
	65	60	0	0	1
	65	70	0	0	1
	65	90	1ig	1ig	1ig
	65	121=BP	1ig	1ig	2
	80	20	0	0	0
	80	50	0	0	1
	80	80	1ig	1ig	2
	80	106=BP	2	1ig	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
	90	20	0	0	0
	90	80	2	2	2
	90	94=BP	2	2	2
	94	30	0	0	2
	97	25	0	0	2
	99	25	1	1	2
	99	40	2	2	2
	99	84=BP	2	2	2
Nitrocellulose		20	0	0	0
Nitrous Acid	All	20	0	0	2
O					
Oxalic Acid	0.5	20	0	0	1
	0.5	30	0	0	1
	0.5	60	0	0	1
	0.5	80	1	0	2
	0.5	100=BP	2	2	2
	1	35	0	0	1
	1	60	0	0	2
	1	100=BP	2	2	2
	2.5	20	0	0	1
	2.5	40	0	0	2
	2.5	60	0	0	2
	2.5	80	1	0	2
	2.5	100=BP	2	2	2
	5	20	0	0	1
	5	35	0	0	2
	5	60	1	0	2
	5	85	1	1	2
	5	100=BP	2	1	2
	10	25	0	0	2
	10	50	0	0	2
	10	60	1	0	2
	10	80	2	1	2
	10	101=BP	2	2	2
	25	60	2	0	2
	25	75	2	1	2
	25	103=BP	2	2	2
	40	75	2	1	2
	40	106=BP	2	2	2
	50	107=BP	2	2	2
P					
Paraffin		20-100	0	0	0
Pectin		20-100	0	0	-
Perchloric Acid	10	20	2	2	2
	100	20	2	2	2
Petrol		20-BP	0	0	-
Phenol	All	50	0	0	0
	70-100	BP	1	0	2
Phosphoric Acid	1	20	0	0	0
	1	100=BP	0	0	2
	1	140	0	0	1
	3	100=BP	0	0	2
	5	20-60	0	0	0
	5	85	0	0	0
	5	100=BP	0	0	2
	10	40	0	0	2
	10	60	0	0	2
	10	80	0	0	2
	10	101=BP	0	0	2
	20	35	0	0	2
	20	60	0	0	2
	20	102=BP	0	0	2
	30	20-35	0	0	2
	30	60	0	0	2
	30	100	1	0	2
	40	35	0	0	2
	40	50	0	0	2
	40	100	1	0	2
	40	106=BP	2	1	2
	50	20	0	0	2
	50	35	0	0	2
	50	50	0	0	2
	50	85	0	0	2
	50	100	1	1	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
	50	110=BP	2	2	2
	60	20	0	0	2
	60	35	0	0	2
	60	100	2	1	2
	60	116=BP	2	2	2
	70	35	0	0	2
	70	90	2	1	2
	70	126=BP	2	2	2
	80	20	0	0	2
	80	35	0	0	2
	80	80	1	0	2
	80	100	2	1	2
	80	146=BP	2	2	2
	86	20	0	0	2
	86	50	0	0	2
	86	85	1	-	-
	86	95	2	1	2
	86	156=BP	2	2	2
Phosphoric Anhydride	Dry	20	0	0	-
	Moist	20	1	0	-
Phosphorous Pentachloride	100	20	0	0	0
Picric Acid	1	BP	0	0	2
	All	20	0	0	2
Potassium	Molten	540-600	0	0	-
Potassium Acetate	All	100	0	0	0
	Molten	292	0	0	-
Potassium Bicarbonate	All	100	0	0	0
Potassium Dichromate	20	90	0	0	0
	25	20	0	0	0
	25	BP	0	0	2
Potassium Bisulphate	2	90	2	0	2
	5	20	1	0	2
	5	50	1	0	2
	5	90	2	1	2
	10	20	1	0	2
	10	90	2	1	2
	10	100	2	2	2
	15	90	2	2	2
Potassium Bisulphite	10	20	0	0	1
	10	BP	1	0	2
Potassium Bitartrate	Sat. at 100	BP	1	0	2
Potassium Bromide	All	20	0p	0p	2
Potassium Carbonate	All	BP	0	0	0
	Molten	900-1000	2	2	2
Potassium Chlorate	7 - 10	50	0	0	0
	10	100	0	0	-
	36	BP	1	0	-
Potassium Chromate	All	BP	0	0	-
Potassium Chromium Sulphate	6	20-90	0	0	2
	20	BP	2	0	2
	40	BP	2	1	2
Potassium Cyanide	All	20	0	0	0
	All	BP	-	0	-
Potassium Hydroxide	10	BP	0	0	0
	20	20	0	0	0
	25	BP	0	0	2
	50	20	0	0	1
	50	BP	1s	1s	2
	70	120	1s	1s	2
	Molten	300-365	2s	2s	2
Potassium Hypochlorite	<2	20	1p	0p	-
	>2	20	2	1p	-
Potassium Iodide	All	BP	0p	0p	2
Potassium Nitrate	All	20-BP	0	0	0
	Molten	550	0	0	2
		780	1	1	-
Potassium Oxalate		20	0	0	0
		BP	0	0	2
Potassium Permanganate	5 - 10	20	0	0	0
	10	BP	0	0	1
Potassium Peroxide	10	20-90	0	0	-
Potassium Persulphate	4	20	0	0	2
	Saturated	20	2	1	2
Potassium Sulphate	All	BP	0	0	-

Test Solution	Concentration %	Temperature °C	T304	T316	T430
Potassium Sulphide	1	20	0	0	0
Propylene Dichloride	100	20	0	0	-
Pyridine		100	0	0	-
Pyrogallic Acid	All	20-BP	0	0	0
Q					
Quinine Bisulphate	All	20	2	0	2
Quinine Solution		20	0	0	-
Quinine Sulphate	All	20	0	0	2
Quinosol	0.2-0.5	20	0	0	-
S					
Saccharin	All	100	0	0	-
Salicylic Acid	5	20-85	0	0	0
	20	100	0	0	-
Silver Bromide	All	20-BP	Op	0	Op
Silver Nitrate	All	20-BP	0	0	0
	Molten	250	0	0	2
Sodium	Molten	600	0	0	-
		800	0	0	-
Sodium Acetate	All	20-340	0	0	0
Sodium Aluminate	All	20	0	0	-
Sodium Bicarbonate	All	20-100	0	0	0
Sodium Dichromate	Saturated	50	0	0	-
Sodium Bisulphate	1	85	1	0	-
	2	20	0	0	-
	2	85	1	0	2
	4	20	1	0	-
	4	BP	2	-	2
	5	20	1	0	2
	5	85	2	0	2
	10	20	1	0	2
	10	50	2	0	2
	10	BP	2	-	2
	15	85	2	2	2
Sodium Bisulphite	10	20	0	0	1
	10	BP	1	0	2
Sodium Bromide	5-10	20	0p	0p	-
	20	80	0ps	0ps	-
Sodium Carbonate	All	20-BP	0	0	0
	Molten	900	2	2	2
Sodium Chlorate	10	20-BP	0	0	-
	30	20	0	0	-
	30	BP	1	0	-
Sodium Chlorite	5	20	2	2	-
	5	BP	2	2	-
Sodium Citrate	3.5	20-100	0	0	0
	35	100	0	0	0
Sodium Cyanide	All	BP	0	0	0
Sodium Dithionite	2	70	Op	0	-
Sodium Fluoride	5-10	20-100	0	0	0
Sodium Hydroxide	10	20	0	0	0
	10	90	0	0	0
	10	103=BP	0	0	1
	20	20	0	0	0
	20	90	0	0	1
	25	20	0	0	0
	25	112=BP	0	0	2
	30	20	0	0	0
	30	100	0	0	1
	30	116=BP	1s	Os	2
	40	80	0	0	1
	40	90	0	0	1
	40	100	1	1	1
	40	128=BP	1s	1s	2
	50	60	0	0	1
	50	90	1	1	1
	50	100	1	1	2
	50	120	1	1	2
	50	140=BP	1s	1s	2
	60	90	1	1	1
	60	120	1	1	2
	60	160=BP	2s	2s	2
	70	90	1	1	1
	70	130	1	1	2
	70	180=BP	2s	2s	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
	90	300	2s	1s	2
	Molten	320	2s	2s	2
Sodium Hypochlorite	5	20	1p	1p	2
	5	BP	1ps	1ps	2
Sodium Metaborate	Molten	100	0	0	0
Sodium Nitrate	All	20-BP	0	0	0
	Molten	360	0	0	0
Sodium Nitrite	All	BP	0	0	0
Sodium Oleate	All	20	0	0	-
Sodium Perborate	All	20	0	0	-
Sodium Perchlorate	10	BP	0	0	2
Sodium Peroxide	10	20	0	0	1
	10	100	0	0	2
Sodium Phosphate	All	BP	0	0	0
Sodium Salicylate	All	20	0	0	0
Sodium Silicate	All	100	0	0	0
Sodium Sulphate	All	20	0	0	0
Sodium Sulphide	5	BP	0	0	0
	10	20	0	0	0
	10-50	BP	0	0	2
Sodium Sulphite	50	20	0	0	1
	50	BP	0	0	2
Sodium Thiosulphate	16-25	20-BP	0	0	0
Soft Soap		20	0	0	0
Stannic (IV) Chloride	5-24	20	2	1p	2
	18-24	BP	2	2	2
Stannous (II) Chloride	5	20	1p	Op	2
	5	50	1p	Op	2
	5	BP	2	Ops	2
Starch	All	60	0	0	-
Strontium Nitrate	All	100	0	0	-
Sulphamic Acid	1	75	0	0	-
	1	95	-	0	-
	1	BP	1	1	-
	2	50	0	0	-
	2	75	1	1	-
	2	95	1	1	-
	2	BP	1	-	-
	5	50	0	0	-
	5	75	2	1	-
	5	95	-	1	-
	10	60	1	0	-
	10	75	2	1	-
	10	BP	-	2	-
Sulphite Gas		140-150	1	0	2
Sulphur	Molten	240	0	0	0
	Molten	445=BP	2	1	2
	Vapour	570	2	2	2
Sulphur Chloride	Dry 100	20	0	0	1
	Dry 100	136=BP	0	0	2
	Moist	20	1p	1p	2
Sulphur Dichloride	100	20	0	0	1
	100	BP	0	0	2
Sulphur Dioxide	Dry Gas	300	0	0	-
	Liquid Gas	25	0	0	0
	Air Free, moist gas	20	1	0	2
	Air Free, moist gas	100	1	0	2
Sulphuric Acid	0.1	100=BP	2	1	2
	0.5	20	0	0	2
	0.5	50	1	0	2
	0.5	100=BP	2	1	2
	1	20	0	0	2
	1	50	1	0	2
	1	70	1	0	2
	1	85	2	1	2
	1	100=BP	2	1	2
	2	20	0	0	2
	2	50	1	0	2
	2	60	1	0	2
	3	20	0	0	2
	3	35	1	0	2
	3	50	1	0	2
	3	85	2	1	2
	3	100=BP	2	2	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
	5	20	1	0	2
	5	35	1	0	2
	5	60	2	1	2
	5	75	2	1	2
	5	85	2	2	2
	5	101=BP	2	2	2
	10	20	2	0	2
	10	50	2	1	2
	10	60	2	1	2
	10	80	2	2	2
	10	102=BP	2	2	2
	20	20	2	0	2
	20	40	2	1	2
	20	50	2	1	2
	20	60	2	2	2
	20	100	2	2	2
	30	20	2	1	2
	30	40	2	2	2
	30	60	2	2	2
	40	20	2	2	2
	40	40	2	2	2
	40	60	2	2	2
	40	90	2	2	2
	50	20	2	2	2
	50	40	2	2	2
	50	70	2	2	2
	60	20	2	2	2
	60	40	2	2	2
	60	70	2	2	2
	70	20	2	2	2
	70	40	2	2	2
	70	70	2	2	2
	80	20	2	1	2
	80	40	2	2	2
	80	60	2	2	2
	85	20	1	1	1
	85	30	1	1	1
	85	40	1	1	2
	85	50	2	2	2
	90	20	0	0	0
	90	30	0	0	1
	90	40	2	1	2
	90	70	2	2	2
	94	20	0	0	0
	94	30	0	0	1
	94	40	1	0	2
	94	50	1	1	2
	96	20	0	0	0
	96	30	0	0	1
	96	40	0	0	2
	96	50	1	1	2
	98	30	0	0	1
	98	40	0	0	1
	98	50	2	0	2
	98	80	2	2	2
Sulphurous Acid	2	50	0	0	2
	5	20	-	0	-
	10	160	1	0	2
	20	20	1	0	2
	Saturated	20	1	0	2
	Saturated	135	1	0	2
	Saturated	200	2	1	2
Syrup and Sugar	All	20-BP	0	0	0
T					
Tall Oil		100	0	0	-
		300	2	1	-
Tannic Acid	5	20	0	0	0
	5	BP	0	0	1
	10	20	0	0	0
	10	BP	0	0	2
	25	100	0	0	2
	50	65	0	0	1
	50	BP	0	0	2

Test Solution	Concentration %	Temperature °C	T304	T316	T430
Tar	20	BP	0	0	0
Tartaric Acid	1	90	0	0	2
	1	100=BP	0	0	2
	20	70	0	0	2
	20	100	1	0	2
	30	60	0	0	2
	30	90	1	0	2
	30	102=BP	1	0	2
	50	50	0	0	2
	50	70	0	0	2
	50	90	1	0	2
	50	106=BP	2	1	2
	60	80	1	0	2
	60	100	2	1	2
	70	114=BP	2	1	2
	75	100	2	1	2
	75	118=BP	2	1	2
Textile Dyes		BP	0	0	-
Thionyl Chloride	100	20-40	0	0	1
Tin	Molten	300	0	0	2
		350	-	-	2
		400	1	1	2
		500	2	2	2
		700	2	2	2
Tincture of Iodine		20	0p	0p	-
Toluene	100	BP	0	0	0
Thrichloroethylene	100	20	0	0	-
	100	BP	0	0	2
Turpentine		20	0	0	0
U					
Urea		180	-	0	-
Urine		0-60	0p	0p	-
V					
Vinegar	4-5	20	0	0	-
W					
White Liquor		180	0	0	-
Wines			(see fruit juices)		
X					
Xylene	All	BP	0	0	0
Y					
Yeast		20-BP	0	0	0
Z					
Zinc	Molten	500	2	2	2
Zinc Carbonate	All	20	0	0	0
Zinc Chloride	5-20	20	0p	0p	0p
	5-20	BP	1ps	0ps	1p
	20-70	150	1ps	0ps	2p
	75	200	1ps	2ps	2p
	80	150	2ps	1ps	2p
Zinc Cyanide	All	20	0	0	-
Zinc Nitrate	75	175	0	0	-
Zinc Sulphate	20	20-BP	0	0	-
	40	BP	1	0	2
Zirconium Oxychloride	11	80	2ps	1ps	2p
	11	100	2ps	2ps	2p
	20	80	2ps	1ps	2p
	20	100	2ps	2ps	2p