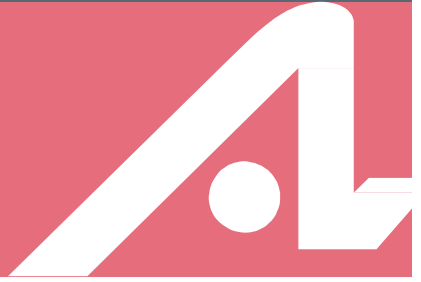


# Appendices



Appendices

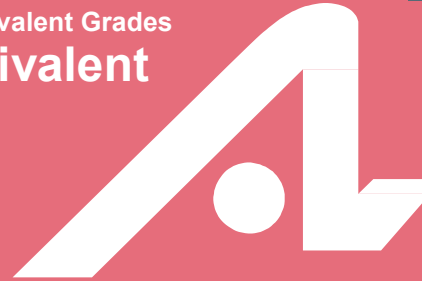
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9



# Stainless Steels – Properties & Equivalent Grades



Type	Grade	UNS No	Old British		Euronorm		Swedish SS	Japanese JIS
			BS	En	No	Name		
Austenitic	201	S20100	-	-	1.4372	X12CrMnNiN17-7-5	-	SUS 201
	202	S20200	-	-	1.4373	X12CrMnNiN18-9-5	-	SUS 202
	301	S30100	301S21	-	1.4310	X10CrNi18-8	2331	SUS 301
	302HQ	S30430	394S17	-	1.4567	X3CrNiCu18-9-4	-	SUS XM7
	303	S30300	303S31	58M	1.4305	X8CrNiS18-9	2346	SUS 303
	304	S30400	304S31	58E	1.4301	X5CrNi18-10	2332	SUS 304
	304L	S30403	304S11	-	1.4307	X2CrNi18-9	2352	SUS 304L
	304H	S30409	-	-	1.4948	X6CrNi18-10	-	-
	304N	S30451	-	-	-	-	2371	SUS 304N1
	309S	S30908	309S24	-	1.4833	X12CrNi23-13	-	SUS 309S
	310H	S31009	310S24	-	-	-	-	SUH 310
	310S	S31008	310S16	-	1.4845	X8CrNi25-21	2361	SUS 310S
	316	S31600	316S31	58H,58J	1.4401	X5CrNiMo17-12-2	2347	SUS 316
	316L	S31603	316S11	-	1.4404	X2CrNiMo17-12-2	2348	SUS 316L
	316H	S31609	316S51	-	1.4919	-	-	-
	316N	S31651	-	-	1.4406	X2CrNiMoN17-11-2	2375	SUS 316N
	316Ti	S31635	320S31	-	1.4571	X10CrNiMoTi18-10	2350	SUS 316Ti
	317L	S31703	317S12	-	1.4438	X2CrNiMo18-16	2367	SUS 317L
	321	S32100	321S31	58B,58C	1.4541	X6CrNiTi18-10	2337	SUS 321
	347	S34700	347S31	58G	1.4550	X6CrNiNb18-10	2338	SUS 347
904L	N08904	904S13	-	1.4539	X1NiCrMoCuN25-20-5	2562	-	
253MA	S30815	-	-	1.4835	X9CrNiSiNCE21-11-2	2368	-	
4565S	S34565	-	-	1.4565	X2CrNiMnMoN24-17-6-4	-	-	
Ferritic	409	S40910	409S19	-	1.4512	X6CrTi12	-	SUH 409
	AtlasCr12	S41003	-	-	1.4003	X2CrNi12	-	-
	AtlasCR12Ti	-	-	-	-	-	-	-
	430	S43000	430S17	60	1.4016	X8Cr17	2320	SUS 430
	430F	S43020	-	-	1.4105	X6CrMoS17	2383	SUS 430F
	Atlas F20S	-	-	-	-	-	-	-
	444	S44400	-	-	1.4521	X1CrMoTi18-2	2326	SUS 444
446	S44600	-	-	1.4749	X18CrN28	2322	SUH 446	
Duplex	2101	S32101	-	-	1.4162	-	-	-
	2304	S32304	-	-	1.4362	X2CrNiN23-4	2327	-
	2205	S32250	318S13	-	1.4462	X2CrNiMoN22-5-3	2377	SUS 329J3L
	329	S32900	-	-	1.4460	X8CrNiMo27-5	2324	SUS 329J1
	2507	S32750	-	-	1.4410	X2CrNiMoN25-7-4	2328	-
	2507Cu	S32520	-	-	1.4507	X2CrNiMoCuN25-6-3	-	-
	Zeron100	S32760	-	-	1.4501	X2CrNiMoCuWN25-7-4	-	-
Martensitic	410	S41000	410S21	56A	1.4006	X12Cr13	2302	SUS 410
	416	S41600	416S21	56AM	1.4005	X12CrS13	2380	SUS 416
	420	S42000	420S37	56C	1.4021	X20Cr13	2303	SUS 420J1
	431	S43100	431S29	57	1.4057	X17CrNi16-2	2321	SUS 431
	440C	S44004	-	-	1.4125	X105CrMo17	-	SUS 440C
P.H	630	S17400	-	-	1.4542	X5CrNiCuNb16-4	-	SUS 630
	631	S17700	460S52	-	1.4568	X7CrNiAl17-7	2388	SUS 631

The above comparisons are approximate only - in some instances they are very close, in others much less so. The list is intended as a comparison of functionally similar materials not as a schedule of contractual equivalents. If exact equivalents are needed original specifications must be consulted.

## Specified Compositions

Type	Grade	UNS	C	Mn	Si	P	S	Cr	Mo	Ni	N	Other
Austenitic	201	S20100	0.15	5.50-7.50	1.00	0.06	0.030	16.0-18.0		3.5-5.5		
	202	S20200	0.15	7.50-10.00	1.00	0.06	0.030	17.0-19.0		4.0-6.0		
	301	S30100	0.15	2.00	1.00	0.045	0.030	16.0-18.0		6.0-8.0	0.10	
	302HQ	S30430	0.030	2.00	1.00	0.045	0.030	17.0-19.0		8.0-10.0		3.0-4.0 Cu
	303	S30300	0.15	2.00	1.00	0.2	0.15min	17.0-19.0		8.0-10.0		
	304	S30400	0.07	2.00	0.75	0.045	0.030	17.5-19.5	-	8.0-10.5	0.10	
	304L	S30403	0.030	2.00	0.75	0.045	0.030	17.5-19.5	-	8.0-10.5	0.10	
	304H	S30409	0.04-0.10	2.00	0.75	0.045	0.030	18.0-20.0		8.0-10.5		
	304N	S30451	0.08	2.00	0.75	0.045	0.030	18.0-20.0		8.0-10.5	0.10-0.16	
	305	S30500	0.12	2.00	0.75	0.045	0.030	17.0-19.0		10.5-13.0		
	309S	S30908	0.08	2.00	0.75	0.045	0.030	22.0-24.0		12.0-15.0		
	310H	S31009	0.04-0.10	2.00	0.75	0.045	0.030	24.0-26.0		19.0-22.0		
	310S	S31008	0.08	2.00	1.50	0.045	0.030	24.0-26.0		19.0-22.0		
	316	S31600	0.08	2.00	0.75	0.045	0.030	16.0-18.0	2.00-3.00	10.0-14.0	0.10	
	316L	S31603	0.030	2.00	0.75	0.045	0.030	16.0-18.0	2.00-3.00	10.0-14.0	0.10	
	316H	S31609	0.04-0.10	2.00	0.75	0.045	0.030	16.0-18.0	2.00-3.00	10.0-14.0		
	316N	S31651	0.08	2.00	0.75	0.045	0.030	16.0-18.0	2.00-3.00	10.0-14.0	0.10-0.16	
	316Ti	S31635	0.08	2.00	0.75	0.045	0.030	16.0-18.0	2.00-3.00	10.0-14.0	0.10	5x(C+N)min, 0.70 max Ti
	317L	S31703	0.030	2.00	0.75	0.045	0.030	18.0-20.0	3.0-4.0	11.0-15.0	0.10	
	321	S32100	0.08	2.00	0.75	0.045	0.030	17.0-19.0		9.0-12.0	0.10	5x(C+N)min, 0.70 max Ti
347	S34700	0.08	2.00	0.75	0.045	0.030	17.0-19.0		9.0-13.0		10x(C+N)min, 1.0 max Nb	
904L	N08904	0.020	2.00	1.00	0.045	0.035	19.0-23.0	4.00-5.00	23.0-28.0	0.10	1.00-2.00 Cu	
253MA	S30815	0.05-0.10	0.8	1.40-2.00	0.040	0.030	20.0-22.0		10.0-12.0	0.14-0.20	0.03-0.08 Ce	

Single values are maxima.

Values listed are from ASTM A240M for flat rolled product, except for those grades only available in other products such as bar or wire, where limits in these ASTM specifications for these products are quoted.

## Specified Compositions

Type	Grade	UNS	C	Mn	Si	P	S	Cr	Mo	Ni	N	Other
Ferritic	409*	S40910	0.030	1.00	1.00	0.040	0.020	10.5-11.7	-	0.50	0.03	6x(C+N)min, 0.50 max Ti
	AtlasCR12	S40977	0.030	1.50	1.00	0.040	0.015	10.50-12.50	-	0.30-1.00	0.03	
	AtlasCR12Ti	-	0.030	2.00	1.00	0.040	0.030	10.5-12.5	-	1.50	-	4x(C+N)min, 0.60 max Ti
	430	S43000	0.12	1.00	1.00	0.040	0.030	16.0-18.0	-	0.75	-	
	430F	S43020	0.12	1.25	1.00	0.060	0.15min	16.0-18.0	-	-	-	
	Atlas F20S	-	0.030	1.00	1.00	0.040	0.030	19.0-21.0	-	-	0.03	4x(C+N)min, 0.60 max Ti
	444	S44400	0.025	1.00	1.00	0.040	0.030	17.5-19.5	1.75-2.50	1.00	0.035	0.20+4x(C+N) Ti+Nb, 0.80max
446	S44600	0.20	1.50	1.00	0.040	0.030	23.0-27.0	-	0.75	0.25		
Duplex	2101	S32101	0.04	4.00-6.00	1.00	0.040	0.030	21.0-22.0	0.10-0.80	1.35-1.70	0.20-0.25	0.10-0.80 Cu
	2304	S32304	0.030	2.50	1.00	0.040	0.030	21.5-24.5	0.05-0.60	3.0-5.5	0.05-0.20	0.05-0.60 Cu
	2205	S32205	0.030	2.00	1.00	0.030	0.020	22.0-23.0	3.0-3.5	4.5-6.5	0.14-0.20	
	329	S32900	0.08	1.00	0.75	0.040	0.030	23.0-28.0	1.00-2.00	2.0-5.0	-	
	2507	S32750	0.030	1.20	0.80	0.035	0.020	24.0-26.0	3.0-5.0	6.0-8.0	0.24-0.32	0.50 Cu
	2507Cu	S32520	0.030	1.50	0.80	0.035	0.020	24.0-26.0	3.0-4.0	5.5-8.0	0.20-0.35	0.50-2.00 Cu
	Zeron100	S32760	0.030	1.00	1.00	0.030	0.010	24.0-26.0	3.0-4.0	6.0-8.0	0.20-0.30	0.50-1.00 Cu, 0.50-1.00 W
Martensitic	410	S41000	0.08-0.15	1.00	1.00	0.040	0.030	11.5-13.5	-	0.75	-	
	416	S41600	0.15	1.25	1.00	0.060	0.15 min	12.0-14.0	-	-	-	
	420	S42000	0.15 min	1.00	1.00	0.040	0.030	12.0-14.0	-	-	-	
	431	S43100	0.20	1.00	1.00	0.040	0.030	15.0-17.0	-	1.25-2.50	-	
	440C	S44004	0.95-1.20	1.00	1.00	0.040	0.030	16.0-18.0	0.75	-	-	
P.H	630	S17400	0.07	1.00	1.00	0.040	0.030	15.0-17.5	-	3.00-5.00	-	3.00-5.00 Cu, 0.15-0.45Nb+Ta
	631	S17700	0.09	1.00	1.00	0.040	0.030	16.00-18.00	-	6.50-7.75	-	0.75-1.50 Al

Single values are maxima.

Values listed are from ASTM A240M for flat rolled product, except for those grades only available in other products such as bar or wire, where limits in these ASTM specifications for these products are quoted.

\* Grade 409 now largely replaced by S40910, S40920 and S40930 – refer to specifications for details.

## Specified Mechanical Properties

Type	Grade	UNS No	Tensile Strength (MPa) min	Yield Strength (MPa) min	Elongation (% in 50mm) min	Hardness max	
						Rockwell (HR B)	Brinell (HB)
Austenitic	201	S20100	515	260	40	95	217
	202	S20200	620	260	40	-	241
	301	S30100	515	205	40	95	217
	302HQ	S30430	(450)	(205)	(70)	-	-
	303	S30300	-	-	-	-	262
	304	S30400	515	205	40	92	201
	304L	S30403	485	170	40	92	201
	304H	S30409	515	205	40	92	201
	304N	S30451	550	240	30	95	217
	309S	S30908	515	205	40	95	217
	310H	S31009	515	205	40	95	217
	310S	S31008	515	205	40	95	217
	316	S31600	515	205	40	95	217
	316L	S31603	485	170	40	95	217
	316H	S31609	515	205	40	95	217
	316N	S31651	550	240	35	95	217
	316Ti	S31635	515	205	40	95	217
	317L	S31703	515	205	40	95	217
	321	S32100	515	205	40	95	217
	347	S34700	515	205	40	92	201
904L	N08904	490	220	35	90	-	
253MA	S30815	600	310	40	95	217	
4565S	S34565	795	415	35	100	241	
Ferritic	409	S40900	380	207	20	95	207
	AtlasCR12	S41003	455	275	18	20HRC	223
	AtlasCR12Ti	-	460	300	18	-	220
	430	S43000	450	205	22	89	180
	430F	S43020	(552)	(380)	(25)	-	262
	Atlas F20S	-	(510)	(360)	(29)	(78)	-
	444	S44400	415	275	20	96	217
446	S44600	450	276	20	-	219	
Duplex	2101	S32101	680	480	30	-	290
	2304	S32304	600	400	25	32HRC	290
	2205	S32205	620	450	25	31HRC	293
	329	S32900	620	485	15	28HRC	269
	2507	S32750	795	550	15	32HRC	310
	2507Cu	S32520	770	550	25	-	310
	Zeron100	S32760	750	550	25	-	270
Martensitic	410	S41000	480	275	16	-	-
	416	S41600	(517)	(276)	(30)	-	262
	420	S42000	(655)	(345)	(25)	-	241
	431 (H&T)	S43100	850-1000	635	11	-	248-302
	440C	S44004	(758)	(448)	(14)	-	269
P.H	630 (H900)	S17400	1310	1170	10	40HRC min	388 min
	631 (CH900)	S17700	1585	-	-	-	-

The above properties are specified for each grade's most common product - generally plate or bar in the solution treated condition. Different limits apply to some other products.

Values in parentheses are typical; no values are specified. Original specifications must be consulted for definitive values.

## Typical Physical Properties

Grade	UNS No.	Density kg/m <sup>3</sup>	Elastic Modulus (a) GPa	Mean Coefficient of Thermal Expansion (b)			Thermal Conductivity		Specific Heat 0-100°C J/kg.K	Elect. Resis- tivity nΩ.m
				0-100°C µm/m/°C	0-315°C µm/m/°C	0-538°C µm/m/°C	at 100°C W/m.K	at 500°C W/m.K		
201	S20100	7800	197	15.7	17.5	18.4	16.2	21.5	500	690
202	S20200	7800	-	17.5	18.4	19.2	16.2	21.6	500	690
301	S30100	8000	193	17.0	17.2	18.2	16.2	21.5	500	720
302HQ	S30430	8000	193	17.2	17.8	18.8	16.3	21.5	500	720
303	S30300	8000	193	17.3	17.8	18.4	16.2	21.5	500	720
304	S30400	8000	193	17.2	17.8	18.4	16.2	21.5	500	720
304L	S30403	8000	193	17.2	17.8	18.4	16.2	21.5	500	720
304H	S30409	8000	193	17.2	17.8	18.4	16.2	21.5	500	720
304N	S30451	8000	196	17.2	17.8	18.4	16.3	21.5	500	720
309S	S30908	8000	200	15.0	16.6	17.2	15.6	18.7	500	780
310H	S31009	7750	200	15.9	16.2	17.0	14.2	18.7	500	720
310S	S31008	7750	200	15.9	16.2	17.0	14.2	18.7	500	720
316	S31600	8000	193	15.9	16.2	17.5	16.3	21.5	500	740
316L	S31603	8000	193	15.9	16.2	17.5	16.3	21.5	500	740
316H	S31609	8000	193	15.9	16.2	17.5	16.3	21.5	500	740
316N	S31651	8000	196	15.9	16.2	17.5	14.4	-	500	740
316Ti	S31635	8000	193	15.9	16.2	17.5	16.3	21.5	500	740
317L	S31703	8000	200	16.5	17.0	18.1	14.4	-	500	790
321	S32100	8000	193	16.6	17.2	18.6	16.1	22.2	500	720
347	S34700	8000	193	16.6	17.2	18.6	16.1	22.2	500	720
904L	N08904	8000	200	15.0	-	-	13.0	-	500	850
253MA	S30815	7800	200	17.0	17.2	18.0	14.0	18.0	500	850
4565S	S34565	8000	190	14.5	16.3	17.2	14.5	-	510	920
409	S40900	7600	208	11.0	11.7	12.4	25.8	27.5	460	600
AtlasCR12	S41003	7740	200	10.8	11.3	12.5	30.5	40.0	480	570
AtlasCr12Ti	-	7740	200	10.8	11.3	12.5	30.5	40.0	480	570
430	S43000	7750	200	10.4	11.0	11.4	23.9	26.0	460	600
430F	S43020	7750	200	10.4	11.0	11.4	26.1	26.3	460	600
Atlas F20S	-	7700	210	11.5	12.0	12.5	21.3	-	450	700
444	S44400	7800	200	10.0	10.6	11.4	26.8	-	420	620
446	S44600	7800	200	10.4	10.8	11.2	20.9	24.4	500	670
2101	S32101	7800	200	13.0	14.0	-	16.0	-	500	800
2304	S32304	7800	200	13.0	-	-	16.0	-	470	850
2205	S32205	7805	200	13.7	14.7	-	19.0	-	450	850
329	S32900	7800	186	10.1	11.5	-	-	-	460	750
2507	S32750	7800	200	13.0	14.0	-	17.0	-	470	-
2507Cu	S32520	7810	205	13.5	14.0	14.5	17.0	-	450	850
Zeron100	S32760	7840	190	12.6	13.9	-	14.4	-	480	850
410	S41000	7750	200	9.9	11.4	11.6	24.9	28.7	460	570
416	S41600	7750	200	9.9	11.0	11.6	24.9	28.7	460	570
420	S42000	7750	200	10.3	10.8	11.7	24.9	-	460	550
431	S43100	7750	200	10.2	12.1	-	20.2	-	460	720
440C	S44004	7650	200	10.1	10.3	11.7	24.2	-	460	600
630	S17400	7750	196	10.8	11.6	-	18.4	22.7	460	800
631	S17700	7800	204	11.0	11.6	-	16.4	21.8	460	830

Units – (a) 1 GPa = 1000 MPa (b) µm/m/°C = microns/metre/°C = x10<sup>-6</sup>/°C

Properties given are typical for the annealed condition.

Magnetic Permeability of all 300 series austenitic steels in the annealed condition is approximately 1.02.

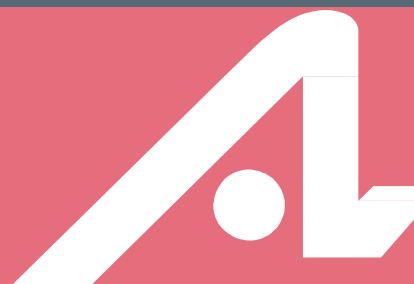
## Specifications & Grade Designations

Australian “common usage” grades are based upon the ASTM (American Society for Testing and Materials) designations; variations of this system have also been adopted in many other countries, including USA, Canada and Japan, and are well-recognised throughout the rest of the world. Certain grades of stainless steel have no equivalents in this system, particularly some European and newer grades. All metals in regular production have been allocated UNS (Unified Numbering System) designations by ASTM and SAE; these are often referred to in ASTM and other national specifications. “EuroNorms” are increasingly used across the European Union; the grades are usually functionally compatible with ASTM / UNS grades, but may vary in their details.

Note that “AISI” was the organisation that first codified the three digit designation system, and steels are still widely referred to as eg “AISI 304”, but AISI is not a standards-writing body – such designations are well recognised but should not be used as specifications for products. Product specifications (such as ASTM A240M for stainless steel flat rolled) do use the same grade designations but have clear requirements for composition limits, and also for mechanical properties, dimensions, testing procedures etc.



# Product Specifications



## Stainless Steel Wire

Standard	Description
ASTM A313	Chromium-nickel stainless and heat resisting steel spring wire.
ASTM A493	Stainless and heat resisting steel for cold heading and cold forging wire.
ASTM A580	Stainless and heat resisting steel wire.
ASTM A581	Free machining stainless and heat resisting steel wire and wire rods.
ASTM A555/A555M	General requirements for stainless and heat resisting steel wire and wire rods.
JIS G4309	Stainless steel wires.
JIS G4314	Stainless steel wires for springs.
<b>Welding wire</b>	
AWS A5.4	Specification for covered corrosion resisting chromium and chromium-nickel steel welding electrodes.
AWS A5.9	Specification for corrosion resisting chromium and chromium-nickel steel bare and composite metal cored and stranded welding electrodes and welding rods.

## Stainless Steel Bar

Standard	Description
ASTM A276	Stainless and heat resisting steel bars and shapes.
ASTM A564/A564M	Hot rolled and cold finished age-hardening stainless and heat resisting steel bars and shapes.
ASTM A582	Free machining stainless and heat resisting steel bars and hot rolled or cold finished.
ASTM A193/A193M	Alloy steels and stainless steel bolting materials for high temperature service.
ASTM A194/A194M	Carbon and alloy steel nuts for bolts for high pressure and high temperature service.
ASTM A320/A320M	Alloy steel bolting materials for low temperature service.
ASTM A453/A453M	Bolting materials, high temperature 345 to 827MPa yield strength with expansion co-efficients comparable to austenitic steels.
ASTM A479/A479M	Stainless and heat resisting steel bars and shapes for use in boilers and other pressure vessels.
ASTM A484/A484M	General requirements for stainless and heat resisting steel bars, billets and forgings.
EN 10088-3	Stainless Steels – Part 3: Technical delivery conditions for semi-finished products, bars, rods and sections for general purposes.

## Stainless Steel Hollow Bar

Standard	Description
ASTM A511	Seamless stainless steel mechanical tubing.
ASTM A450/A450M	General requirements for carbon, ferritic alloy and austenitic alloy tubes.
DIN 17 456	General purpose seamless circular stainless steel tubes – ferritic and austenitic.

# Product Specifications

## Stainless Steel Flat Product

Standard	Description
ASTM A167	Stainless and heat resisting chromium-nickel steel plate, sheet and strip.
ASTM A176	Stainless and heat resisting chromium steel plate, sheet and strip.
ASTM A240/A240M	Chromium and chromium-nickel stainless steel plate, sheet and strip for pressure vessels and general applications.
ASTM A263	Corrosion resisting chromium steel clad plate, sheet and strip.
ASTM A264	Stainless chromium-nickel steel clad plate, sheet and strip.
ASTM A265	Nickel and nickel base alloy clad steel plate.
ASTM A666	Austenitic stainless steel sheet, strip, plate and flat bar for structural applications.
ASTM A480/A480M	General requirements for flat rolled stainless and heat resisting steel plate, sheet and strip.
EN 10088-2	Stainless Steels – Part 2: Technical delivery conditions for sheet/plate and strip for general purposes.
<b>Higher austenitic</b>	
ASTM B625	UNS N08904 plate, sheet and strip

## Stainless Steel Pipe

Standard	Description
ASTM A312/A312M	Seamless and welded austenitic stainless steel pipe.
ASTM A358/A358M	Electric-Fusion-Welded (EFW) austenitic chromium-nickel alloy steel pipe for high temperature service.
ASTM A409/A409M	Welded large diameter austenitic steel pipe for corrosive or high temperature service.
ASTM A731/A731M	Seamless and welded ferritic and martensitic stainless steel pipe.
ASTM A790/A790M	Seamless and welded ferritic/austenitic stainless steel pipe.
ASTM A450/A450M	General requirements for carbon, ferritic alloy and austenitic alloy steel tubes.
ASTM A530/A530M	General requirements for specialised carbon and alloy steel pipe.
ASTM A999/A999M	General requirements for alloy and stainless steel pipe.
JIS G3459	Stainless steel pipes.
ANSI/ASME B36.19M	Stainless steel pipe.
ASTM B673	UNS N08904 welded pipe.
ASTM B677	UNS N08904 seamless pipe and tube.

## Low Alloy Steel Bar

Standard	Description
AS 1444	Wrought alloy steels – standard and hardenability (H) series and hardened and tempered to designated mechanical strengths.
ASTM A331	Steel bars, alloy, cold finished.
ASTM A434	Steel bars, alloy, hot wrought or cold finished, quenched and tempered.
ASTM A29/A29M	Steel bars, carbon and alloy, hot wrought and cold finished; general requirements.
ASTM A304	Steel bars, alloy, subject to end quench hardenability requirements.

# Product Specifications

## Stainless Steel Pipe Fittings and Flanges

Standard	Description
ASTM A182/A182M	Forged or rolled alloy steel pipe flanges, forged fittings and valves and parts for high temperature service.
ASTM A403/A403M	Wrought austenitic stainless steel piping fittings.
ASTM A815/A815M	Wrought ferritic, ferritic/austenitic and martensitic stainless steel piping fittings.
AS 2129	Flanges for pipes, valves and fittings.
ASME B1.20.1	Pipe threads, general purpose (inch).
ANSI B16.5	Steel pipe flanges and flanged fittings.
ANSI B16.9	Factory-made wrought steel butt-welding fittings.
ANSI B16.11	Forged steel fittings socket-welding and threaded.
ANSI B16.25	Butt-welding ends.
MSS SP43	Wrought stainless steel butt-welding fittings.
BS21	BSP Threading – refer also AS ISO 7-1.
ISO 4144	Stainless steel fittings threaded to ISO 7-1.

## Stainless Steel Tube and Fittings

Standard	Description
ASTM A213/A213M	Seamless ferritic and austenitic alloy steel boiler, superheater and heat exchanger tubes.
ASTM A249/A249M	Welded austenitic steel boiler, superheater, heat exchange and condenser tubes.
ASTM A269	Seamless and welded austenitic stainless steel tubing for general purposes.
ASTM A270	Seamless and welded austenitic stainless steel sanitary tubing.
ASTM A450/A450M	General requirements for carbon, ferritic alloy and austenitic alloy steel tubes.
ASTM A554	Welded stainless steel mechanical tubing.
ASTM A791/A791M	Welded unannealed ferritic stainless steel tubing.
ASTM A789/A789M	Seamless and welded ferritic/austenitic stainless steel tubing for general service.
AS 1528, Parts 1 to 4	Tubes (stainless steel) and tube fittings for the food industry.
ASTM B674	UNS N08904 welded tube.
ASTM B677	UNS N08904 seamless pipe and tube.

## Carbon and alloy steel hollow bar

Standard	Description
ASTM A519	Seamless carbon and alloy steel mechanical tubing.
ISO 2938	Hollow bars for machining.
DIN 1629	Seamless circular unalloyed steel tubes – special purposes.

# Product Specifications

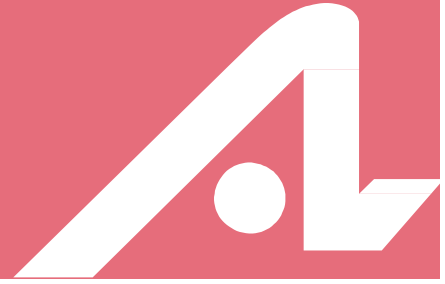
## Carbon Steel Bar Products

Standard	Description
AS 1442	Carbon steels and carbon manganese steels – hot rolled bars and semi-finished product.
AS 1443	Carbon steels and carbon manganese steels – cold finished bars.
ASTM A576	Steel bars, carbon, hot wrought, special quality.
JIS G4051	Carbon steels for machine structural use.

## Carbon Steel Pipe, Tube and Fittings

Standard	Description
ASTM A179/A179M	Seamless cold drawn low alloy steel heat exchange and condenser tubes.
API 5L	Specification for line pipe.
ASTM A53M	Black and zinc coated welded and seamless steel pipe.
ASTM A106M	Seamless carbon steel pipe for high temperature service.
ASTM A105M	Carbon steel forgings for piping application.
ASTM A234M	Piping fittings of wrought carbon steel and alloy steel for moderate and high temperature service.
BS 3799	Steel pipe fittings, screwed and socket welding for the petroleum industry.
AS/NZS 1163	Structural steel hollow sections.
AS 1074	Steel tubes and tubular for ordinary service.
BS 1387	Screwed and socketed steel tube and tubulars.
EN 10241	Steel threaded pipe fittings.
ASME B36.10M	Welded and seamless wrought steel pipe.

# Grade Colour Codes



Stainless Steels		Carbon Steel		Alloy High Tensile		Alloy Case Hardening	
Grade	Colour	Grade	Colour	Grade	Colour	Grade	Colour
303	Light blue	U1004	No Colour	4140	Bluebell	8620	White
304/L	Lilac	M1010	Black	4340	Marigold	X4317	Black
316/L	Bottle Green	M1020	Custard	En 25	Jade	En 36A	Signal Red
253MA	Serpentine	M1030	White	En 26	Redgum	En 39B	Bottle Green
AtlasCR12	No Colour	1040	Golden Tan	Hytuf	Serpentine		
431	Signal Red	1045	Jade				
2205	Lime	1214	Rose Pink				
2507	Violet	12L14	Violet				