



PIPES & TUBES ASTM / API / BS / DIN / IS

MATERIAL SPECIFICATION FOR PIPES & TUBES OF STAINLESS STEEL, ALLOY STEEL, CARBON STEEL & MILD STEEL

PIPE SPECIFICATION	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES			OTHERS	
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Ni%	Mo%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min)		
											L		T
API 5L Gr. A	0.22 Max	0.90 Max	0.030	0.030	-	-	-	-	331	207	e=625 000 A ^{0.2} / U ^{0.9}	For Seamless : C% Will be 0.028 for Gr. B to x 70 Mn% will be 1.40 for Gr. X65 to X 70	
API 5L Gr. B	0.26 Max	1.20 Max	0.030	0.030	-	-	-	-	414	241			
API 5L Gr. X 42	0.26 Max	1.30 Max	0.030	0.030	-	-	-	-	414	290			
API 5L Gr. X 46	0.26 Max	1.40 Max	0.030	0.030	-	-	-	-	434	317			
API 5L Gr. X 52	0.26 Max	1.40 Max	0.030	0.030	-	-	-	-	455	359			
API 5L Gr. X 56	0.26 Max	1.40 Max	0.030	0.030	-	-	-	-	490	386			
API 5L Gr. X 60	0.26 Max	1.45 Max	0.030	0.030	-	-	-	-	517	414			
API 5L Gr. X 65	0.26 Max	1.65 Max	0.030	0.030	-	-	-	-	531	448			
API 5L Gr. X 70	0.26 Max	1.65 Max	0.030	0.030	-	-	-	-	565	483			
BS 3059 PT-I Gr. 320	0.16 Max	0.30-0.70	0.040	0.040	0.35 Max	-	-	-	320-480	195			25
BS 3059 PT-II Gr. 360	0.17 Max	0.40-0.80	0.035	0.035	0.10-0.35	-	-	-	360-500	235	24		
BS 3059 PT-II Gr. 440	0.12-0.18	0.90-1.20	0.035	0.035	0.10-0.35	-	-	-	440-580	245	21		
BS 3059 PT-I Gr. 620	0.10-0.15	0.40-0.70	0.030	0.030	0.10-0.35	0.70-0.10	-	0.45-0.65	460-610	180	22		
BS 6323 Gr. 1	0.13 Max	0.60 Max	0.050	0.050	-	-	-	-	300	200	20		
BS 6323 Gr. 2	0.16 Max	0.70 Max	0.050	0.050	-	-	-	-	340	250	15		
BS 6323 Gr. 3	0.20 Max	0.90 Max	0.050	0.050	0.35 Max	-	-	-	400	300	12		
BS 1387	0.20 Max	1.20 Max	0.045	0.045	-	-	-	-	320-460	195	20		
DIN 17175 Gr. St 35.8	0.17 Max	0.40-0.80	0.040	0.040	0.10-0.35	-	-	-	225	360-480	25		
DIN 17175 Gr. St 45.8	0.21 Max	0.40-1.20	0.040	0.040	0.10-0.35	-	-	-	245	410-530	21		
DIN 17175 Gr. 17Mn4	0.14-0.20	0.90-1.20	0.040	0.040	0.20-0.40	0.30 Max	-	-	275	460-580	23		
DIN 17175 Gr. 19Mn5	0.17-0.22	1.00-1.30	0.040	0.040	0.30-0.36	0.30 Max	-	-	315	510-610	19		
DIN 17175 Gr. 15Mo3	0.12-0.20	0.40-0.80	0.035	0.035	0.10-0.35	-	-	0.25-0.35	275	550-600	22		
DIN 17175 Gr. 13CrMo44	0.10-0.18	0.40-0.80	0.035	0.035	0.10-0.35	0.70-1.10	-	0.45-0.65	295	440-590	22		
DIN 17175 Gr. 10CrMo910	0.08-0.15	0.40-0.70	0.035	0.035	0.50 Max	2.00-2.50	-	0.90-1.20	385	550-600	20		
DIN 17175 Gr. 13CrMo910	0.10-0.18	0.40-0.70	0.035	0.035	0.10-0.35	0.70-1.10	-	0.45-0.65	295	440-590	22		
DIN 17175 Gr. 14MoV63	0.10-0.18	0.40-0.70	0.035	0.035	0.10-0.35	0.50-0.70	-	0.50-0.70	325	460-610	20	V: 0.22-0.32	
DIN 17175 Gr. X20CrMoV121	0.17-0.23	1.00 Max	0.030	0.030	0.50 Max	0.80-1.20	0.30-0.80	0.80-1.20	490	690-850	17	V: 0.25-0.35	
IS 1239 Part I	-	-	0.050	0.050	-	-	-	-	320	-	20		
IS 3589 Gr. Fe 380	0.16 Max	1.20 Max	0.040	0.040	-	-	-	-	330	195	20		
IS 3589 Gr. Fe 410	0.20 Max	1.30 Max	0.040	0.040	-	-	-	-	410	235	18		
IS 1979 Gr. YST 290	0.28 Max	1.25 Max	0.040	0.050	-	-	-	-	410	290	e=1942 57 A ^{0.2} / U ^{0.9}		
IS 1979 Gr. YST 320	0.30 Max	1.35 Max	0.040	0.050	-	-	-	-	430	320			
IS 1979 Gr. YST 360	0.30 Max	1.35 Max	0.040	0.050	-	-	-	-	450	360			
IS 1979 Gr. YST 390	0.26 Max	1.35 Max	0.040	0.050	-	-	-	-	490	390			
IS 1979 Gr. YST 410	0.26 Max	1.35 Max	0.040	0.050	-	-	-	-	520	410			
IS 1979 Gr. YST 450	0.26 Max	1.40 Max	0.040	0.050	-	-	-	-	530	450			
IS 1979 Gr. YST 480	0.26 Max	1.60 Max	0.040	0.040	-	-	-	-	565	480			
IS 1978 Gr. YST 210	0.22 Max	0.90 Max	0.040	0.050	-	-	-	-	330	210			
IS 1978 Gr. YST 240	0.27 Max	1.15 Max	0.040	0.050	-	-	-	-	410	240			



PIPES & TUBES ASTM / API / BS / DIN / IS

MATERIAL SPECIFICATION FOR PIPES & TUBES STAINLESS STEEL ALLOY STEEL, CARBON STEEL & MILD STEEL

PIPE SPECIFICATION	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES			OTHERS	
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Ni%	Mo%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min)		
ASTMA 312 Gr. TP 304	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	35	25	-
ASTMA 312 Gr. TP 304L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-13.0	-	485	170	35	25	-
ASTMA 312 Gr. TP 304H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	35	25	-
ASTMA 312 Gr. TP 304LN	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-12.0	-	515	205	35	25	N%=0.10-0.16
ASTMA 312 Gr. TP 309S	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	22.0-24.0	12.0-15.0	0.75 Max	515	205	35	25	-
ASTMA 312 Gr. TP 310S	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	24.0-26.0	19.0-22.0	0.75 Max	515	205	35	25	-
ASTMA 312 Gr. TP 316	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	-
ASTMA 312 Gr. TP 316L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-14.0	2.00-3.00	485	170	35	25	-
ASTMA 312 Gr. TP 316H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	-
ASTMA 312 Gr. TP 316LN	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.00-3.00	515	205	35	25	N%=0.10-0.16
ASTMA 312 Gr. TP 317	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-14.0	3.00-4.00	515	205	35	25	-
ASTMA 312 Gr. TP 317L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-15.0	3.00-4.00	515	205	35	25	-
ASTMA 312 Gr. TP 321	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	35	25	Ti%=(5XC)-0.70
ASTMA 312 Gr. TP 321H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	35	25	Ti%=(4XC)-0.60
ASTMA 312 Gr. TP 347	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-13.0	-	515	205	35	25	Cb%=(10XC)-1.00
ASTMA 312 Gr. TP 347H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-13.0	-	515	205	35	25	Cb%=(8XC)-1.10
ASTMA 358 Gr. TP 304	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	18.0-20.0	8.0-10.5	-	515	205	40		N%=0.10 Max, HRB=92 Max
ASTMA 358 Gr. TP 304L	0.035 Max	2.00 Max	0.045	0.030	0.75 Max	18.0-20.0	8.0-12.0	-	485	170	40		N%=0.10 Max, HRB=92 Max
ASTMA 358 Gr. TP 309S	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	22.0-24.0	12.0-15.0	-	515	205	40		HRB=95 Max
ASTMA 358 Gr. TP 310S	0.080 Max	2.00 Max	0.045	0.030	1.50 Max	24.0-26.0	19.0-22.0	-	515	205	40		HRB=95 Max
ASTMA 358 Gr. TP 316	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	16.0-18.0	10.0-14.0	2.00-3.00	515	205	40		N%=0.10 Max, HRB=95 Max
ASTMA 358 Gr. TP 316L	0.035 Max	2.00 Max	0.045	0.030	0.75 Max	16.0-18.0	10.0-14.0	2.00-3.00	485	170	40		N%=0.10 Max, HRB=95 Max
ASTMA 358 Gr. TP 321	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	17.0-19.0	9.0-12.0	-	515	205	40		N%=0.10 Max, Ti%=5X(C+N)-0.70, HRB=95 Max
ASTMA 358 Gr. TP 347	0.080 Max	2.00 Max	0.045	0.030	0.75 Max	17.0-19.0	9.0-13.0	-	515	205	40		Cb%=(10XC)-1.00, HRB=92 Max
ASTM A 106 Gr. A	0.25 Max	0.27-0.93	0.035	0.035	0.10 Min	0.40 Max	0.40 Max	0.15 Max	330	205	35	25	Cu%:0.40 Max, Va%: 0.08
ASTM A 106 Gr. B	0.30 Max	0.29-1.06	0.035	0.035	0.10 Min	0.40 Max	0.40 Max	0.15 Max	415	240	30	16.5	Cu%:0.40 Max, Va%: 0.08
ASTM A 106 Gr. C	0.35 Max	0.29-1.06	0.035	0.035	0.10 Min	0.40 Max	0.40 Max	0.15 Max	485	275	30	16.5	Cu%:0.40 Max, Va%: 0.08
ASTM A 53 Gr. A	0.25 Max	0.95 Max	0.050	0.045	-	0.40 Max	0.40 Max	0.15 Max	330	205	30	16.5	Cu%:0.40 Max, Va%: 0.08
ASTM A 53 Gr. B	0.30 Max	1.20 Max	0.050	0.045	-	0.40 Max	0.40 Max	0.15 Max	415	240	30	16.5	Cu%:0.40 Max, Va%: 0.08
ASTM A 333 Gr. 1	0.30 Max	0.40-1.06	0.025	0.025	-	-	-	-	380	205	35	25	Impact Test= -45°C, J=18 Min, HRB=85 Max
ASTM A 333 Gr. 6	0.30 Max	0.29-1.06	0.025	0.025	0.10 Min	-	-	-	415	240	30	16.5	Impact Test=-45°C, J=18 Min, HRB=85 Max
ASTM A 335 Gr. P1	0.10-0.20	0.30-0.80	0.025	0.025	0.10-0.50	-	-	0.44-0.65	380	205	30	20	
ASTM A 335 Gr. P2	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	-	0.44-0.65	380	205	30	20	
ASTM A 335 Gr. P5	0.15 Max	0.30-0.60	0.025	0.025	0.50 Max	4.00-6.00	-	0.45-0.65	415	205	30	20	
ASTM A 335 Gr. P9	0.15 Max	0.30-0.60	0.025	0.025	0.25-1.00	8.00-10.00	-	0.90-1.10	415	205	30	20	
ASTM A 335 Gr. P11	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	-	0.44-0.65	415	205	30	20	
ASTM A 335 Gr. P12	0.05-0.15	0.30-0.61	0.025	0.025	0.50 Max	0.80-1.25	-	0.44-0.65	415	220	30	20	
ASTM A 335 Gr. P22	0.05-0.15	0.30-0.60	0.025	0.025	0.50 Max	1.90-2.60	-	0.87-1.13	415	205	30	20	
ASTM A 335 Gr. P91	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	8.00-9.50	0.40 Max	0.85-1.05	620	440	20	-	V%=0.18-0.25, N%=0.030-0.070, Al%=0.02 Max, Cb%=0.06-0.10
ASTM A 213 Gr. T2	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	-	0.44-0.65	415	205	30		HRB=85 Max
ASTM A 213 Gr. T5	0.15 Max	0.30-0.60	0.025	0.025	0.50 Max	4.00-6.00	-	0.45-0.65	415	205	30		HRB=85 Max
ASTM A 213 Gr. T11	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	-	0.44-0.65	415	205	30		HRB=85 Max
ASTM A 213 Gr. T12	0.05-0.15	0.30-0.61	0.025	0.025	0.50 Max	0.80-1.25	-	0.44-0.65	415	220	30		HRB=85 Max
ASTM A 213 Gr. T22	0.05-0.15	0.30-0.60	0.025	0.025	0.50 Max	1.90-2.60	-	0.87-1.13	415	205	30		HRB=85 Max
ASTM A 179	0.06-0.18	0.27-0.63	0.035	0.035	-	-	-	-	325	180	35		HRB=72 Max
ASTM A 210 Gr. A1	0.27 Max	0.93 Max	0.035	0.035	0.10 Min	-	-	-	415	255	30		HRB=79 Max



BUTT-WELDING FITTING ASTM

MATERIAL SPECIFICATION FOR SEAMLESS / WELDED BUTT-WELDING PIPE FITTINGS

SPECIFICATION (ASTM-2002)	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES					OTHERS
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Mo%	Ni%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min) L T		Hardness (Max) BHN	
STAINLESS STEEL														
A 403 Gr. WP 304	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	-	8.0-11.0	515	205	28	20	-	
A 403 Gr. WP 304L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	-	8.0-12.0	485	170	28	20	-	
A 403 Gr. WP 304H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	-	8.0-11.0	515	205	28	20	-	
A 403 Gr. WP 304LN	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	-	8.0-11.0	515	205	28	20	-	N%=0.10-0.16
A 403 Gr. WP 309	0.20 Max	2.00 Max	0.045	0.030	1.00 Max	22.0-24.0	-	12.0-15.0	515	205	28	20	-	
A 403 Gr. WP 310S	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	24.0-26.0	-	19.0-22.0	515	205	28	20	-	
A 403 Gr. WP 316	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	2.0-3.0	10.0-14.0	515	205	28	20	-	
A 403 Gr. WP 316L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	2.0-3.0	10.0-14.0	485	170	28	20	-	
A 403 Gr. WP 316H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	2.0-3.0	10.0-14.0	515	205	28	20	-	
A 403 Gr. WP 316LN	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	2.0-3.0	10.0-13.0	515	205	28	20	-	N%=0.10-0.16
A 403 Gr. WP 317	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	3.0-4.0	11.0-15.0	515	205	28	20	-	
A 403 Gr. WP 317L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	3.0-4.0	11.0-15.0	515	205	28	20	-	
A 403 Gr. WP 321	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	-	9.0-12.0	515	205	28	20	-	Ti%=(5XC)-0.70
A 403 Gr. WP 321H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	-	9.0-12.0	515	205	28	20	-	Ti%=(4XC)-0.70
A 403 Gr. WP 347	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	-	9.0-12.0	515	205	28	20	-	Cb%=(10XC)-1.10
A 403 Gr. WP 347H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	-	9.0-12.0	515	205	28	20	-	Cb%=(8XC)-1.10
CARBON STEEL														
A 234 Gr. WPB	0.30 Max	0.29-1.06	0.050	0.058	0.10 Min	0.40 Max	0.15 Max	0.40 Max	415-655	240	30	20	197	Cu%=0.40 Max, Va%=0.08 Max, Cb%=0.02 Max
A 234 Gr. WPC	0.35 Max	0.29-1.06	0.050	0.058	0.10 Min	0.40 Max	0.15 Max	0.40 Max	485-655	275	30	20	197	Cu%=0.40 Max, Va%=0.08 Max, Cb%=0.02 Max
LOW TEMPERATURE CARBON STEEL														
A 420 Gr. WPL6	0.30 Max	0.50-1.35	0.035	0.040	0.15-0.40	0.30 Max	0.12 Max	0.40 Max	415-655	240	30	16.5	197	Cu%=0.40 Max, Va%=0.08 Max, Cb%=0.02 Max Impact Test=-45°C, J=17.3-13-6
A 420 Gr. WPL 3	0.20 Max	0.31-0.64	0.050	0.050	0.13-0.37	-	-	3.20-3.80	450-620	240	30	20	197	Impact Test=-45°C, J=17.3-13-6
ALLOY STEEL														
A 234 Gr. WP 1	0.28 Max	0.30-0.90	0.045	0.045	0.10-0.50	-	0.44-0.65	-	380-550	205	30	20	197	
A 234 Gr. WP 5	0.15 Max	0.30-0.60	0.040	0.030	0.50 Max	4.0-6.0	0.44-0.65	-	415-585	205	30	20	217	
A 234 Gr. WP 9	0.15 Max	0.30-0.60	0.030	0.030	1.00 Max	8.0-10.0	0.90-1.10	-	415-585	205	30	20	217	
A 234 Gr. WP 11 CL1	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.0	1.0-1.5	0.44-0.65	-	415-585	205	30	20	197	
A 234 Gr. WP 11 CL2	0.05-0.20	0.30-0.80	0.040	0.040	0.50-1.0	1.0-1.5	0.44-0.65	-	485-655	275	30	20	197	
A 234 Gr. WP 11 CL3	0.05-0.20	0.30-0.80	0.040	0.040	0.50-1.0	1.0-1.5	0.44-0.65	-	520-690	310	30	20	197	
A 234 Gr. WP 12 CL1	0.05-0.20	0.30-0.80	0.045	0.045	0.60 Max	0.80-1.25	0.44-0.65	-	415-585	220	30	20	197	
A 234 Gr. WP 12 CL2	0.05-0.20	0.30-0.80	0.045	0.045	0.60 Max	0.80-1.25	0.44-0.65	-	485-655	275	30	20	197	
A 234 Gr. WP 22 CL1	0.05-0.15	0.30-0.60	0.040	0.040	0.50 Max	1.90-2.60	0.87-1.13	-	415-585	205	30	20	197	
A 234 Gr. WP 22 CL3	0.05-0.15	0.30-0.60	0.040	0.040	0.50 Max	1.90-2.60	0.87-1.13	-	520-690	310	30	20	197	
A 234 Gr. WP 91	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	8.0-9.5	0.85-1.05	0.40 Max	585-760	415	20	-	248	Va%=0.18-0.25, Cb%=0.06-0.10, N%=0.03-0.07, Al%=0.04 Max



**FORGED FITTINGS & FLANGES ASTM
MATERIAL SPECIFICATION FOR FORGED FITTINGS & FLANGES**

SPECIFICATION (ASTM-2002)	CHEMICAL PROPERTIES								MECHANICAL PROPERTIES					OTHERS
	C%	Mn%	P% (Max)	S% (Max)	Si%	Cr%	Ni%	Mo%	U.T.S. (Min) Mpa	Y.S. (Min) Mpa	ELONG. (Min) %	RED. AREA %	Hardness (Max) BHN	
STAINLESS STEEL														
A 182 Gr. F 304	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	30	50	-	-
A 182 Gr. F 304L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-13.0	-	485	170	30	50	-	-
A 182 Gr. F 304H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	515	205	30	50	-	-
A 182 Gr. F 304LN	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-10.5	-	515	205	30	50	-	N%=0.10-0.16
A 182 Gr. F 309H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	22.0-24.0	12.0-15.0	-	515	205	30	50	-	-
A 182 Gr. F 310	0.25 Max	2.00 Max	0.045	0.030	1.00 Max	24.0-26.0	19.0-22.0	-	515	205	30	50	-	-
A 182 Gr. F 316	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-14.0	2.0-3.0	515	205	30	50	-	-
A 182 Gr. F 316L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-15.0	2.0-3.0	485	170	30	50	-	-
A 182 Gr. F 316H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	10.0-14.0	2.0-3.0	515	205	30	50	-	-
A 182 Gr. F 316LN	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	16.0-18.0	11.0-14.0	2.0-3.0	515	205	30	50	-	N%=0.10-0.16
A 182 Gr. F 317	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-15.0	3.0-4.0	515	205	30	50	-	-
A 182 Gr. F 317L	0.030 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	11.0-15.0	3.0-4.0	485	170	30	50	-	-
A 182 Gr. F 321	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	30	50	-	Ti%=(5xC)-0.70
A 182 Gr. F 321H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-12.0	-	515	205	30	50	-	Ti%=(4xC)-0.70
A 182 Gr. F 347	0.080 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-20.0	9.0-13.0	-	515	205	30	50	-	Cb%=(10xC)-1.10
A 182 Gr. F 347H	0.04-0.10	2.00 Max	0.045	0.030	1.00 Max	17.0-20.0	9.0-13.0	-	515	205	30	50	-	Cb%=(8xC)-1.10
CARBON STEEL														
A 105	0.35 Max	0.60-1.05	0.035	0.040	0.10-0.35	0.30 Max	0.40 Max	0.12 Max	485	250	22	30	187	Cu%=0.40 Max, Va %= 0.08 Max
LOW TEMPERATURE CARBON STEEL														
A 350 Gr. LF 1	0.35 Max	0.60-1.35	0.035	0.040	0.15-0.30	0.30 Max	0.40 Max	0.12 Max	415-585	205	25	38	197	Cu%=0.40Max, Cb%=0.02 Max, Va %= 0.05 Max, Impact Test =-28.9°C, J=18 Min
A 350 Gr. LF 2	0.30 Max	0.60-1.35	0.035	0.040	0.15-0.30	0.30 Max	0.40 Max	0.12 Max	485-655	250	22	30	197	Cu%=0.40Max, Cb%=0.02 Max, Va %= 0.05 Max, Impact Test =-45.6°C, J=18 Min
A 350 Gr. LF 3	0.20 Max	0.90 Max	0.035	0.040	0.20-0.35	0.30 Max	3.30-3.70	0.12 Max	485-655	260	22	35	197	Cu%=0.40Max, Cb%=0.02 Max, Va %= 0.03 Max, Impact Test =-101°C, J=20 Min
ALLOY STEEL														
A 182 Gr. F 1	0.28 max	0.60-0.90	0.045	0.045	0.15-0.35	-	-	0.44-0.65	485	275	20	30	143-192	-
A 182 Gr. F 2	0.05-0.21	0.30-0.80	0.040	0.040	0.10-0.60	0.50-0.81	-	0.44-.65	485	275	20	30	143-192	-
A 182 Gr. F 5	0.15 max	0.30-0.60	0.030	0.030	0.50 Max	4.0-6.0	0.5 Max	0.44-0.65	485	275	20	35	143-217	-
A 182 Gr. F 9	0.15 max	0.30-0.60	0.030	0.030	0.50-1.00	8.0-10.0	-	0.90-1.10	585	380	20	40	179-217	-
A 182 Gr. F 11 CL1	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.00	1.0-1.50	-	0.44-0.65	415	205	20	45	121-174	-
A 182 Gr. F 11 CL2	0.10-0.20	0.30-0.80	0.040	0.040	0.50-1.0	1.0-1.50	-	0.40-0.65	485	275	20	30	143-207	-
A 182 Gr. F 11 CL3	0.10-0.20	0.30-0.80	0.040	0.040	0.50-1.0	1.0-1.50	-	0.44-0.65	515	310	20	30	156-207	-
A 182 Gr. F 12 CL1	0.05-0.15	0.30-0.60	0.045	0.045	0.50 Max	0.80-1.25	-	0.44-0.65	415	220	20	45	121-174	-
A 182 Gr. F 12 CL2	0.10-0.20	0.30-0.80	0.040	0.040	0.10-0.60	0.80-1.25	-	0.44-0.65	485	275	20	30	143-207	-
A 182 Gr. F 22 CL1	0.05-0.15	0.30-0.60	0.040	0.040	0.50 Max	2.0-2.5	-	0.87-1.13	415	205	20	35	170	-
A 182 Gr. F 22 CL3	0.05-0.15	0.30-0.60	0.040	0.040	0.50 Max	2.0-2.50	-	0.87-1.13	515	310	20	30	156-207	-
A 182 Gr. F 91	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	8.0-9.5	0.40 Max	0.85-1.05	585	415	20	40	248	Cb%=0.06-0.10, N%=0.03-0.07, Va %= 0.18-0.25



SUMMARY OF THE MAIN ASTM STANDARDS GENERALLY USED FOR SHEETS / PLATES

ASTM	Grade	Chemical requirements percent (%)										Mechanical requirements						
		C max	Mn max	P max	S max	Si max	Ni	Cr.	Mo	Cu	Others	Tensile Strength mini-MPa	Yield Strength mini-MPa	Elong mini %	Hardness Brinell Rockwell			
A240	304	0.08	2.00	0.045	0.030	0.75	8.00-10.5	18.00-20.0				515	205	40	201	92		
	304L	0.03	2.00	0.045	0.030	0.75	8.00-12.0	18.00-20.0				485	170	40	201	92		
	310	0.08	2.00	0.045	0.030	1.50	19.0-22.0	24.0-26.0				515	205	40	217	95		
	316	0.08	2.00	0.045	0.030	0.75	10.0-14.0	16.0-18.0	2.00-3.00			515	205	40	217	95		
	316L	0.03	2.00	0.045	0.030	0.75	10.0-14.0	16.0-18.0	2.00-3.00			485	170	40	217	95		
	317L	0.03	2.00	0.045	0.030	0.75	11.0-15.0	18.0-20.0	3.00-4.00			515	205	40	217	95		
	321	0.08	2.00	0.045	0.030	0.75	9.00-12.0	17.0-19.0			Ti > 5xC < 0.70	515	205	40	217	95		
	347	0.08	2.00	0.045	0.030	0.75	9.00-13.0	17.0-19.0			Cb + Ta > 10xC < 1.10	515	205	40	201	92		
A 387 Class1 Class2	2	0.05-0.21	0.55-0.80	0.035	0.040	0.15-0.40		0.50-0.80	0.45-0.60			Class 1	Class 2	Class 1	Class 2			
	5	0.15	0.30-0.60	0.04	0.030	0.050		4.00-6.00	0.45-0.65			380	486	230	310	22	max201HB	max92HRB
	7	0.15	0.30-0.60	0.030	0.030	1.00		6.00-8.00	0.45-0.65			415	515	205	310	18	max202HB	max92HRB
	9	0.15	0.30-0.60	0.030	0.030	1.00		8.00-10.0	0.90-1.10			415	515	205	310	18	max217HB	max95HRB
	11	0.04-0.17	0.40-0.65	0.035	0.04	0.50-0.80		1.00-1.50	0.45-0.65			415	515	240	310	22	max217HB	max95HRB
	12	0.04-0.17	0.40-0.65	0.035	0.04	0.15-0.40		0.80-1.15	0.45-0.60			380	450	230	275	22	max217HB	max95HRB
	21	0.04-0.17	0.30-0.60	0.035	0.035	0.50		2.75-3.25	0.90-1.10			415	515	205	310	18	max201HB	max92HRB
	22	0.05-0.17	0.30-0.60	0.035	0.035	0.50		2.00-2.50	0.90-1.10			415	515	205	310	18	max201HB	max92HRB
	A 515	55	0.22	0.90	0.035	0.04	0.15-0.40						380-515		205	27		
60		0.27	0.90	0.035	0.04	0.15-0.40						415-550		220	25			
65		0.31	0.90	0.035	0.04	0.15-0.40						450-585		240	23			
70		0.33	1.20	0.035	0.04	0.15-0.40						485-620		260	21			
A 516	55	0.20	0.60-1.20	0.035	0.04	0.15-0.40						380-515		205	27			
	60	0.23	0.85-1.20	0.035	0.04	0.15-0.40						415-550		202	25			
	65	0.26	0.85-1.20	0.035	0.04	0.15-0.40						450-585		240	23			
	70	0.28	0.85-1.20	0.035	0.04	0.15-0.40						485-620		260	21			
	Class 1	0.24	0.70-1.35	0.035	0.040	0.15-0.40	0.25 max	0.80 max	0.35 max			485-620		345	22			
A 537	Class 2	0.24	0.70-1.35	0.035	0.040	0.15-0.40	0.25 max	0.80 max	0.35 max			550-690		415	22			

IS-2062-92 STEEL FOR GENERAL STRUCTURAL PURPOSES

Grade	Designation	% Chemical Composition						Tensile strength (Min) Kg/mm ²	Yield Strength (Min) Mpa			%El.in gauge length 5.660So	Bend Test	Std.test Piece charpy V Notch Impact Energy Joule min
		C max	MN max	S max	P max	Si max	C.E max		<20 min	<20-40 min	>40min			
A	FE410 WA	0.23	1.5	0.050	0.050	-	0.42	41.8	250	240	230	23	3t	-
B	FE410 WB	0.22	1.5	0.045	0.045	0.40	0.41	41.8	250	250	230	23	t<25mm	2t for 27 3t for t>25mm
C	FE410 WC	0.20	1.5	0.040	0.040	0.40	0.36	41.8	250	250	230	23	2t	27

IS-2002-62 STEEL PLATES FOR BOILERS

Designation	Chemical Composition				Tensile Test		Elongation	
	c max	Si max	P max	S max	Tensile strength Mpa	Yield Strength Mpa	Test Piece	%min
IS 2002-1	0.18	0.10-0.35	0.040	0.040	362-442	540	5.65oSo 4oSo	26 30
IS 2002-2A	0.20	0.10-0.35	0.050	0.050	412-491	491	5.60oSo 4oSo	25 29
IS 2002-2B	0.22	0.10-0.35	0.050	0.050	510-608	491	5.65oSo 4oSo	20 24

Formula - Weight of Stainless Steel Sheets/Plates = Length (mm) x Width (mm) x Thickness (mm) x 7.86 = Kg./Sheet.



TECHNICAL INFO OF NICKEL BASED ALLOYS

U.S.A. / GROSSBRITANNIE U.S.A. / GRANDE-BRETAGNE U.S.A. / GREAT BRITAN													
Analyses	Analyses Composition												
Handelsbezeichnung Designation Commercial Commercial designation	C%	Co%	Cr%	Mo%	Ni%	V%	W%	Ai%	Cu%	Nb/Cb Ta%	Ti%	Fe%	Sonstige Autres -Other %
Monel 400	0.12	-	-	-	65.0	-	-	-	32.0	-	-	1.5	Mn 1.
Monel 401	0.10	-	-	-	43.0	-	-	-	53.0	-	-	0.75	Si 0.25;Mn z25
Monel 404	0.15	-	-	-	52.0-57.0	-	-	0.05	rest/bal	-	-	0.50	Mn 0.10; Si 0.10;So.024
Monel 502	0.10	-	-	-	63.0-17.0	-	-	2.5-3.5	rest/bal	-	0.50	2.0	Mn 1.5;Si:So.010
Monel k 500	0.13	-	-	-	64.0	-	-	2.8	30.0	-	0.60	1.0	Mn 0.8
Monel B	0.10	1.25	0.60	28.0	rest/bal	0.30	-	-	31.0	-	-	1.2	Mn1.0;So,0.04
Hastelloy B2	0.02	1.0	1.0	26.0-30.0	rest/bal	-	-	-	-	-	-	2.0	Mn1.0;Si 0.10
Hastelloy C	0.07	1.25	16.0	17.0	rest/bal	0.30	40	-	-	-	-	5.75	Mn 1.0;Si 0.70
Hadselloy C4	0.015	2.0	14.0-17.0	14.0-17.0	rest/bal	-	-	-	-	-	0.70	3.0	Mn1.0;Si 0.70
Hastelloy C276	0.02	2.5	140-16.5	15.0-17.0	rest/bal	0.35	3.0-4.5	-	-	-	-	4.0-7.0	Mn 1.0;Si 0.05
Incoloy 800	0.04	-	21.0	-	32.0	-	-	0.3	-	-	0.4	45.0	-
Incoloy 801	0.05	-	20.5	-	32.0	-	-	-	-	-	1.1	45.0	-
Incoloy 802	0.35	-	21.0	-	32.0	-	-	0.6	-	-	0.7	45.0	-
Incoloy 804	0.05	-	29.5	-	41.0	-	-	0.3	-	-	0.6	25.4	-
Incoloy 805	0.12	-	7.5	0.50	36.0	-	-	-	0.10	-	-	rest/bal	Mn 0.60;Si 0.50
Incoloy 810	0.25	-	21.0	-	32.0	-	-	-	0.50	-	-	rest/bal	Mn 0.90; Si 0.80
Incoloy 825	0.04	-	21.0	3.0	42.0	-	-	-	2.0	-	1.0	30.0	-
Incoloy 901	0.05	-	12.5	6.0	rest/bal	-	-	-	-	-	2.9	34.0	Mn 0.24;0.12;00.015
Incoloy 903	0.02	15.0	-	-	38.0	-	-	0.7	-	Nb 3.0	1.4	41.0	-
Incoloy 904	0.02	14.0	-	-	33.0	-	-	-	-	-	1.7	50.0	-
Incoloy 600	0.05	-	15.5	-	75.0	-	-	-	-	-	-	8.0	-
Incoloy 601	0.05	-	23.0	-	60	-	-	1.4	-	-	-	14.0	-
Incoloy 610	0.20	-	15.5	-	rest/bal	-	-	-	0.50	Nb 1.0	-	9.0	Mn0.90;Si 2.0
Incoloy 617	0.07	12.5	22.5	9.0	54.0	-	-	1.0	-	-	-	-	-
Incoloy 625	0.05	-	21.5	9.0	61.0	-	-	0.60	-	Nb 3.65	0.60	2.5	Mn 05;Si 0.50
Incoloy671	0.07	12.5	22.5	9.0	51.0	-	-	-	-	-	0.35	-	-
Incoloy 700	0.12	28.5	15.0	3.75	46.0	-	-	3.0	0.05	-	2.20	0.70	Mn 0.10;Si 0.30
Incoloy 702	0.04	-	15.6	-	rest/bal	-	-	3.4	0.10	-	0.70	0.35	Mn 0.05; Si 0.20
Incoloy 705	0.30	-	15.5	-	rest/bal	-	-	-	0.50	-	-	8.0	Mn 0.90; Si 5.5

CHEMICAL COMPOSITION OF TITANIUM / NICKEL BASE ALLOYS

Grade	UNS Designation	C % Max	Mn % Max	P % Max	S % Max	Si% -	Ni %	Co %	Cu %	Ag%	Fe %	Pb %	Zn % Max	N %	Ti % Max	H % Max	O %
70/30 Cu-Nu	C 71500	0.05	1.0	0.02	0.02	-	29.0-33.0	-	-	-	0.40-1.0	0.02	0.50	-	-	-	-
90/10 Cu-Ni	C 70600	0.05	1.0	0.02	0.02	-	9.0-11.0	-	-	-	1.0-1.8	0.02	0.50	-	-	-	-
Titanium Gr. 2	R 50400	0.08	0.03	-	-	-	-	-	-	-	0.30	-	-	-	-	-	0.25
Titanium Gr. 1	R 50250	0.08	0.03	-	-	-	-	-	-	-	0.20	-	-	-	-	0.015	0.18
Type 17-4PH	-	0.07	1.00	0.04	0.03	1.00	3.00-5.00	3.00-5.00	0.15-0.45	-	-	-	-	-	-	-	-
Nickel 200	2200	0.15	0.35	-	0.01	0.35	99.0	-	-	-	0.40	-	-	-	-	-	-
Nickel 201	2201	-	0.35	-	0.01	0.35	99.0	-	0.25	-	0.40	-	-	-	-	-	-



NICKEL & NICKEL ALLOYS

Table with 15 columns: EXOTIC, UNS NO, W.NR, C(MAX), Mn(Max), S(Max), Si (Max), Cr, Ni, Mo, Cu, Fe, Ti, Al, Other. It lists various alloy grades and their chemical compositions.

AGE HARDENING / MARTENSTIC STEELS

Table with 13 columns: COMMON GRADE, UNS, C, Mn, P, S, Si, Cr, Ni, Mo, N, OTHER. It lists common grades of age hardening and martensitic steels.

**CARBON, ALLOY AND STAINLESS STEEL**

Grade	DIN designation	UNS	SS	AFNOR	AISI	BS
1.4005	X 12 CrS 13	S 41600	2380	Z 12 CF 13	416	416 S 21
1.4006	X 10 Cr 13	S 41000	2302	Z 12 C 13	410	410 S 21
1.4016	X 6 Cr 17	S 43000	2320	Z 8 C 17	430	430 S 15
1.4021	X 20 Cr 13	S 42000	2303	Z 20 C 13	420	420 S 37
1.4034	X 46 Cr 16		2304	Z 40 C 14		420 S 45
1.4057	X 12 Cr Ni 172	S 43100	2321	Z 15 CN 162	431	431 S 29
1.4104	X 12 Cr MoS 17	S 43020	2383	Z 10 CF 17	430F	441 S 29
1.4112	X 90 Cr MoV 18	S 44003				440 BB
1.4122	X 35 CrMo 17					
1.4301	X 5 CrNi 18 10	S 30400	2332	Z 6 CN 18.09	304	304 S 15
1.4305	X 10 CrNi 18.9	S 30300	2346	Z 10 CNF 18.09	303	303 S 21
1.4306	X 2 CrNi 19 11	S 30403	2352	Z 2 CN 18.09	304L	304 S 12
1.4310	X 12 CrNi 17 7	S 30100	2331	Z 12 CN 17.07	301	
1.4401	X 5 CrNiMo 17 12 2	S 31600	2347	Z 6 CND 17.11	316	316 S 16
1.4404	X 2 CrNiMo 17 13 2	S 31603	2348	Z2 CND 17.12	316L	316 S 12
1.4435	X 2 CrNiMo 18 14 3	S 31603	2353	Z 2 CND 17.13	316L	316 S 12
1.4436	X 5 CrNiMo 17 13 3	S 31600	2343	Z 6 CND 17.12	316	316 S 16
1.4438	X 2 CrNiMo 18 16 4	S 31703	2367	Z 2 CND 19.15	317L	17 S 12
1.4439	X 2 CrNiMoN 17 13 5				317LNM	
1.4449	X 5 CrNiMo 17 13 3	S 31700			317	317 S 16
1.4460	X 6 CrNiMo 27 5	S 32900	2324			329
1.4462	X 2 CrNiMoN 22 5	S 31803		Z 5 CND 21.08		
1.4539	X 2 NiCrMoCu 25 20 5	N 08904	2562	Z 1 NCDU 25.20		
1.4541	X 6 CrNiTi 18 10	S 32100	2337	Z 6 CNT 18.10	321	321 S 12
1.4550	X 6 CrNiNb 18 10	S 34700	2338	Z 6 CNNB 18.10	347	347 S 17
1.4571	X 6 CrNiMoTi 17 12 2	S 31635	2350	Z 6 CNDT 17.12	316Ti	320 S 17
1.4713	X 10 CrAl 7			Z 8 CA 7		
1.4724	X 10 CrAl 13					
1.4742	X 10 CrAl 18			Z 10 CAS 18		
1.4762	X 10 CrAl 24	S 44600	2322	Z 10 CAS 24	446	
1.4821	X 20 CrNiSi 25 4					
1.4828	X 15 CrNiSi 20 12	S 30900		Z 15 CNS 20.12	309	309 S 24
1.4841	X 15 CrNiSi 25 20	S 31400		Z 12 CNS 25.20	314	
1.4845	X 12 CrNi 25 21	S 31008	2361	Z 12 CN 25.20	3105	310 S 24
1.4864	X 12 CrNiSi 36 16	N 08330		Z 12 NC 37.18	330	
1.4876	X 10 CrNiAlTi 32 20			Z 8 NC 32.21		3076 NA 15 H
1.4878	X 12 CrNiTi 18 9	S 32100	2337	Z 6 CNT 18.12	321	321 S 20
2.4068	LC Ni99.2				B 160	
2.4360	Ni Cu 30 Fe				B 164	3076 NA 13
2.4375	Ni Cu 30 Al					3076 NA 18
2.4610	Ni Mo 16 Cr 16 Ti					3076 NA 45
2.4816	Ni Cr 15 Fe				B 166	3076 NA 14
2.4856	Ni Cr 21 Mo					3076 NA 43



**ASTM A 193/A 193M ALLOY STEEL, CARBON STEEL & STAINLESS STEEL
BOLTING FOR HIGH TEMPERATURE SERVICE**

ASTM GRADE	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Hardness	Tensile Psi(MPa)	Yield Psi(MPa)	Elongation in Area %	Redu
A193 B8-B8A AISI Type 304	0.08	2.00 Max	1.00 Max	0.030 Max	0.045 Max	18.00 20.00	8.00 10.50	- -	- -	223HB	75000(515)	30000(205)	30	50
A193B8-B8MA AISI Type 316	0.08 Max	2.00 Max	1.00 Max	0.030 Max	0.045 Max	16.00 18.00	10.00 14.00	2.00 3.00		223HB 223HB	75000(515)	30000(205)	30	50
A193B8T-B8TA AISI Type 321	0.08 Max	2.00 Max	1.00 Max	0.030 Max	0.045 Max	17.00 19.00	9.00 12.00	-	Ti>5xC <0.70	223HB	75000(515)	30000(205)	30	50
A193 B8C-B8CA AISI Type 347	0.08 Max	2.00 Max	1.00 Max	0.030 Max	0.045 Max	17.00 19.00	9.00 13.00	-	Cb+7a>10 xc51.10	192HB	75000(515)	30000(205)	30	50
A193B6-B6X AISI Type 410	0.15 Max	1.00 -	1.00 Max	0.03 Max	0.040 Max	11.50 13.50	-				110000(760)	85000(585)	15	50
A193 B7-B7M Alloy Steel (Cr. Mo)	0.37 0.49	0.65 1.10	0.15 0.35	0.040 Max	0.035 Max	0.75 1.20	- -	0.15 0.25	- -	- -	125000(860)	105000(720)	16	50
A193B5 A S -5% Cr.AISI50 1	0.10 min	1.00 Max	1.00 Max	0.030 Max	0.040 Max	4.00 6.00	-	0.40	-	-	100000(690)	80000(550)	16	50

**ASTM A 194/ 194 M CARBON STEEL, ALLOY STEEL & STAINLESS STEEL NUTS, BOLTS FOR HIGH PRESSURE &
HIGH TEMPERATURE SERVICE**

A194/8A AISI Type 304	0.08 Max	2.00 Max	1.00 Max	0.03 Max	0.045 Max	18.00 20.00	8.00 10.50	- -	- -	126 - 300 Grade 8 126 - 182 Grade 8 A
A 194 8M/MA AISI Type 316	0.08 Max	2.00 Max	1.00 Max	0.03 Max	0.045 Max	16.00 18.00	10.00 14.00	2.00 3.00	-	126 - 300 Grade 8m 126 - 192 Grade 8 MA
A194/ 8T/8TA AISI Type 321	0.08 max	2.00 12.00	1.00 max	0.03 0.78 Min	0.045	17.00 19.00	9.00 12.00	-	Ti>5 x C <0.70	126 - 300 Grade 8T 126-192 Grade 8 TA
A194/ 8C/8CA AISI Type 347	0.08 Max	2.00 Max	1.00 Max	0.03 Max	0.045 Max	17.00 19.00	9.00 13.00	-	Cb+7ax10 xC<1.10	126 - 300 Grade 8CA 126 - 192 Grade 8 CA
A194-6 AISI Type 410	0.15 Max	1.00 Max	1.00 Max	0.03 Max	0.040 Max	11.50 13.50	-	-	-	228 271HRC-20-28
A194 2 2HM & 2H Carbon Steel	0.4 min	1 Max	0.4 Max	1.050. Max	0.040 Max	-	-	-	-	159-352GR.2 248 -352GR.2H 159-237GR.2HM
A194-7/7M Alloy Steel	0.37 0.49	0.65 1.1	0.15 0.35	0.04 Max	0.4 Max	0.75 1.2	-	0.15 0.25	-	248-352GR.7 159-237GR.7M
A194-30.10A.S.-5%Cr. AISI501	0.10 Max	1.00 Max	1.00 Max	0.030 Max	0.040 Max	4.00 6.00	-	0.4 0.65	-	248-352 (HRC-24-38)

