



RAJKAMAL METALS



A passion of making things BETTER

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RAJKAMAL METALS

COMPANY PROFILE

Rajkamal Metals a name that you trust established by Mangilal T. Shah with a faith to win trust, stability, growth & provide highest level of Service with complete satisfaction.

Sensing the potential on the global front, Rajkamal Metals was conceived in the year 1976 to meet the demand for all types of Stainless Steel & Non Ferrous Metals and their derivatives. The promoters with over 40 years of experience in trade of metals in the Industry and with their drive for excellence have succeeded in establishing **RAJKAMAL** as a reliable source for specialty products of these metals in India.

We believe in satisfying customers by providing quality and reliable steel products in timely manner. We worked with the top named companies and gain good reputation by providing quality products within time.

THIRD PARTY INSPECTION

CONTROLLERATE OF
NAVAL ARMAMENT
INSPECTION



& Many More

OUR SISTER CONCERN COMPANIES



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MICRO, SMALL & MEDIUM ENTERPRISES
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PIPE & TUBES AS PER ASTM / API / BS / DIN / IS

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

PIPE SPECIFICATION	CHEMICAL PROPERTIES				MECHANICAL PROPERTIES				OTHERS
	C%	Mn%	P%	S%	Si%	Cr%	Ni%	Mo%	
ASTM A 312 Gr. TP 304	0.080 Max	2.00 Max	0.045	0.0	1.00 Max	18.0-20.0	8.0-11.0	-	-
ASTM A 312 Gr. TP 304L	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	-
ASTM A 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	-	-
ASTM A 312 Gr. TP 304LN	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	18.0-20.0	8.0-11.0	-	Ni=0.10-0.16
ASTM A 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	-
ASTM A 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	-
ASTM A 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	-
ASTM A 312 Gr. TP 316L	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	-
ASTM A 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	-
ASTM A 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	Ni=0.10-0.16
ASTM A 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	-
ASTM A 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	-	Ti=5(C+N) - 0.70
ASTM A 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	-	Ti=4(C+N) - 0.60
ASTM A 312 Gr. TP 347	0.035 Max	2.00 Max	0.045	0.030	1.00 Max	17.0-19.0	9.0-13.0	-	Cb%=(10XC)-1.00
ASTM A 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	-	Cb%=(8XC)-1.10
ASTM A 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	-	Ni=0.10 Max, HRB=92 Max
ASTM A 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	-	Ni=0.10 Max, HRB=92 Max
ASTM A 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	-	HRB=95 Max
ASTM A 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	-	HRB=95 Max
ASTM A 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	Ni=0.10 Max, HRB=95 Max
ASTM A 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	Ni=0.10 Max, HRB=95 Max
ASTM A 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	-	Ni=0.10 Max, Ti=5(C+N)-0.70, HRB=95 Max
ASTM A 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	-	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	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	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	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	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	Cu%:0.40 Max, Va%: 0.08
ASTM A 333 Gr. 1	0.30 Max	0.40-1.06	0.025	0.025	-	-	-	-	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	-	-	-	Impact Test: 45 °C, J=18 Min, HRB=85 Max
ASTM A 335 Gr. P1	0.10-0.20	0.30-0.60	0.025	0.025	0.10-0.50	-	-	0.44-0.65	-
ASTM A 335 Gr. P2	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.50	0.50-0.81	-	0.44-0.65	-
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	-
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	-
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	-
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	-
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	-
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	-
ASTM A 213 Gr. T2	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.50	0.50-0.81	-	0.44-0.65	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	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	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	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	HRB=85 Max
ASTM A 179	0.06-0.18	0.27-0.63	0.035	0.035	-	-	-	325	HRB=72 Max
ASTM A 210 Gr. A1	0.27 Max	0.93 Max	0.035	0.035	0.10 Min	-	-	415	HRB=79 Max





CARBON STEEL, ALLOY STEEL, LOW TEMP, PIPE AND TUBES SPECIFICATION

SPECIFICATION	WT	C%	Mn %	P % MAX	S% MAX	Si%	Cr%	Mo%	MECHANICAL PROPERTIES			SPECIFIC REQUIREMENT
									TENSILE STRENGTH	YIELD STRENGTH	ELONGA- TION	
									Mpa	Mpa	50mm MIN Longitudinal	
ASTM A 53/A	AW	0.25MAX	0.95MAX	0.050	0.060	-	-	-	331MIN	207MIN	36	Cr. Mo Cu Ni Va 0.40 0.15 0.40 0.40 0.08 Five elements not to exceed 1%
ASTM A 53/B	AW	0.30MAX	1.20MAX	0.050	0.060	-	-	-	413MIN	240MIN	29.5	
ASTM A 106/A	AW	0.25MAX	0.27-0.93	0.025	0.025	0.10MIN	0.40MAX	0.15MAX	330MIN	205MIN	35/28	
ASTM A 106/B	AW	0.30MAX	0.29-1.06	0.025	0.025	0.10MIN	0.40MAX	0.15MAX	415 MIN	240MIN	30/22	
ASTM A 106/C	AW	0.35MAX	0.29-1.06	0.025	0.025	0.10MIN	0.40MAX	0.15MAX	485MIN	275MIN	30/22	
ASTM A 179	MW	0.06-0.18	0.27-0.63	0.048	0.048	-	-	-	325MIN	180MIN	35.0	Hardness 72 HRB Max
ASTM A 214	MW	0.18MAX	0.27-0.63	0.050	0.050	-	-	-	385MIN	180MIN	35.0	Hardness 72 HRB Max
ASTM A 192	MW	0.06-0.18	0.27-0.63	0.048	0.048	0.25MAX	-	-	325MIN	180MIN	35.0	Hardness 77 HRB Max
ASTM A 209/T1	MW	0.10-0.20	0.30-0.80	0.045	0.045	0.10-0.50	-	0.44-0.65	380MIN	205MIN	30/22	Hardness 80 HRB Max
ASTM A 209/T1a	MW	0.15-0.25	0.30-0.80	0.045	0.045	0.10-0.50	-	0.44-0.65	365MIN	195MIN	30/22	Hardness 81 HRB Max
ASTM A 209/T1B	MW	0.14MAX	0.30-0.80	0.045	0.045	0.10-0.50	-	0.44-0.65	415MIN	220MIN	30/22	Hardness 77 HRB Max
ASTM A 210/A-1	MW	0.27max	0.93max	0.048	0.058	0.10MIN	-	-	415MIN	255MIN	30/22	Hardness 79 HRB Max
ASTM A 210/C	MW	0.35MAX	0.29-1.06	0.048	0.058	0.10MIN	-	-	485MIN	275MIN	30/22	Hardness 89 HRB Max
ASTM A 213/T2	MW	0.10/0.20	0.30-0.61	0.045	0.045	0.10-0.30	0.50-0.81	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 213/T5	MW	0.15MAX	0.30-0.60	0.030	0.030	0.50MAX	4.00-6.00	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 213/T11	MW	0.15MAX	0.30-0.60	0.030	0.030	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 213/T12	MW	0.15MAX	0.30-0.61	0.045	0.045	0.50MAX	0.80-1.25	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 213/T22	MW	0.15MAX	0.30-0.60	0.030	0.030	0.50MAX	1.90-2.60	0.87-1.13	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 333/1	AW	0.30MAX	0.40-1.06	0.025	0.025	-	-	-	380MIN	205MIN	25/20	IMPACT AS -50F FOR 40X10J/18/14 -50F40X10J/18/14 90 HRB MAX
ASTM A 333/6	AW	0.30MAX	0.29-1.06	0.025	0.025	0.10MIN	-	-	415MIN	240MIN	30/22	
ASTM A 334/1	AW	0.30MAX	0.40-1.06	0.025	0.025	-	-	-	380MIN	205MIN	35/28	
ASTM A 334/6	MW	0.30MAX	0.29-1.06	0.025	0.025	0.10MIN	-	-	415MIN	240MIN	30/22	
ASTM A 335/P1	AW	0.10-0.20	0.30-0.80	0.025	0.025	0.10-0.50	-	0.44-0.65	380MIN	205MIN	30/22	Hardness 85 HRB MAX
ASTM A 335/P2	AW	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	0.44-0.65	380MIN	205MIN	30/22	
ASTM A 335/P5	AW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	4.00-6.00	0.45-0.65	415MIN	205MIN	30/22	
ASTM A 335/P9	AW	0.15MAX	0.30-0.60	0.025	0.025	0.25-1.00	8.00-10.00	0.09-1.10	415MIN	172MIN	30/22	
ASTM A 335/P11	AW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	205MIN	30/22	
ASTM A 335/P12	AW	0.15MAX	0.30-0.61	0.025	0.025	0.50MAX	0.80-1.25	0.44-0.65	415MIN	205MIN	50/22	
ASTM A 335/P22	AW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87-1.13	415MIN	205MIN	30/22	
BS/3059/1/33		0.15Max	0.30-0.70	0.050	0.050	-	-	-	324-441	186MIN	25	Hardness 85 HRB MAX
BS/3059/2/33		0.15MAX	0.40-0.70	0.050	0.050	0.10-0.35	-	-	324-441	186MIN	21	
BS/3059/2/45		0.12-0.18	0.90-1.20	0.035	0.035	0.10-0.35	-	-	441-560	245MIN	22	
BS/3059/2/620		0.10-0.15	0.40-0.70	0.040	0.040	0.10-0.35	0.70-1.10	0.45-0.65	441-618	235MIN	22	
DIN/17175/ST35.8		0.17MAX	0.40MIN	0.040	0.040	0.35MAX	-	-	340-441	235MIN	25	Hardness 85 HRB MAX
DIN/17175/ST45.8		0.22MAX	0.45MIN	0.040	0.040	0.10-0.35	-	-	441-540	255 MIN	25	
DIN/17175/15MO3		0.12-0.20	0.50-0.80	0.040	0.040	0.10-0.35	-	0.25-0.35	441-540	284MIN	21	
DIN/17175/13CrMO44		0.10-0.18	0.40-0.70	0.040	0.040	0.10-0.35	0.70-1.60	0.40-0.50	441-570	294MIN	22	
DIN/17175/10CrM910		0.15MAX	0.40-0.60	0.040	0.040	0.15-0.50	2.0-2.5	0.9-1.10	441-570	294MIN	22	
ASTM A 199/T5	MW	0.50-0.15	0.30-0.60	0.030	0.030	0.50MAX	4.00-6.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 199/T11	MW	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 199/T22	MW	0.05-0.15	0.30-0.60	0.030	0.030	0.50MAX	1.90-2.60	0.87-1.13	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 199/T4	MW	0.15MAX	0.30-0.60	0.030	0.030	0.50-1.00	2.15-2.85	0.44-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 199/T7	MW	0.15MAX	0.30-0.60	0.030	0.030	0.50-1.00	6.00-8.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T5	MW	0.15MAX	0.30-0.60	0.030	0.030	0.50-1.00	4.00-6.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T11	MW	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T22	MW	0.05-0.15	0.30-0.60	0.030	0.030	0.50MAX	1.90-2.60	0.87-1.13	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T4	MW	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.00	2.15-2.85	0.44-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T7	MW	0.15MAX	0.30-0.60	0.030	0.030	0.50-1.00	6.00-8.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 199/T9	MW	0.15MAX	0.30-0.60	0.030	0.030	0.25-1.00	8.00-10.0	0.90-1.10	415MIN	170MIN	30/22	HARDNESS 89 HRB MAX





STAINLESS STEEL PIPE DIMENSION AS PER ASTM & WEIGHT-KG. PER MTR. (ANSI B36.19)

Nominal Bore		Outside Diameter	Schedule 5S		Schedule 10S		Schedule 40S		Schedule 80S		Schedule 160S		Schedule XXS	
mm	INCH	mm	Wt mm	Weight (Kg/mt)	Wt mm	Weight (Kg/mt)	Wt mm	Weight (Kg/mt)	Wt mm	Weight (Kg/mt)	Wt mm	Weight (Kg/mt)	Wt mm	Weight (Kg/mt)
3	1/8	10.3	1.24	0.276	1.24	0.28	1.73	0.37	2.41	0.47	-	-	-	-
6	1/4	13.7	1.24	0.390	1.65	0.49	2.24	0.631	3.02	0.80	-	-	-	-
10	3/8	17.1	1.24	0.490	1.65	0.63	2.31	0.845	3.20	1.10	-	-	-	-
15	1/2	21.3	1.65	0.800	2.11	1.00	2.77	1.27	3.75	1.62	4.75	1.94	7.47	2.55
20	3/4	26.7	1.65	1.03	2.11	1.28	2.87	1.68	3.91	2.20	5.54	2.89	7.82	3.63
25	1	33.4	1.65	1.30	2.77	2.09	3.38	2.50	4.55	3.24	6.35	4.24	9.09	5.45
32	1 1/4	42.2	1.65	1.65	2.77	2.70	3.56	3.38	4.85	4.47	6.35	5.61	9.70	7.77
40	1 1/2	48.3	1.65	1.91	2.77	3.11	3.68	4.05	5.08	5.41	7.14	7.25	10.16	9.54
50	2	60.3	1.65	2.40	2.77	3.93	3.91	5.44	5.54	7.48	8.74	11.1	11.07	13.44
65	2 1/2	73.0	2.11	3.69	3.05	5.26	5.16	8.63	7.01	11.4	9.53	14.9	14.2	20.39
80	3	88.9	2.11	4.51	3.05	6.45	5.49	11.30	7.62	15.2	11.1	21.3	15.24	27.65
100	4	114.3	2.11	5.84	3.05	8.36	6.02	16.07	8.56	22.3	13.49	33.54	17.12	41.03
125	5	141.3	2.77	9.47	3.40	11.57	6.55	21.8	9.53	31.97	15.88	49.11	19.05	57.43
150	6	168.3	2.77	11.32	3.40	13.84	7.11	28.3	10.97	42.7	18.2	67.56	21.95	79.22
200	8	219.1	2.77	14.79	3.76	19.96	8.18	42.6	12.7	64.6	23.0	111.2	22.23	107.8
250	10	273.1	3.40	22.63	4.19	27.78	9.27	60.5	12.7	96.0	28.6	172.4	25.40	155.15
300	12	323.9	3.96	31.25	4.57	36.00	9.52	73.88	12.7	132.0	33.32	238.76	25.40	186.97
350	14	355.6	3.96	34.36	4.78	41.3	11.13	94.59	19.05	158.08	35.71	281.70	-	-
400	16	406.4	4.19	41.56	4.78	47.29	12.7	123.30	21.41	203.33	40.46	365.11	-	-
450	18	457.2	4.19	46.80	4.78	53.42	14.27	155.80	23.8	254.36	45.71	466.40	-	-
500	20	508.0	4.78	59.25	5.54	68.71	15.09	183.42	26.19	311.2	49.99	564.68	-	-
600	24	609.6	5.54	82.47	6.35	94.45	17.48	255.41	30.96	442.08	59.54	808.22	-	-

Formula - Pipe Weight Kg / Mtr. • OD - Thick x Thick x 0.02466 = Kg Per Mtr.

CARBON STEEL SEAMLESS PIPE DIMENSION & WEIGHT - KG. PER MTR. (ANSI B 36.10)

Nominal Pipe size	OD	Schedule 10	Schedule 20	Schedule 30	Schedule STD	Schedule 40	Schedule 60	Schedule Extra Strong (XS)	Schedule 80	Schedule 100	Schedule 120	Schedule 140	Schedule 160	Schedule Double Extra Strong (XXS)
mm inch	mm	mm kg/m	mm kg/m	mm kg/m	wall wt. wt.	wall wt. wt.	wall wt. wt.	wall wt. wt.	wall wt. wt.	wall wt. wt.	wall wt. wt.	wall wt. wt.	wall wt. wt.	wall wt. wt.
3 1/8 10.3					1.73 0.37	1.73 0.37			2.41 0.47	2.41 0.47				
6 1/4 13.7					2.24 0.63	2.24 0.63			3.02 0.80	3.02 0.80				
10 3/8 17.1					2.31 0.84	2.31 0.84			3.20 1.10	3.20 1.10				
15 1/2 21.3					2.77 1.27	2.77 1.27			3.73 1.62	3.73 1.62				
20 3/4 26.7					2.87 1.69	2.87 1.69			3.91 2.20	3.91 2.20				
25 1 33.4					3.38 2.50	3.38 2.50			4.55 3.24	4.55 3.24				
32 1 1/4 42.2					3.56 3.39	3.56 3.39			4.85 4.47	4.85 4.47				
40 1 1/2 48.3					3.68 4.05	3.68 4.05			5.08 5.41	5.08 5.41				
50 2 60.3					3.91 5.44	3.91 5.44			5.54 7.48	5.54 7.48				
65 2 1/2 73.0					5.16 8.63	5.16 8.63			7.01 11.41	7.01 11.41				
80 3 88.9					5.49 11.3	5.49 11.3			7.62 15.27	7.62 15.3				
90 3 1/2 101.6					5.74 13.57	5.74 13.57			8.08 18.63	8.08 18.63				
100 4 114.3					6.02 16.07	6.02 16.07			8.56 22.3	8.56 22.3				
125 5 141.3					6.55 21.77	6.55 21.77			9.53 30.9	9.53 30.9				
150 6 168.3					7.11 28.26	7.11 28.26			10.97 42.5	10.97 42.5				
200 8 219.1		6.35 33.3	7.0 36.8	8.18 42.5	8.18 42.5	10.31 53.10	12.7 64.6	12.7 64.5	15.1 75.92	18.3 90.4	20.6 100.9	23.0 111.7	22.23 108.0	
250 10 273.0		6.35 41.7	7.8 51.3	9.27 60.3	9.27 60.3	12.70 81.50	12.7 81.5	15.1 96.0	18.3 114.7	21.44 133.0	25.4 155	28.6 172.3	25.4 155.0	
300 12 323.9		6.35 49.7	8.4 65.2	9.53 73.8	10.31 79.73	14.30 109.0	12.7 97.4	17.5 132.0	21.4 160.0	25.4 187.0	28.6 208	33.3 238.7	25.4 187.0	
350 14 355.6	6.35 54.6	7.92 67.9	9.53 81.3	9.53 81.3	11.13 94.55	15.10 126.4	12.7 107.4	19.0 158.0	23.8 195.0	27.6 224.0	31.8 253.5	36.7 281.7		
400 16 406.4	6.35 62.6	7.92 77.9	9.53 93.3	9.53 93.3	12.7 123.3	16.70 160.0	12.7 123.3	21.44 203.5	26.2 245.5	30.9 286.6	36.53 333	40.5 365.4		
450 18 457.0	6.35 70.5	7.92 87.7	11.13 122.4	9.53 105.0	14.27 156.0	19.05 206.0	12.7 139.0	23.8 254.6	29.96 309.6	34.9 363.6	39.7 408.3	45.2 459.4		
500 20 508.0	6.35 78.5	9.53 117.2	12.7 155.1	9.53 117.2	15.09 183.4	20.62 248.5	12.7 155.1	26.2 311.2	32.54 381.5	38.1 441.5	44.4 508	50.0 564.8		
550 22 559.0	6.35 86.5	9.53 129.0	12.7 171.0	9.53 129.0		22.20 294.0	12.7 171.0	29.6 373.8	34.9 451.4	41.3 527.0	47.6 600	54.0 672.0		
600 24 610.0	6.35 94.5	9.53 141.0	14.3 209.7	9.53 141.0	17.48 255.4	24.61 355.0	12.7 187.0	30.96 442.08	38.89 547.7	46.0 640.0	52.4 720.15	59.5 808.22		
650 26 660.0	7.92 127.0	12.7 203.0		9.53 153.0			12.7 202.7							
700 28 711.0	7.92 137.4	12.7 218.7	15.88 271.2	9.53 165.0			12.7 218.7							
750 30 762.0	7.92 147.3	12.7 234.6	15.88 292.18	9.53 176.8			12.7 234.7							
800 32 813.0	7.92 157.0	12.7 250.6	15.88 312.0	9.53 188.2	17.48 342.9		12.7 250.6							
850 34 864.0	7.92 167.0	12.7 266.6	15.88 332.1	9.53 200.3	17.48 364.9		12.7 266.6							
900 36 914.4	7.92 176.9	12.7 282.3	15.88 351.7	9.53 212.5	19.05 420.4		12.7 282.2							

Formula - Pipe Weight Kg/Mtr. • OD-Thickness x Thick x 0.02466=Kg Per Mtr.





SWG DIMENSIONS AND WEIGHTS (SWG WALL THICKNESS)

Outside diameter		22 SWG 0.711mm	20 SWG 0.914mm	18 SWG 1.218mm	16 SWG 1.625mm	14 SWG 2.032mm	12 SWG 2.641mm	11 SWG 2.946mm	10 SWG 3.257mm
Inches	mm	Kg/m	Kg/m	Kg/m	Kg/m	Kg/m	Kg/m	Kg/m	Kg/m
1/4"	6.350	—	0.124	0.157	0.192	—	—	—	—
5/16"	7.950	—	0.161	0.205	0.257	—	—	—	—
3/8"	9.525	—	0.197	0.253	0.321	0.381	—	—	—
1/2"	12.700	0.213	0.270	0.350	0.451	0.543	0.665	0.720	—
5/8"	15.875	0.270	0.342	0.447	0.580	0.704	0.875	0.954	—
3/4"	19.050	—	0.415	0.544	0.709	0.866	1.090	1.190	1.290
7/8"	22.225	0.383	0.488	0.641	0.838	1.030	1.300	1.420	1.550
1"	25.400	0.440	0.560	0.738	0.967	1.190	1.510	1.660	1.800
1 1/4"	31.750	0.553	0.706	0.931	1.230	1.510	1.930	2.130	2.320
1 1/2"	38.100	0.666	0.851	1.130	1.480	1.840	2.350	2.590	2.840
1 3/4"	44.450	0.779	0.996	1.320	1.740	2.160	2.770	3.060	3.350
2"	50.800	0.892	1.140	1.510	2.000	2.480	3.190	3.530	3.870
2 1/2"	63.500	—	—	1.900	2.520	3.130	4.030	4.470	4.910
3"	76.200	—	—	2.290	3.030	3.770	4.870	5.400	5.640
3 1/2"	88.900	—	—	2.670	3.550	4.420	5.700	6.340	6.970
4"	101.600	—	—	3.060	4.070	5.070	6.540	7.280	8.010
5"	127.000	—	—	3.628	4.970	6.010	7.926	—	9.673
5 1/2"	139.700	—	—	4.000	5.481	6.624	8.736	—	10.675
6"	152.400	—	—	4.360	6.000	7.330	9.545	—	11.699
6 1/2"	161.100	—	—	4.720	6.480	7.840	10.419	—	12.720

TOLERANCE OF ASTM SPECIFICATION STAINLESS STEEL TUBES AND PIPES

Specification	Allowable Outside Diameter Variation in mm			Allowable wall Thickness Variation		Exact Length Tolerances in mm		Testing
Specification	Diameter	Over	Under	Over %	Under%	Over	Under	Testin
ASTM A - 270 Seamless & Welded Sanitary Tubes	25.4 38.1 50.8 63.5 76.2 101.6	.05 .05 .05 .05 .08 .08	.20 .20 .28 .28 .30 .38	+12.5 +12.5 +12.5 +12.5 +12.5 +12.5	-12.5 -12.5 -12.5 -12.5 -12.5 -12.5	3.2 3.2 3.2 3.2 3.2 3.2	0 0 0 0 0 0	Reverse Flattening test 100% Hydrostatic test External polish on all tubes Refer to ASTM A-270
ASTM A - 249 Welded Boiler, Super heater, Heat Exchanger and Condenser Tubes	Under 25.4 25.4 - 38.1 incl. 38.1 - 50.8 excl. 50.8 - 63.5 excl. 63.5 - 76.2 excl. 76.2 - 101.6 incl.	0.1016 0.1524 0.2032 0.2540 0.3048 0.3810	0.1016 0.1524 0.2032 0.2540 0.3048 0.3810	+10 +10 +10 +10 +10 +10	-10 -10 -10 -10 -10 -10	3.175 3.175 3.175 3.76 4.76 4.76	0 0 0 0 0 0	Tension Test, Flattening test Flare Test * Reverse Bend Test Hardness Test 100% Hydrostatic Test *Reverse Flattening Test Refer to ASTM A-450 Whenever applicable
ASTM A - 312 Seamless & Welded Pipes Test	13.7 - 48.3 incl. 48.3 - 114.3 incl. 114.3 - 220 incl.	0.40 0.79 1.59	0.79 0.79 0.79	Minimum Wall tubes 12.5% under nominal wall Specified	6.4 6.4	0 0 6.4 (Normally Random lengths ordered)	Tension Test Flattening Test 0	100% Hydrostatic
ASTM A - 269 Seamless & Welded Service	Upto 12.7 12.7 - 38.1 excl. 38.1 - 88.9 excl. 88.9 - 139.7 excl. 139.7 - 203.2 excl.	0.13 0.13 0.25 0.38 0.76	0.13 0.13 0.25 0.38 0.76	+15 +10 +10 +10 +10	-15 -10 -10 -10 -10	3.2 3.2 4.8 4.8 4.8	0 0 0 0 0	Tension Test Flange Test (Welded only) Hardness Test Reverse Flattening test (Welded only) 100% Hydrostatic Test Refer to ASTM-269
ASTM A - 213 Seamless Boiler, Superheater and Heat Exchanger Tubes	Upto 25.4 25.4 - 38.1 incl. 38.1 - 50.8 excl. 50.8 - 63.5 excl. 63.5 - 73.2 excl. 73.2 - 101.6 incl.	0.1016 0.1524 0.2032 0.2540 0.3048 0.3810	0.1016 0.1524 0.2032 0.2540 0.3048 0.3810	+20 +20 +22 +22 +22 +22	-0 -0 -0 -0 -0 -0	3.175 3.175 3.175 3.760 4.760 4.760	0 0 0 0 0 0	Tension Test Flattening Test Hardness test 100% Hydrostatic Test Refer to ASTM-450
ASTM A - 258 Seamless & Welded Ferritic Stainless Steel Tubes	Upto 12.7 12.7 - 38.1 excl. 38.1 - 88.9 excl. 88.9 - 168.9 excl.	0.13 0.13 0.25 0.38	0.13 0.13 0.25 0.38	+15 +10 +10 +10	-15 -10 -10 -10	3.2 3.2 4.8 4.8	0 0 0 0	Tension Test Flange Test CERW only Hardness Test Reverse Flattening Test 100% Hydrostatic Test
ASTM A - 358 For Welded big Diameter Pipes	For all size	+0.5%	0.5%	No Limit	-0.3 mm	Customer's Specification		





MILD STEEL PIPES CONFIRMING TO IS : 1239 (PART 1) - 1979

Nominal Bore		Outside Diameter		Light		Medium		Heavy	
Inch	In mm	In	mm	Thickness mm	Weight kg/mtr	Thickness mm	Weight Kg/Mtr.	Thickness mm	Weight Kg/Mtr.
1/8"	3 mm	0.406	10.32	1.80	0.361	2.00	0.407	2.65	0.493
1/4"	6 mm	0.532	13.49	1.80	0.517	2.35	0.650	2.90	0.769
3/8"	10 mm	0.872	17.10	1.80	0.674	2.35	0.852	2.90	1.02
1/2"	15 mm	0.844	21.43	2.00	0.952	2.65	1.122	3.25	1.45
3/4"	20 mm	1.094	27.20	2.35	1.410	2.65	1.580	3.25	1.90
1"	25 mm	1.312	33.80	2.65	2.010	3.25	2.440	4.05	2.97
1.1/4"	32 mm	1.656	42.90	2.65	2.580	3.25	3.140	4.05	3.84
1.1/2"	40 mm	1.906	48.40	2.90	3.250	3.25	3.610	4.05	4.43
2"	50 mm	2.375	60.30	2.90	4.110	3.65	5.100	4.47	6.17
2.1/2"	65 mm	3.004	76.20	3.25	5.840	3.65	6.610	4.47	7.90
3"	80 mm	3.500	88.90	3.25	6.810	4.05	8.470	4.85	10.1
4"	100 mm	4.500	114.30	3.65	9.890	4.50	12.10	5.40	14.4
5"	125 mm	5.500	139.70	-	-	4.85	16.20	5.40	17.8
6"	150 mm	6.500	165.10	-	-	4.85	19.20	5.40	21.2

ERW PIPES CONFIRMING TO IS 3589

Wall Thickness in mm	Nominal Bore 7" NB 193.7 mm OD	Nominal Bore 8" NB 219.1 mm OD	Nominal Bore 10" NB 273 mm OD	Nominal Bore 12" NB 323.7 mm OD	Nominal Bore 14" NB 355.6 mm OD	Nominal Bore 16" NB 406.4 mm OD	Nominal Bore 18" NB 457 mm OD	Nominal Bore 20" NB 508 mm OD
kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr	kg/mtr
4.85	22.59	25.62	32.07	38.13	-	-	-	-
5.20	24.17	27.43	34.34	40.85	-	-	-	-
5.60	26.00	29.28	36.93	43.93	48.11	-	-	-
6.00	27.88	31.53	39.50	47.02	51.49	61.00	69.00	-
6.35	29.34	33.28	41.73	49.67	54.43	62.35	70.50	78.50
7.01	32.27	36.76	46.43	55.45	61.82	69.04	-	-
7.94	-	41.00	50.95	61.85	67.98	77.92	87.80	-
8.18	-	42.56	53.42	65.12	-	-	-	-
9.53	-	51.50	60.24	73.75	81.21	93.13	105.00	117.00
12.70	-	-	-	-	107.28	123.30	139.00	155.00

Tolerance on Thickness and Weight : as per IS 1239

The following manufacturing tolerance shall be permitted on the tubes and sockets.

- (a) **Thickness**
 (1) Butt welded Light tubes + Not limited
 - 8 percent
 Medium and Heavy tubes + Not Limited
 - 10 percent
 (2) Seamless tubes + Not Limited
 - 12.5 percent
- (b) **Weight :**
 (1) Single tube (light series) + 10 percent
 - 8 percent
 (2) Single tube (medium and heavy series) + 10 percent

MAXIMUM PERMISSIBLE PRESSURE AND TEMPERATURE FOR TUBES WITH STEEL COUPLINGS OR SCREWED AND SOCKETED JOINTS

Nominal Bore mm	Maximum Permissible Pressure N/mm ²	Maximum Permissible Kg./cm ²	Maximum Permissible Temperature °C
Upto and including 25 mm	1.20	12.24	260
Over 25 mm upto and including 40 mm	1.03	10.50	260
Over 40 mm upto and including 80 mm	0.86	8.77	260
over 80 mm upto and including 100 mm	0.69	7.04	260
	0.83	8.47	177
Over 100 mm upto and including 125 mm	0.69	7.04	171
Over 125 mm upto and including 150 mm	0.50	5.10	160

For tubes fitted with appropriate fittings of suitably butt welded together, the Max. permissible pressure shall be 21.00 Kg/cm² and Max. permissible temp. 260°C



	CHEMICAL COMPOSITION										MECHANICAL PROPERTIES						
	JEL Grain	%C (Max)	%Mn (Max)	%P (Max)	%S (Max)	%Si (Max)	%Cr	%Ni	%Mo	N/PM (MAX)	%S OTHERS	Tensile Strength MPa (min)	Yield Strength MPa (min)	% Elongation (min)	Hardness Rockwell B (Max)		
Austenitic Cr-Ni	J-201 #	0.15	5.5-7.5	0.060	0.030	1.00	16.00-18.00	3.50-5.50	-	2500	-	655	310	40	100		
	J-201L	0.030	5.5-7.5	0.045	0.030	0.75	16.00-18.00	3.50-5.50	-	2500	-	655	260	40	95		
	J-201LN	0.030	6.4-7.5	0.045	0.015	0.75	16.00-17.50	4.00-5.00	-	1000-2500	Cu - 1.0 max	655	310	45	100		
	J-202	0.15	7.5-10.0	0.060	0.030	1.00	17.00-19.00	4.00-6.00	-	2500	-	620	260	40	100		
	J-204 Cu	0.10	6.5-9.0	0.060	0.010	0.75	16.00-17.50	1.50-3.50	-	1000-2500	Cu = 2.0 - 4.0	620	310	40	100		
	JSLAUS (1)	0.08	6.0-8.0	0.070	0.010	0.75	16.00-18.00	4.00-6.00	-	1000	Cu = 1.5 - 2.0	650	205	40	95		
	J-4	0.10	8.50-10.0	0.080	0.010	0.75	15.00-16.00	1.00-2.00	-	2000	Cu = 1.5 - 2.0	650	325	40	100		
	JSL U DD	0.15	9.7-10.7	0.1	0.030	0.75	15.00-16.00	0.45-0.60	-	-	Cu = 1.9-2.2 / N = 0.2	700	350	40	100		
	JSL U SD	0.15	9.7-10.7	0.1	0.030	0.75	13.25-14.25	0.4-0.5	-	-	Cu = 1.25 - 1.75 / n = 0.1-0.2	700	350	40	100		
	JT	0.11	9.8-10.8	0.1	0.010	0.75	14.0-15.25	0.35	-	-	Cu = 0.60 -1.00 / N = 2000	700	350	40	100		
Austenitic Cr-Ni	J-301	0.15	2.00	0.045	0.030	1.00	16.00-18.00	6.00-8.00	-	1000	-	515	205	40	95		
	J-301L	0.030	2.00	0.045	0.030	1.00	16.00-18.00	6.00-8.00	-	2000	-	550	220	45	100		
	J-301LN	0.030	2.00	0.045	0.030	1.00	16.00-18.00	6.00-8.00	-	700-2000	-	550	240	45	100		
	J-304	0.07	2.00	0.045	0.030	0.75	18.00-19.50	8.00-10.50	-	1000	-	515	205	40	92		
	J-304H	0.04-0.10	2.00	0.045	0.030	0.75	18.00-20.00	8.00-10.50	-	-	-	515	205	40	92		
	J-304L	0.030	2.00	0.045	0.030	0.75	18.00-19.50	8.00-12.00	-	1000	-	485	170	40	92		
	J-304LN	0.030	2.00	0.045	0.030	0.75	18.00-20.00	8.00-12.00	-	1000-1600	-	515	205	40	95		
	J-309	0.20	2.00	0.045	0.030	0.75	22.00-24.00	12.00-15.00	-	-	-	515	205	40	95		
	J-309S	0.08	2.00	0.045	0.030	0.75	22.00-24.00	12.00-15.00	-	-	-	515	205	40	95		
	J-310	0.25	2.00	0.045	0.030	1.50	24.00-26.00	19.00-22.00	-	-	-	515	205	40	95		
Martensitic	J-310S	0.08	2.00	0.045	0.030	1.50	24.00-26.00	19.00-22.00	-	-	-	515	205	40	95		
	J-313	0.08	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	1000	-	515	205	40	95		
	J-316L	0.030	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	1000	-	485	170	40	95		
	J-316LN	0.030	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	1000-1600	-	515	205	40	95		
	J-316Ti	0.08	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	1000	Ti = 5x(C+N) min 0.70 max	515	205	40	95		
	J-317	0.08	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	1000	-	515	205	35	95		
	J-317L	0.030	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	1000	-	515	205	40	95		
	J-317LN	0.030	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	1000-2200	-	550	240	40	95		
	J-317Z	0.030	1.00	0.030	0.030	1.00	17.50-19.00	14.50-16.50	3.80-4.50	1500-2100	Cu = 2.8-4.0	550	245	35	96		
	J-321	0.08	2.00	0.045	0.030	0.75	17.00-19.00	9.00-12.00	-	1000	Ti = 5x(C+N) min 0.70 max	515	205	40	95		
Ferritic	J-347	0.08	2.00	0.045	0.030	0.75	17.00-19.00	9.00-13.00	-	-	Nb = 10 x C min 1.00 max	515	205	40	92		
	J-410	0.08-0.15	1.00	0.040	0.030	1.00	11.50-13.50	0.75 max	0.50-1.00	-	-	450	205	20	96		
	J-415	0.05	0.50-1.00	0.030	0.030	0.60	11.50-14.00	3.50-5.50	0.50 max	-	-	795	620	15	32rc		
	J-420	0.15 min	1.00	0.040	0.030	1.00	12.00-14.00	0.75 max	-	-	-	690	-	15	96		
	J-431	0.20	1.00	0.040	0.030	1.00	15.00-17.00	1.25-2.50	-	-	-	-	-	-	29rc		
	JBS	0.6-0.7	1.00	0.030	0.015	0.75	12.50-13.50	-	-	-	-	-	-	-	-		
	J-405	0.08	1.00	0.040	0.030	1.00	11.50-14.50	0.60	-	-	Al = 0.10-0.30	415	170	20	88		
	J-409	0.030	1.00	0.040	0.020	1.00	10.50-11.70	0.50 max	-	300	Ti = 6 x (C+N) min., 0.5 max	380	170	20	88		
	J-409L	0.030	1.00	0.040	0.030	1.00	10.50-11.70	0.50 MAX	-	-	Ti = 6 x (C+N) min., 0.75 max	380	170	20	88		
	J-410S	0.08	1.00	0.040	0.030	1.00	11.50-13.50	0.60 max	-	-	-	415	205	22	89		
Duplex (Austenitic-Ferritic)	J-430	0.12	1.00	0.040	0.030	1.00	16.00-18.00	0.75 max	-	-	-	450	205	22	89		
	J-430ti	0.030	1.00	0.040	0.030	1.00	16.00-19.00	-	-	-	Ti = 0.10-1.00	360	175	22	90		
	J-436	0.120	1.00	0.040	0.030	1.00	16.00-18.00	-	0.75-1.25	-	Nb = 5 x C min 0.70 max	450	240	22	89		
	J-436L	0.025	1.00	0.040	0.030	1.00	16.00-19.00	-	0.75-1.25	250	% Nb or & Ti or % Combination = 8 X (C+N) min 0.80 max	410	245	20	96		
	J-439	0.030	1.00	0.040	0.030	1.00	17.00-19.00	0.50 max	-	300	Ti = 0.20 + 4 x (C+N) min., 1.10 max	415	205	22	89		
	J-441	0.030	1.00	0.040	0.030	1.00	17.50-18.50	-	-	-	Al = 0.15 max Nb - 3 X % C+0.3 min 1% max., Ti = 0.1-0.6%	430	250	18	88		
	J-409M	0.030	0.8-1.5	0.030	0.030	1.00	10.80-12.50	1.50 max	-	300	Ti = 0.75 max	450	275	20	90		
	J-2205	0.030	2.00	0.030	0.020	1.00	22.00-23.00	4.50-6.50	3.0-3.50	1400-2000	-	655	450	25	31rc		
	J-2304	0.030	2.50	0.040	0.030	1.00	21.50-24.50	3.00-5.50	0.05-0.60	500-2000	Cu 0.05 min - 0.60 max	600	400	25	32rc		
	J-31803	0.030	2.00	0.030	0.020	1.00	21.00-23.00	2.50-3.50	800-2000	-	620	620	450	25	31rc		

*These grades can be supplied with 0.005% S max also

This grade will be supplied with 0.08%C max for improved corrosion resistance.

This grade can be supplied in two versions of 0.08%C max or 0.1%C max.

Specific Chemical and Mechanical properties can be supplied by mutual agreement.

SPECIFICATIONS



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rajkamalmetals@yahoo.com



EQUIVALENT INTERNATIONAL STAINLESS STEEL GRADES

	JIS Designation / Grade	UNS - Designation	USA - Canada AISI - ASTM - ASME	INDIA / IS Lehr Symbol	European	Chinese	GERMANY / DIN Designation	Japan / JIS	COST
Austenitic Cr-Mn	J-201	S20100	201	X10Cr17Mn6Ni4N20	-	-	X12CrMnNiN17-7-5	SUS201	-
	J-201L	S20103	201L	-	1.4371	-	X2CrMnNiN17-7-5	-	-
	J-201LN	S20153	201LN	-	-	-	-	-	-
	J-202	S20200	202	X10Cr18Mn9Ni5	-	-	X12CrMnNiN18-9-5	SUS202	-
	J-204 Cu	S20430	-	-	-	-	-	-	-
	JSLAUS (J1)	-	-	-	-	-	-	-	-
Austenitic Cr-Ni	J-301	S30100	301	X10Cr17Ni7	1.4310	1Cr17Ni7	X12CrNi17-7	SUS301	-
	J-301L	S30103	301L	-	-	-	-	-	-
	J-301LN	S30153	301LN	-	1.4318	-	X2CrNiN18-7	-	-
	J-304	S30400	304	X04Cr19Ni9	1.4301	0Cr18Ni9	X5CrNi18-10	SUS304	-
	J-304H	S30409	304H	-	-	-	-	-	-
	J-304L	S30403	304L	-	1.4307	-	X2CrNi18-9	SUS304L	-
	J-304LN	S30453	304LN	-	1.4311	-	X2CrNiN18-10	SUS304LN	-
	J-309	S30900	309	X15Cr24Ni13	1.4828	-	-	-	-
	J-309S	S30908	309S	-	1.4833	1Cr23Ni13	X7CrNi23-14	SUS309S	-
	J-310	S31000	310	X20Cr25Ni20	-	-	X15CrNiSi25-20	SUH310	20Ch25N20S2
Martensitic	J-310S	S31008	310S	-	1.4845	0Cr25Ni20	X12CrNi25-21	SUS310S	20Ch23N18
	J-316	S31600	316	X04Cr17Ni12Mo2	1.4401	0Cr17Ni12Mo2	X5CrNiMo17-12-2	SUS316	-
	J-316L	S31603	316L	X02Cr17Ni12Mo2	1.4404	00Cr17Ni14Mo2	X2CrNiMo17-13-2	SUS316L	-
	J-316LN	S31653	316LN	-	1.4429	-	X2CrNiMoN17-11-2	SUS316LN	-
	J-316Ti	S31635	316Ti	X04Cr17Ni12Mo2Ti	1.4571	0Cr18Ni12Mo2Ti	X6CrNiMoTi17-12-2	SUS316Ti	10Ch17N13M2Ti
	J-317	S31700	317	-	-	-	-	-	-
	J-317L	S31703	317L	-	1.4438	00Cr19Ni13Mo3	X2CrNiMo18154	SUS317L	-
	J-317LN	S31753	317LN	-	-	-	-	-	-
	J-317Z	S31727	-	-	-	-	-	-	-
	J-321	S32100	321	X04Cr18Ni10Ti	1.4541	0Cr18Ni10Ti	X6CrNiTi18-10	SUS321	08Ch18N10T
Ferritic	J-347	S34700	347	X04Cr18Ni10Nb	1.4550	0Cr18Ni11Nb	X6CrNiNb18-10	SUS347	09Ch18N12B
	J-410	S4100	410	K12Cr12	1.4006	1Cr12	X12Cr13	SUS410	-
	J-415	S41500	-	-	1.4313	-	X3CrNiMo13-4	-	-
	J-420	S42000	420	X20Cr13	1.4006	1Cr12	X12Cr13	SUS410	-
	J-431	S43100	431	-	1.4057	1Cr17Ni2	X17CrNi15-2	-	20Ch17N2
	JBS	-	-	-	-	-	-	-	-
	J-405	S40500	405	X04Cr12	1.4002	0Cr13Al	X6CrAl13	SUS405	-
	J-409	S40900	409	-	1.4512	-	X2CrTi12	SUS409	-
	J-409RC	-	-	-	-	-	-	-	-
	J-410S	S41008	410S	-	1.4000	0Cr13	X6Cr13	SUS403	-
Ferritic + Martensitic	J-430	S43000	430	X07Cr17	1.4016	1Cr17	X6Cr17	SUS409	-
	J-430Ti	-	-	-	-	-	X3CrTi17	SUS430LX	-
	J-436	S43600	436	-	-	-	-	-	-
	J-436L	S43932	436L	-	-	-	-	SUS436L	-
	J-439	S43035	439	-	-	00Cr18Ti	X3CrTi17	-	-
	J-441	S43940	-	-	1.4509	-	X2CrTiNb18	-	-
	Duplex (Austenitic + Ferritic)								
	J-2205	S32205	-	-	-	-	-	-	-
Duplex (Austenitic + Ferritic)	J-31803	S31803	-	-	1.4462	-	X2CrNiMoN 22-5-3	SUS32913L	-
	J-2304	S32304	2304	-	1.4362	-	X2CrN N 23-4	-	-





SWG (STANDARD WIRE GAUGE) & WEIGHT (W) OF STAINLESS STEEL SHEET IN KG.

Thickness (T)			1250 x 2500 mm mm	4' x 8' ft ft	1' x 1' Mtr Mtr	14" x 4" In ft	1' x 1' ft ft
SWG	Inch	mm					
0	0.324	8.230	203.200	193.300	65.000	28.300	6.100
1	0.276	7.010	173.100	179.000	60.200	26.200	5.600
2	0.276	7.010	173.100	164.700	55.400	24.100	4.700
3	0.252	6.401	158.000	150.400	50.600	22.100	4.700
4	0.232	5.893	145.500	138.400	46.600	20.300	4.300
5	0.212	5.385	132.900	126.500	42.600	18.600	4.000
6	0.192	4.877	120.400	114.600	38.600	16.800	3.600
7	0.176	4.470	110.400	105.000	35.300	15.400	3.300
8	0.160	4.064	100.300	95.500	32.100	14.000	3.000
9	0.144	3.658	90.300	85.900	28.900	12.600	2.700
10	0.128	3.251	80.300	76.400	25.700	11.200	2.400
11	0.116	2.946	72.800	69.200	23.300	10.200	2.200
12	0.104	2.642	65.200	62.100	20.900	9.100	2.000
13	0.092	2.337	57.700	54.900	18.500	8.100	1.700
14	0.080	2.032	50.200	47.800	15.100	7.000	1.500
15	0.072	1.829	45.200	43.000	14.500	6.300	1.350
16	0.064	1.626	40.200	38.200	12.900	5.600	1.200
17	0.056	1.422	35.100	33.400	11.300	4.900	1.050
18	0.048	1.219	30.100	28.700	9.700	4.200	0.900
19	0.040	1.016	25.100	23.900	8.100	3.500	0.750
20	0.036	0.914	22.600	21.500	7.300	3.200	0.700
21	0.032	0.813	20.100	19.100	5.600	2.800	0.600
22	0.028	0.711	17.600	16.700	5.600	2.500	0.500
23	0.024	0.610	15.100	14.300	4.800	2.100	0.450
24	0.022	0.559	13.800	13.200	4.400	2.000	0.410
25	0.020	0.508	12.600	12.000	4.000	1.800	0.370
26	0.018	0.457	11.300	10.800	3.600	1.600	0.340
27	0.0164	0.417	10.300	9.800	3.300	1.500	0.310
28	0.0148	0.376	9.300	8.900	3.000	1.300	0.280
29	0.0136	0.345	8.600	8.200	2.800	1.200	0.250
30	0.0124	0.315	7.800	7.400	2.500	1.100	0.230
31	0.0116	0.295	7.300	6.900	2.400	1.000	0.220
32	0.0108	0.274	6.800	6.500	2.200	0.950	0.200
33	0.0100	0.254	6.300	6.000	2.000	0.900	0.190
34	0.0092	0.234	5.800	5.500	1.900	0.800	0.170
35	0.0084	0.213	5.300	5.000	1.700	0.750	0.160
36	0.0076	0.193	4.800	4.600	1.600	0.700	0.140
37	0.0068	0.173	4.300	4.100	1.400	0.600	0.130
38	0.0060	0.152	3.800	3.579	1.200	0.550	0.110
39	0.0052	0.132	3.300	3.100	1.100	0.500	0.100
40	0.0048	0.122	3.000	2.900	1.000	0.400	0.090

Direct Formula for
Stainless steel Sheet :

$$T \times 7.85 \text{ Kg/m}^2$$

$$T \times 0.733 \text{ Kg/ft}^2$$

T = Thickness



Weight of Following Metal's Sheet

Copper : W x 1.135

Aluminium : W x 0.349

Brass : W x 1.090

P.B. : W x 1.139

W = Weight of same size of steel
Sheet from table

Example
Copper Sheet of Thickness 10 SWG
having size of 4' x 8'

$$\begin{aligned} W & \times 1.135 \\ 76.400 & \times 1.135 \\ & = 86.714 \end{aligned}$$

Answer

Weight of 10 SWG

4ft x 8ft copper sheet is 86.714 kg.



CARBON STEEL PLATES - IS 8500

CHEMICAL COMPOSITION						
Grade IS 8500	Ladle Analysis					
	C% Max	Mn% Max	S% Max	P% Max	Si% Max	C.E% Max
Fe 440	0.20	1.30	0.040	0.040	0.45	0.40
Fe 490	0.20	1.50	0.040	0.040	0.45	0.42
Fe 540	0.20	1.60	0.040	0.040	0.45	0.44
Fe 570	0.22	1.60	0.040	0.040	0.45	0.46
Fe 590	0.22	1.80	0.040	0.040	0.45	0.48

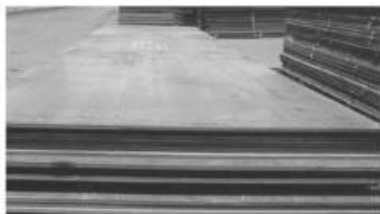
MECHANICAL PROPERTIES										
Grade IS 8500	Tensile Strength (Min)	Yield Strength (Min)				Elongation Percent (Min)	Bend (Internal diameter)		Charpy V - notch Impact toughness, Joules, Min	
		<16 mm	16-40 mm	>40 mm			Min 25 mm	>25 mm	RT	20°C
	MPa	MPa	MPa		5.65 √So					
	Fe 440	440	300	290	280		22	2t	3t	50
Fe 490	490	350	330	320	-	22	2t	3t	50	25
Fe 540	540	410	390	380	-	20	2t	3t	50	25
Fe 570	570	450	430	420	-	20	2t	3t	45	20
Fe 590	590	450	430	420	-	20	2t	3t	45	20

SAILMA HIGH STRENGTH MICRO ALLOY STRUCTURAL STEEL (KILLED)

CHEMICAL COMPOSITION				
Grade	C% Max	Mn% Max	S% Max	P% Max
SAILMA 350	0.25	1.50	0.055	0.055
SAILMA 350HI	0.20	1.50	0.055	0.055
SAILMA 410	0.25	1.50	0.055	0.055
SAILMA 410HI	0.25	1.50	0.055	0.055
SAILMA 450	0.25	1.50	0.055	0.055
SAILMA 450HI	0.20	1.50	0.040	0.040

MECHANICAL PROPERTIES						
Grade	UTS (MPa)	YS (MPa) Min	El. % Min 5.65√So	Charpy V - notch Impact toughness, Joules, Min		Bend Test
				RT	20°C	
SAILMA350	490-610	350	20	-	-	3T
SAILMA350HI	490-610	350	21	35	25	3T
SAILMA410	510-660	410	19	-	-	3T
SAILMA410HI	540-660	410	20	30	20	3T
SAILMA450	570-720	450	18	-	-	3T
SAILMA450HI	570-720	450	19	*	*	3T

*For SAILMA 450HI Impact is for > 10mm for <12mm Impact to be given only if specified





CARBON STEEL: CHEMICAL COMPOSITION OF STANDARD GRADES

Grades	% Chemical Composition									Deoxidation
	C	Mn	Si	S	P	Al	Cu	Nb+V+Ti	Ce	
IS 1079 Gr O	0.15 max	0.60 max	-	0.055 max	0.055 max	-	-	-	-	Semi Killed / Killed
IS 1079 Gr D	0.12 max	0.50 max	-	0.040 max	0.040 max	-	-	-	-	Semi Killed / Killed
IS 1079 Gr DD	0.10 max	0.40 max	-	0.035 max	0.035 max	0.02 min	-	-	-	Al Killed
IS 1079 Gr EDD	0.08 max	0.40 max	-	0.030 max	0.030 max	0.02 min	-	-	-	Al Killed
IS 2062 E 250 A	0.23 max	1.50 max	0.40 max	0.045 max	0.045 max	-	-	0.25	0.25	Semi Killed / Killed
IS 2062 E 250 B	0.22 max	1.50 max	0.40 max	0.045 max	0.045 max	-	-	0.25 max	0.41 max	Killed
IS 2062 E250 C	0.20 max	1.50 max	0.04 max	0.040 max	0.040 max	-	0.20-0.35	0.25 max	-	Killed
IS 2062 E 250 Cu C	0.20 max	1.60 max	0.45 max	0.045 max	0.045 max	-	-	0.25 max	0.44 max	Killed
IS 2062 E410	0.20 max	1.60 max	0.45 max	0.045 max	0.045 max	-	-	0.25 max	0.44 max	Killed
IS 2060 E450 D	0.22 max	1.60 max	0.45 max	0.045 max	0.045 max	-	-	0.25 max	0.45 max	Killed
IS 2062 E450 E	0.22 max	1.80 max	0.45 max	0.045 max	0.045 max	-	-	0.25 max	0.48 max	Killed
IS 5986 Fe 410	0.20 max	1.20 max	- max	0.040 max	0.040 max	-	-	-	0.42 max	Killed
IS 10748 Gr f	0.10 max	0.50 max	- max	0.040 max	0.040 max	-	-	-	-	Killed

CARBON STEEL : MECHANICAL PROPERTIES OF STANDARD GRADES

Grades	YS N/mm ²	UTS N/mm ²	% El (Min) GL= 5.65√So	Bend Test (t)	Hard R _e	Charpy V-Notch Impact Energy (min)
IS 1079 Gr O	-	-	-	2 t	-	-
IS 1079 Gr D	-	240 - 400	25	1 t	-	-
IS 1079 Gr DD	-	260 - 390	28	Close	-	-
IS 1079 Gr EDD	-	260 - 380	32	Close	-	-
IS 2062 E250 A	250 min	410 min	23	3 t	-	-
IS 2062 E250 B	250 min	410 min	23	2 t	-	27 J at Room temp See Note
IS 2062 E250 C	250 min	410 min	23	2 t	-	27 J at Roomtemp See Note
IS 2062E250Cu C	250 min	410 min	23	2 t	-	27 J at Roomtemp See Note
IS 2062 E410	410 min	540 min	23	2 t	-	50 J at Roomtemp See Note
IS 2062 E450 D	450 min	570 min	20	2 t	-	45 J at Room temp See Note.
IS 2062 E450 E	450 min	590 min	20	2 t	-	45 J at Room temp See Note
IS 5986 Fe410	255 min	410-520	24 for t>3/0 mm*	2 t	-	-

*t' = Nominal thickness of test piece, * : Elongation 15 min N in 80mm GL for t ≤ 3.0 mm

Note : For grade IS 2062 E250B, E250C, E410, E450E Impact Test shall be certified for product thickness of 12mm or more.

The testing temperature will be room temperature unless otherwise specified in the order.

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EQUIVALENT SPECIFICATIONS OF IS STANDARDS

TITLE (1)	Indian Standard No. and Grade (2)		Near Equivalent Non IS Specifications (3)
Steel Plates for Pressure vessels for Intermediate and high temperature service including boilers	IS 2002	Grade 1 Grade 2 Grade 3	A/SA 515 Grade 60 A/SA 515 Grade 65 A/SA 515 Grade 70
Steel Plates for Pressure vessels used at moderate and low temperature	IS 2041	Grade R220 Grade R220 Grade R260 Grade R260 Grade R355 Grade H235 Grade H235 Grade H265 Grade H295 Grade H355	A/SA 515 Grade 55 A/SA 515 Grade 60 A/SA 515 Grade 65 A/SA 515 Grade 70 A/SA 537 Class 1 DIN 17155 Gr. HI EN 10028-P2-P235GH EN 10028-P2-P235GH EN 10028-P2-P295GH EN 10028-P2-P355GH
Hot Rolled medium and high tensile structural steel (excluding bars and rods of diameter or thickness less than 6mm and structural below 50mm x 50mm x 6mm)	IS 2062	E250 A E250 A E300 A E350 A E350 A or E 410 E250 BR E250 BR E300 BR E250 BR, B0, C E275 BR, B0, C E350 BR, B0, C E250 A E350 C E300 A E300 C E350 A E350 C E410 A E410 C E450 A E450 BR E550 A E550 BR E550 A	A / SA 36 A / SA 283 Grade D A / SA 572 Grade 42 A / SA 572 Grade 50 A / SA 572 Grade 55 A / SA 573 Grade 58 A / SA 573 Grade 65 A / SA 573 Grade 70 EN 10025 S235 JR,J0,J2 EN 10025 S275 JR,J0,J2 EN 10025 S355 JR,J0,J2 DIN 17100 Rst 37.2, St 44.2 DIN 17100 St 52.3 SALIMA 300 SALIMA 300 HI SALIMA 350 SALIMA 350 HI SALIMA 410 SALIMA 410 HI SALIMA 450 SALIMA 450 HI SALIMA 550 SALIMA 550 HI SAIL HITEN

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EQUIVALENT GRADES IN VARIOUS SPECIFICATION

Alloy Steels

Equivalent Grades				
BS	DIN	IS	EN	SAE/AISI
530A40	37Cr4	40Cr1	EN18	5140
817M40	34CrNiMo6	40NiCr4Mo3	EN24	4340
709M40	-	40Cr4Mo3	EN19C	4140, 4142
709M40	-	40Cr4Mo3	EN19	4140, 4142
530A40	37Cr4	40Cr1	EN18D	5140
530A40	37Cr4	40Cr1	EN18C	5140
530A40	37Cr4	40Cr1	EN18A	5140
-	28Mn6	27C15	-	1527
-	20MnCr5	20MnCr1	-	-
150MB	-	20Mn2	EN14A	1524
-	16MnCr5	17Mn1Cr95	-	5120
530A40	37Cr4	40Cr1	EN18B	5140
805M20	-	20NiCrMo2	EN362	8620
805M20	-	20Ni2CrMo2	-	8622
815M17	-	15NiCr1Mo12	EN353	-
820M17	-	15NiVCr1Mo15	EN354	4320
-	17Cr3	-	-	-
41Cr4	41Cr4	40Cr4	EN 18D	5140
34Cr4	34Cr4	-	EN 18	5130

Carbon Steels

Equivalent Grades				
BS	DIN	IS	EN	SAE/AISI
150M36	36Mn5	37Mn2, 37C15	EN15B,	1536
-	CK15	C14	EN32B	1015, 1016, 1018
-	CK38	-	-	1038
-	-	C50	EN43C	1050
-	CK45	45C8	1045	-
070M55	CK55	C55	EN9	1055
-	C35	35C8, C35Mn75	-	1035
-	CK75	80C6	EN42	1074
-	C67	65C6	EN42B	1065
080M50	C55	60C6	EN43	1055
080A47	CK45	-	EN43B	1045

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ASTM A 283 LOW AND INTERMEDIATE TENSILE STRENGTH CARBON STEEL PLATES

Designation	Chemical Composition				Mechanical Properties			
	C% max	Mn% max	P% max	S% max	Tensile Strength (Mpa)	Yield Strength (MPa)	Elongation %min	
							GL=8 in	GL=2 in
Grade A	0.14	0.90	0.035	0.040	310-415	165	27	30
Grade B	0.17	0.90	0.035	0.040	345-450	185	25	28
Grade C	0.24	0.90	0.035	0.040	380-515	205	22	25
Grade D	0.27	0.90	0.035	0.040	415-550	230	20	23

Note : 1) For Silicon: Thickness 40mm and under 0.40max & for Thickness over 40mm 0.15-0.40

2) Min% when copper is specified 0.20

ASTM A 285 PRESSURE VESSEL PLATES, CARBON STEEL LOW AND INTERMEDIATE TENSILE STRENGTH

Designation	Chemical Composition				Mechanical Properties			
	C% max	Mn% max	P% max	S% max	Tensile Strength (Mpa)	Yield Strength (MPa)	Elongation %min	
							GL=8 in	GL=2 in
Grade A	0.17	0.90	0.035	0.035	310-415	165	27	30
Grade B	0.22	0.90	0.035	0.040	345-485	185	25	28
Grade C	0.28	0.90	0.035	0.040	380-515	205	22	23



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ASTM 515 PRESSURE VESSEL PLATES, CARBON STEEL FOR INTERMEDIATE AND HIGHER TEMPERATURE SERVICES CHEMICAL COMPOSITION

Elements	Composition %		
	Grade 60 (Grade 415)	Grade 65 (Grade 450)	Grade 70 (Grade 485)
Carbon, Max (A) :			
1 in. [25 mm] and under	0.24	0.28	0.31
Over 1 in. to 2 in. [25 to 50 mm], incl.	0.27	0.31	0.33
Over 2 in. to 4 in. [50 to 100 mm], incl.	0.29	0.33	0.35
Over 4 to 8 in. [100 to 200 mm], incl.	0.31	0.33	0.35
Over 8 in. [200 mm]	0.31	0.33	0.35
Manganese max :			
Heat analysis	0.90	0.90	1.20
Product analysis	0.98	0.98	1.30
Phosphorus, Max (A)	0.035	0.035	0.035
Sulfur, max (A)	0.035	0.035	0.035
Silicon :			
Heat analysis	0.15-0.40	0.15-0.40	0.15-0.40
Product analysis	0.13-0.45	0.13-0.45	0.13-0.45

Note : (A) Applies to both heat and product analysis.

TENSILE REQUIREMENTS

Elements	Composition %		
	Grade 60 (Grade 415)	Grade 65 (Grade 450)	Grade 70 (Grade 485)
Tensile Strength, ksi [Mpa]	60-80 [415-550]	65-85 [450-585]	70-90 [485-620]
Yield Strength, min, ksi [Mpa]	32 [220]	35 [240]	38 [260]
Elongation in 8 in. [200 mm], min % (A)	21	19	17
Elongation in 2 in. [50 mm], min, % (A)	25	23	21

Note : (A) See Specification A20/A20M for elongation adjustment.

ASTM 516 PRESSURE VESSEL PLATES, CARBON STEEL FOR MATE RATE AND LOWER TEMPERATURE SERVICES CHEMICAL COMPOSITION

Elements	Composition %			
	Grade 55 (Grade 380)	Grade 60 (Grade 415)	Grade 65 (Grade 450)	Grade 70 (Grade 485)
Carbon, Max [†]				
½ in. [12.5 mm] and under	0.18	0.21	0.24	0.27
Over ½ in. to 2 in. [12.5 to 50mm], incl.	0.20	0.23	0.26	0.28
Over 2 in. to 4 in. [50 to 100mm], incl.	0.22	0.25	0.28	0.30
Over 4 to 8 in. [100 to 200 mm], incl.	0.24	0.27	0.29	0.31
Over 8 in. [200 mm]	0.26	0.27	0.29	0.31
Manganese :				
½ in. [12.5 mm] and under	0.60-0.90	0.60-0.90	0.85-1.20	0.85-1.20
Heat analysis [‡]	0.55-0.98	0.55-0.98	0.79-1.30	0.79-1.30
Product analysis [‡]				
Over ½ in. [12.5 mm]				
Heat analysis [‡]	0.60-1.20	0.85-1.20	0.85-1.20	0.85-1.20
Product analysis [‡]	0.55-1.30	0.79-1.30	0.79-1.30	0.79-1.30
Phosphorus, Max [†]	0.035	0.035	0.035	0.035
Sulfur, max [†]	0.035	0.035	0.035	0.035
Silicon :				
Heat analysis [‡]	0.15-0.40	0.15-0.40	0.15-0.40	0.15-0.40
Product analysis [‡]	0.13-0.45	0.13-0.45	0.13-0.45	0.13-0.45

[†]Applies to both heat and product analysis.

[‡]Grade 60 plates ½ in [12.5mm] and under in thickness may have 0.85-1.20% manganese on heat analysis, and 0.79-1.30% manganese on product analysis.

TENSILE REQUIREMENTS

Elements	Composition %			
	Grade 55 (Grade 380)	Grade 60 (Grade 415)	Grade 65 (Grade 450)	Grade 70 (Grade 485)
Tensile Strength, ksi [Mpa]	55-75 [380-515]	60-80 [415-550]	65-85 [450-585]	70-90 [485-620]
Yield Strength, min, ksi [Mpa]	30 [205]	30 [220]	35 [240]	38 [260]
Elongation in 8 in. [200 mm], min %	23 [†]	21 [†]	19 [†]	17 [†]
Elongation in 2 in. [50 mm], min, %	27 [†]	25 [†]	23 [†]	21 [†]

[†] See Specification A20/A 20M

[‡] Determined by either the 0.2% offset method or the 0.5% extension under-load method.

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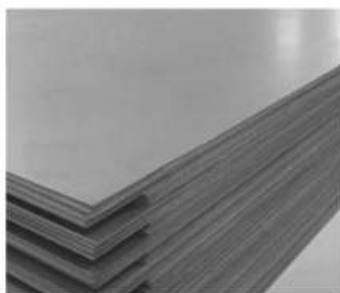




ALLOY STEEL PLATES

ASTM A387 PRESSURE VESSEL PLATES, ALLOY STEEL, CHROMIUM - MOLYBDENUM												
CHEMICAL COMPOSITION									MECHANICAL PROPERTIES			
Specification	C% max	Si%	Mn%	P% max	S% max	Cr%	Mo%	V%	Tensile Strength Ksi (MPa)	Yield Strength (0.2% offset) Ksi (MPa) min	Elongation % min	
											GL = 8 in *2 or 200 mm	GL = 2 in. or 50 mm
Grade 5 Class-2	0.15	0.50 max	0.30-0.60	0.035	0.030	4.00-6.00	0.45-0.65		75-100 (515-690)	45 (310)	-	18
Grade 9 Class-2	0.15	1.00 max	0.30-0.60	0.030	0.030	8.00-10.00	0.90-1.10	0.04 max	75-100 (515-690)	45 (310)	-	18
Grade 11 Class-2	0.05-0.17	0.50-0.80	0.40-0.65	0.035	0.035	1.00-1.50	0.45-0.65		75-100 (515-690)	43 (310)	18	22
Grade 12 Class-2	0.05-0.17	0.15-0.40	0.40-0.65	0.035	0.035	0.80-1.15	0.45-0.60		65-85 (450-585)	40 (275)	19	22
Grade 22 Class-2	0.05-0.15	0.50 max	0.30-0.60	0.035	0.035	2.00-2.50	0.90-1.10		75-100 (515-690)	45 (310)	-	18
Grade 91* Class-2	0.08-0.12	0.20-0.50	0.30-0.60	0.020	0.010	8.00-9.50	0.85-1.05	0.18-0.25	85-110 (585-760)	60 415	-	18

* Additional Properties for Grade 91) Ni - 0.40max, Cb-0.06-0.10, N - 0.030-0.070, Al - 0.02, Ti & Z : 0.01 max



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ALLOY STEEL PLATES

CHEMICAL COMPOSITION

Grade	C	Si	Mn	P	S	Cr	Mo	Ni	Nb	Ti	V	Al	N	Cu
13CrMo45	0.08/0.18	0.35	0.40/1.00	0.025	0.010	0.70/1.15	0.40/0.60	-	-	-	-	-	0.012	0.30

MECHANICAL PROPERTIES

Grade	Thickness	Yield Strength	Tensile Strength	Elongation (A)	Impact energy KV at test temperature		
					-20°C	0°C	+20°C
	mm	Mpa	Mpa	%	J	J	J
13CrMo45	<16	300	450/600	19	-	-	31
	>16<60	290	450/600	19	-	-	31
	>60<100	270	440/590				27
	>100<150	255	430/580				27
	>150<250	245	420/570				27

CHEMICAL COMPOSITION

Grade	C	Si	Mn	P	S	Cr	Mo	Ni	Nb	Ti	V	Al	N	Cu
16Mo3	0.12/0.20	0.35	0.40/0.90	0.025	0.010	0.030	0.25/0.35	0.30	-	-	-	-	0.012	0.30

MECHANICAL PROPERTIES

Grade	Thickness	Temperature (°C)											
		50° MPa	100° MPa	150° MPa	200° MPa	250° MPa	300° MPa	350° MPa	400° MPa	450° MPa	500° MPa		
16Mo3	<16	273	264	250	233	213	194	175	159	147	141		
	>16<40	268	259	245	228	209	190	172	156	145	139		
	>40<60	258	250	236	220	202	183	165	150	139	134		
	>60<100	238	230	218	203	186	169	153	139	129	123		
	>100<150	218	211	200	186	171	155	140	127	118	113		
	>150<250	208	202	191	178	163	148	134	121	113	108		

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EN 10155 : 1993 - STRUCTURAL STEEL WITH IMPROVED ATMOSPHERE CORROSION RESISTANCE

(Properties minima unless stated)

Grade ^a	S235/JW	S235/J2W	S355/JWP	S355/J2WP	S355/JW	S355/J2W	S355/JG1W	S355/J2G1W	S355/JG2W	S355/JG2W	S355/JG2W	S355/JG2W
Corresponding EN 10025 Grade ^b S235-J0	S235-J0	S235/J2G3	-	-	S355-J0	S355/J2G3	S355/JG3	S355/JG4	S355/JG4	S355/JG4	S355/JG4	S355/JG4
BS 580 Equivalent Grade	-	-	WR50A	-	WR50B	WR50C	WR50C	WR50C	WR50C	WR50C	WR50C	WR50C
C	0.13	0.13	0.12	0.12	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Si	0.40	0.40	0.75	0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Mn	0.20-0.60	0.20-0.60	1.00	1.00	0.50-1.50	0.50-1.50	0.50-1.50	0.50-1.50	0.50-1.50	0.50-1.50	0.50-1.50	0.50-1.50
P	0.040	0.040	0.06-0.15	0.06-0.15	0.040	0.035	0.035	0.035	0.035	0.035	0.035	0.035
S	0.040	0.035	0.04	0.035	0.040	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Cr	0.40-0.80	0.40-0.80	0.30-1.25	0.30-1.25	0.40-0.80	0.40-0.80	0.40-0.80	0.40-0.80	0.40-0.80	0.40-0.80	0.40-0.80	0.40-0.80
Mo	-	-	-	-	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Ni	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Cu 0.25	-	-	Cu 0.25	Cu 0.25	Cu 0.25	Cu 0.25	Cu 0.25	Cu 0.25	Cu 0.25	Cu 0.25	Cu 0.25	Cu 0.25
Others ¹⁾	-0.55	-0.55	-0.55	-0.55	-0.55	-0.55	-0.55	-0.55	-0.55	-0.55	-0.55	-0.55
	N 0.009	N 0.009	Zr 0.15	Zr 0.15	Zr 0.15	Zr 0.15	Zr 0.15	Zr 0.15	Zr 0.15	Zr 0.15	Zr 0.15	Zr 0.15
	Thickness (mm)											
Yield Stress ^{2,3}	≤ 16	235	235	355 ^{II}	355	355	355	355	355	355	355	355
R _m	≥ 16 ≤ 40	225	225	345 ^{II}	345	345	345	345	345	345	345	345
N/mm ²	≥ 40 ≤ 63	215	215	-	335	335	335	335	335	335	335	335
	≥ 63 ≥ 80	215	215	-	325	325	325	325	325	325	325	325
	≥ 80 ≤ 100	215	215	-	315	315	315	315	315	315	315	315
Tensile Strength ³⁾	< 3	360/510	360/510	510/680	510/680	510/680	510/680	510/680	510/680	510/680	510/680	510/680
R _m	≥ 3 ≤ 100	340/470	340/470	490/630	490/630	490/630	490/630	490/630	490/630	490/630	490/630	490/630
N/mm ²												
Elongation ⁴⁾	> 1.5 ≤ 2	19 (17)	19 (17)	16 (14)	16 (14)	16 (14)	16 (14)	16 (14)	16 (14)	16 (14)	16 (14)	16 (14)
%	> 2 ≤ 2.5	20 (18)	20 (18)	17 (15)	17 (15)	17 (15)	17 (15)	17 (15)	17 (15)	17 (15)	17 (15)	17 (15)
	> 2.5 ≤ 3	21 (19)	21 (19)	18 (16)	18 (16)	18 (16)	18 (16)	18 (16)	18 (16)	18 (16)	18 (16)	18 (16)
	> 3 ≤ 40	26 (24)	26 (24)	22 (20)	22 (20)	22 (20)	22 (20)	22 (20)	22 (20)	22 (20)	22 (20)	22 (20)
	> 40 ≤ 63	25 (23)	25 (23)	-	-	21 (19)	21 (19)	21 (19)	21 (19)	21 (19)	21 (19)	21 (19)
	> 63 ≤ 100	24 (22)	24 (22)	-	-	20 (18)	20 (18)	20 (18)	20 (18)	20 (18)	20 (18)	20 (18)
Impact ⁵⁾	0	27	-	27	-	27	-	-	-	-	-	-
KV	-20	27	27	27	-	27	27	27	27	27	27	27

Notes : 1), 2), 3), 4), 5), 6), 7) references shall be made to BS EN 10155 Handbook.

Symbols Used in EN 10025	
S	Structural steel
E	Engineering Steel
JR	Longitudinal Charpy V-notch impacts 27J @ room temperature
JO	" " " " 27J @ 00C
J2	" " " " 27J @ -200C
K2	" " " " 40J @ -200C
G1	Rimming Steel (FU)
G2	Rimming Steel not permitted (FN)
G3	Supply Condition "N", i.e. normalized or normalized rolled
G4	Supply Condition at the manufacturer's discretion.

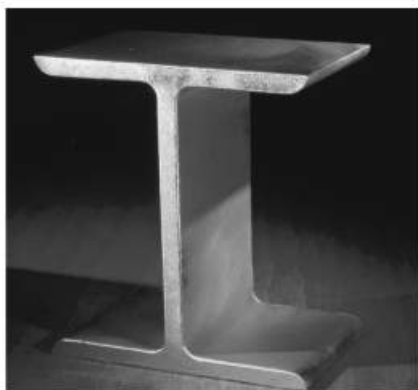
National Annex NA (normative) - Non-Conflicting national additions

Grade	BS 4300 Equivalent Grade	Chemical Composition % maximum (minimum)							Mechanical properties are the same as grades: S235JR, S275JR and S355JR but without specified impact properties
		C	Si	Mn	P	S	Nb	V	
S 235	40A	0.22	0.5	1.6	0.005	0.05	-	-	
S 275	43A	0.25	0.5	1.6	0.005	0.05	-	-	
S 355	50A	0.23	0.5	1.6	0.005	0.05	0.1 (0.003)	0.1 (0.003)	

Mechanical properties are the same as grades S235, RG2, S275JR and S355JR but without specified impact properties

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STRUCTURAL STEEL (I BEAM, H BEAM IN CARBON & M.S.)



- U-Channels
- C-Channels

We are engaged in exporting of Mild Steel Channel, which is widely used as structural support in construction works. Available in different sizes and shapes, the MS Channels are procured from reliable sources, which use high grade steel that adds anti-corrosion properties and high tensile strength to the finished range. We are rated among the leading MS Channels Exporters and Mild Steel U Channels Suppliers.

- Equal Angle
- Unequal Angle

One of the most commonly used Steel Products in construction is M S Angles and we specialize in supplying Wholesale Mild Steel Angles. We Supply Equal Angles, Unequal Angles and T Angles which are available in different thickness and dimensions. Our MS Angles are galvanized to make them corrosion resistant. We are among the topmost Galvanized Mild Steel Angles Suppliers in India.

Technical Specifications :-**Dimension And Properties As Per ISI Specification IS: 2062-1999**

Designation	Depth of Section	Width of - Flange	Thickness of - Web	Weight / Mtr	Sectional - Area	Moduli of - Section	
	H	b	t	w	a	Zxx	Zyy
	(mm)	(mm)	(mm)	(Kg)	(cm ²)	(cm ²)	(cm ²)
ISMC 75	75	40	4.8	7.1	9.1	20.3	4.7
ISBC 100	100	50	5.0	9.6	12.2	37.3	7.5
ISMC 125	125	65	5.3	13.1	16.7	68.0	13.4
ISMC 150	150	75	5.7	16.8	21.3	105.0	19.4
ISMC 175	175	75	6.0	19.6	24.4	139.8	22.8
ISMC 200	200	75	6.2	22.3	28.5	181.0	26.4
ISMC 250	250	80	7.2	30.6	39.0	307.0	38.4
ISMC 300	300	90	7.8	36.3	46.3	428.0	47.1
ISMC 400	400	100	8.8	50.1	63.8	760.0	67.0



ANGLES (Equal Sides)

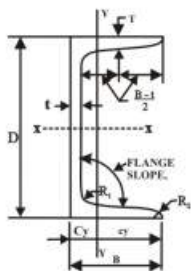
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IS : 2062 / IS : 1977

Sides in mm Equivalent	Thickness in mm - Weight in kg per metre											kg
	3	4	5	6	8	10	12	15	16	18	20	
20 X 20 mm	0.9	1.1										kg/m
25 X 25 mm	1.1	1.4	1.8									kg/m
30 X 30 mm	1.4	1.8	2.2									kg/m
35 X 35 mm	1.6	2.1	2.6	3.0								kg/m
40 X 40 mm	1.8	2.4	3.0	3.5								kg/m
45 X 45 mm	2.1	2.7	3.4	4.0								kg/m
50 X 50 mm	2.3	3.0	3.8	4.5								kg/m
55 X 55 mm			4.1	4.9	6.4	7.9						kg/m
60 X 60 mm			4.5	5.4	7.0	8.6						kg/m
65 X 65 mm			4.9	5.8	7.7	9.4						kg/m
70 X 70 mm			5.3	6.3	8.3	10.2						kg/m
75 X 75 mm			5.7	6.8	8.9	11.0						kg/m
80 X 80 mm				7.3	9.6	11.8	14.0					kg/m
90 X 90 mm				8.2	10.8	13.4	15.8					kg/m
100 X 100 mm				9.2	12.1	14.9	17.7					kg/m
110 X 110 mm					13.4	16.6	19.7		25.7			kg/m
130 X 130 mm					15.9	19.7	23.5		30.7			kg/m
150 X 150 mm						22.9	27.3		35.8		44.1	kg/m
200 X 200 mm							36.9		48.5		60.0	kg/m

CHANNELS

Thickness in mm - Weight in kg per metre



Section	Size mm X mm	Weight	Web thick in mm	Flange thick in mm	Sectional Area, a
	D B	kg/m	t	thick	cm ²
MC 75	75.00 X 40.00	7.14	4.80	7.50	9.10
MC 100	100.00 X 50.00	9.56	5.00	7.70	12.20
MC 125	125.00 X 65.00	13.10	5.30	8.20	16.70
MC125	125.00 X 66.00	13.70	6.00	8.10	17.50
MC150	150.00 X 75.00	16.80	5.70	9.00	21.10
MC 150	150.00 X 76.00	17.70	6.50	9.00	22.60
MC 175	175.00 X 75.00	19.60	6.00	10.20	24.90
MC 175	175.00 X 76.00	22.70	7.50	10.20	27.60
MC 200	200.00 X 75.00	22.30	6.20	11.40	28.50
MC 200	200.00 X 76.00	24.30	7.50	11.40	31.00
MC 225	225.00 X 80.00	26.10	6.50	12.40	33.30
MC 225	225.00 X 82.00	30.70	9.00	12.40	39.00
MC 250	250.00 X 80.00	30.60	7.20	14.10	39.00
MC 250	250.00 X 82.00	34.20	9.00	14.10	43.50
MC 250	250.00 X 83.00	38.10	11.00	14.10	48.50
MC 300	300.00 X 90.00	36.30	7.80	13.60	46.30
MC 300	300.00 X 92.00	41.50	10.00	13.60	52.80
MC 300	300.00 X 93.00	46.20	12.00	13.60	58.80
MC 350	350.00 X 100.00	42.70	8.30	13.50	54.40
MC 400	400.00 X 100.00	50.10	8.80	15.30	63.80



STAINLESS STEEL BARS

Product Range

Condition	Peeled, Centreless & Polished	Peeled & Polished	Peeled (Rough Turned)	Forged, Rough Turned
Grades	201, 202, 301, 303, 304, 304L, 310, 316, 316L, 321, 410, 416, 416, 420, 430, 431, 430F & others		304, 304L, 316L, 410, 416, 420, 430	303, 304, 304L, 316, 316L, 410, 416, 420, 431
Diameter (Size)	20mm to 85mm (3/4" to 3-1/4")	85mm to 140mm (3-1/4" to 5-1/2")	25mm to 140mm (1" to 5-1/2")	150mm to 400mm (6" to 16")
Diameter /+3mm Tolerance	h9 (Din 671) (ASTM A484)	h 11	K 12/K 13 (Din 1013)	-0mm to (-0"/+0.12")
Length	3/4/5, 6/6 meter (12/14ft/20 feet)	3/4/5, 6/6 meter (12/14ft/20 feet)	3/4/5, 6/6 meter 10 feet, 16 feet	3 meter - 5 meter
Length Tolerance	-0/+200mm of +100mm to +50mm (-0"/+1 feet or +4" or 2")	-0/+200mm or +100mm or +50mm (-0"/+1 feet or +4" or 2")	-0/+100mm or 500mm (-0"/+3 feet or +2 feet)	-0/+2 meter (-0/+6 feet)

ASTM A182 Alloy Steel Round Bar Chemical & Physical Properties

ASTM Grade	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Tensile Psi (MPa)	Yield Psi (Mpa)	Elongation Strip/Round	Hardn.	Redu. in Area. (%)
182 F11 Class 2	0.10 0.20	0.30 0.80	0.50 1.0	0.04 max	0.04 max	1.0 1.50	-	0.04 0.65	-	70000 (485)	40000 (275)	20	143-207	30
A 182 F22 Class	0.05 0.15	0.30 0.60	0.50 max	0.04 max	0.04 max	2.0 2.50	-	0.87 1.13	-	75000 (515)	45000 (310)	20	156-207	30
A 182 F5	0.15 max	0.30 0.06	0.50 max	0.03 max	0.03 max	4.0 6.0	0.5 max	0.44 0.65	-	70000 (485)	40000 (275)	20	143-217	35
A 182 F9	0.15 max	0.30 0.60	0.50 1.00	0.03 max	0.03 max	8.0 10.0	-	0.90 1.10	-	85 (585)	55 (380)	20	179-217 (BHN)	40

Stainless Steel Bright Bars (Cold Drawn)

Condition	Cold Drawn and Polished	Cold Drawn, Center less Ground & Polished	Cold Drawn, Center less Ground and Polished (Strain Hardened)
Grades	201, 202, 303, 304, 304L, 310, 316, 316L, 321, 410, 420, 416, 430, 431, 430F, & others		304, 304L, 316, 316L
Diameter (Size)	2mm to 5mm (1/8" to 3/16")	6mm to 22mm (1/4" to 7/8")	10mm to 40mm (3/8" to 1-1/2")
Diameter Tolerance	h9 (Din 671), h11 ASTM A 484	h9 (Din 671) ASTM A 484	h9 (Din 671), h11 ASTM A 484
Length	3/4/5, 6/6 meter (12/14ft/20 feet)	3/4/5, 6/6 meter (12/14ft/20 feet)	3/4/5, 6/6 meter (12/14ft/20 feet)
Length Tolerance	-0/+200mm of +100mm or +50mm (-0"/+1 feet or +4" or 2")	-0/+200mm or +100mm or +50mm (-0"/+1 feet or +4" or 2")	-0/+200mm (-0"/+1 feet)



IS-1875 ASTM A105 CARBON STEEL ROUND BAR CHEMICAL & PHYSICAL PROPERTIES

ASTM GRADE	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Tensile Psi (MPa)	Yield Psi (Mpa)	Elongation Strip/Round	Hardn.	Redu. in Area. (%)
A 105	0.35 max	0.60 1.05	0.10/0.35 max	0.040 max	0.035 max	-	-	-	-	70000 (485)	36000 (250)	30 Strip 22 Round	187 max	30 Round
A LF2	0.30 max	1.35 max	0.15 0.30	0.040 max	0.035 max	0.30 max	0.40 max	0.12 max	Cu-0.4 max Cb-0.02 max Va-0.3 max	70-95 (485-655)	36 (250)	22/30	20/16 (-45.6°)	36

Formula - Weight of stainless steel rounds = Dia. (mm) x Dia (mm) x 0.00623 = Kg Per Mtr.

Weight of Stainless Steel Hexagonal Rods = Dia. (mm) x Dia. (mm) x 0.00679 = Kg Per Mtr.

Weight of Stainless Steel Square Bars = Dia. (mm) x Dia (mm) x 0.00787 = Kg. Per Mtr.

Weight of Stainless Steel Circle & Blanks = O.D. (mm) x O.D. (mm) X Thk (mm)/160/1000 = Kg Per Pcs.

ROUND BARS



RAJKAMAL METALS

WEIGHT (W) OF ROUND, SQUARE & HEX OF STAINLESS STEEL IN Kg / Mtr

Size		Round	Square	Hex
mm	inch	Kg/m	Kg/m	Kg/m
3.96	5/32	0.097	0.123	0.106
4.00		0.099	0.126	0.109
4.76	3/16	0.140	0.178	0.154
5.00		0.154	0.196	0.170
5.55	7/32	0.190	0.242	0.209
6.00		0.222	0.283	0.244
6.35	1/4	0.249	0.317	0.273
7.00		0.302	0.385	0.332
7.93	5/16	0.388	0.494	0.426
8.00		0.395	0.502	0.434
9.00	3/8	0.499	0.636	0.549
9.52		0.559	0.711	0.615
10.00		0.617	0.785	0.678
11.00		0.746	0.950	0.821
11.11	7/16	0.761	0.969	0.837
12.00		0.888	1.130	0.977
12.70	1/2	0.994	1.266	1.094
13.00		1.042	1.327	1.146
14.00		1.208	1.539	1.329
14.28	9/16	1.257	1.601	1.383
15.00		1.387	1.766	1.526
15.87	5/8	1.553	1.977	1.708
16.00		1.578	2.010	1.736
17.00		1.782	2.269	1.960
17.46	11/16	1.880	2.393	2.067
18.00		1.998	2.543	2.197
19.00		2.228	2.834	2.448
19.05	3/4	2.237	2.849	2.461
20.00		2.466	3.140	2.713
20.63	13/16	2.624	3.341	2.886
21.00		2.719	3.462	2.991
22.00		2.984	3.799	3.282
22.22	7/8	3.044	3.876	3.348
23.00		3.261	4.153	3.588
23.81	15/16	3.495	4.450	3.845
24.00		3.551	4.522	3.906
25.00		3.853	4.906	4.375
25.40	1	3.978	5.065	4.375
26.00		4.168	5.307	4.585
27.00		4.495	5.723	4.944
28.00		4.834	6.154	5.317
28.57	1-1/8	5.032	6.408	5.536
29.00		5.185	6.602	5.704
30.00		5.549	7.065	6.104
31.75	1-1/4	6.215	7.913	6.837
32.00		6.313	8.038	6.945
34.00		7.127	9.075	7.840
34.92	1-3/8	7.518	9.572	8.270
35.00		7.553	9.616	8.308
36.00		7.990	10.174	8.789
38.00		8.903	11.335	9.793
38.10	1-1/2	8.950	11.395	9.845
40.00		9.865	12.560	10.851
41.27	1-5/8	10.501	13.370	11.551
42.00		10.876	13.847	11.963
44.00		11.936	15.198	13.130

Size		Round	Square	Hex
mm	inch	Kg/m	Kg/m	Kg/m
44.45	1-3/4	12.182	15.510	13.400
45.00		12.485	15.896	13.733
46.00		13.046	16.611	14.351
47.62	1-7/8	13.981	17.801	15.379
48.00		14.205	18.086	15.620
50.00	2	15.413	19.625	16.955
50.80		15.911	20.258	17.502
52.00		16.671	21.226	18.338
53.97	2-1/8	17.958	22.865	19.754
54.00		17.978	22.891	19.776
55.00		18.650	23.746	20.515
56.00		19.335	24.618	21.268
57.15	2-2/4	20.137	25.639	22.151
58.00		20.740	26.407	22.814
60.00		22.195	28.260	24.415
60.32	2-3/8	22.433	28.562	24.676
62.00		23.700	30.175	26.070
63.50	2-1/2	24.860	31.653	27.346
64.00		25.253	32.154	27.779
65.00		26.049	33.166	28.854
66.00		26.856	34.195	29.542
66.67	2-5/8	27.404	34.892	30.145
68.00		28.509	36.298	31.360
69.00		29.353	37.374	32.289
69.85	2-3/4	30.081	38.300	33.089
70.00		30.210	38.465	33.231
72.00		31.961	40.694	35.157
73.02	2-7/8	32.873	41.856	36.161
74.00		33.762	42.987	37.138
75.00		34.680	44.156	38.148
76.00		35.611	45.342	39.172
76.20	3	35.799	45.581	39.379
78.00		37.510	47.759	41.261
80.00		39.458	50.240	43.404
82.55	3-1/4	42.014	53.494	46.215
85.00		44.545	56.716	48.999
88.90	3-1/2	48.726	62.040	53.599
90.00		49.940	63.585	54.933
95.00		55.643	70.846	61.207
95.25	3-3/4	55.936	71.220	61.529
100.00		51.654	78.500	67.819
101.60	4	63.642	81.032	70.007
105.00		67.973	86.546	74.771
107.95	4-1/4	71.846	91.478	79.031
110.00		74.604	94.985	82.061
114.30	4-1/2	80.547	102.556	88.602
115.00		81.537	103.816	89.691
120.00		88.781	113.040	97.660
120.65	4-3/4	89.746	114.268	98.720
125.00		96.334	122.656	105.967
127.00	5	99.441	126.613	109.385
130.00		104.195	132.665	114.614
133.35	5-1/4	109.634	139.590	120.597
135.00		112.364	143.066	123.600
139.70	5-1/2	120.324	153.201	132.356
140.00		120.841	153.860	132.925

Size		Round	Square	Hex
mm	inch	Kg/m	Kg/m	Kg/m
145.00		129.627	165.046	142.590
146.05	5-3/4	131.511	167.445	144.662
150.00		138.511	176.625	152.593
152.40	6	143.196	182.322	157.515
155.00		148.123	188.596	162.935
158.75	6-1/4	155.377	197.832	170.915
160.00		157.834	200.960	173.617
165.00		167.852	213.716	184.638
165.10	6-1/2	168.056	213.975	184.861
170.00		178.179	226.865	195.997
171.45	6-3/4	181.232	230.752	199.355
175.00		188.815	240.406	207.696
177.80	7	194.905	248.161	214.396
180.00		199.758	254.340	219.734
184.15	7-1/4	209.075	266.203	229.983
185.00		211.010	268.666	232.111
190.00		222.570	283.385	244.827
190.50	7-1/2	238.908	304.187	246.117
195.00		234.438	298.496	257.882
196.85	7-3/4	238.908	304.187	262.799
200.00		246.615	314.000	271.277
203.20	8	254.570	324.128	280.027
210.00		271.893	346.185	299.082
215.80	8-1/2	287.119	365.572	315.831
220.00		298.404	379.940	328.245
228.60	9	322.190	410.225	354.409
230.00		326.148	415.265	358.763
240.00		355.126	452.160	390.638
241.30	9-1/2	358.983	457.072	394.882
250.00		385.536	490.525	423.870
254.00	10	397.765	506.451	437.542
260.00		416.779	530.660	458.457
266.71	10-1/2	438.569	558.404	482.426
270.00		449.456	572.265	494.401
279.41	11	481.331	612.849	529.464
280.00		483.365	615.440	531.702
290.00		518.508	660.185	570.359
292.09	11-1/2	526.009	669.735	578.610
300.00		554.884	706.500	610.372
304.81	12	572.820	729.337	630.102
310.00		592.493	754.385	651.742
330.20	13	672.223	855.902	739.446
342.90	13-1/4	724.927	923.006	797.420
355.60	14	779.620	992.643	857.420
368.30	14-1/2	955.631	1216.748	1051.194
381.00	15	894.972	1139.514	984.469
393.70	15-1/5	955.531	1216.748	1251.194
406.40	16	1018.279	1296.514	1120.107
419.10	16-1/2	1082.916	1378.812	1191.208
431.80	17	1149.542	1463.642	1264.496
444.50	17-1/2	1218.156	1551.005	1339.972
457.20	18	1288.760	1640.900	1417.636
469.90	18-1/2	1361.352	1733.327	1497.487
482.60	19	1435.933	1828.287	1579.526
495.30	19-1/2	1512.503	1925.778	1663.753
508.00	20	1591.061	2025.802	1750.168



ASTM SPECIFICATION FOR FASTENERS

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 P _s (MPa)	Yield P _s (MPa)	Elongation in Area %	Redu
A193 B8-B8A AISI Type 304	0.08 Max	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
A193 B8-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	75000(515)	30000(205)	30	50
A193 B8-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	-	Ti5xC 0.70Min	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	-	CbxPTA= 1.10c Min	192HB	75000(515)	30000(205)	30	50
A193 B6-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
A193 B5 A S-5%Cr AISI501	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
A194 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 19.00	2.00 12.00	1.00 -	0.03 0.78 Min	0.045 Max	17.00 19.00	9.00 13.00	-	-	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	-	-	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	-	-	-	228 271 HRC-20-28
A194 2 2H/2H & 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 248-352GR.7 159-237GR.7M 248-352 (HRC-24-38)
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	-	-	-	-
A194-30.10 A S-5%Cr AISI501	0.10 Max	1.00 Max	1.00 Max	0.030 Max	0.040 Max	4.00 6.00	-	-	-	-





FURNITURE FITTINGS



Long Stud Bend



Square Pipe Base



Ball



Square Concealed



Mogra



Ball Set



Conceal



Elbow



Hallow Ball



Dip Bracket



Pan Patti



Casty Pipe Bend



Slot Glass Bracket



Dairy Bend



D Pipe



Glass Bracket



Pipe Base



Thamli Bracket

DAIRY EQUIPMENTS



Clamp Fixed
Cleaning Ball



Rotary
Cleaning Ball



Slight
Glass



Cross
Clamp End



3 Way
Ball Valve



Butter
Fly Valve

DAIRY BUTTWELD FITTINGS



IDF Union



Wye Loop



Conical Strainer



Pipe Holder



Butter Fly Valve



IDF Union



Non-Return
Valve



Diaphragm
Valve



T C Clamp

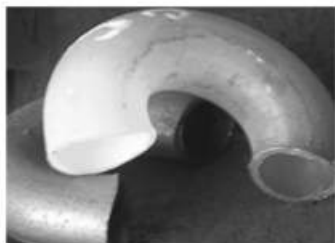


Hose Ferrule



CHEMICAL COMPOSITION & MECHANICAL PROPERTIES

Steel type	ASTM Grade	Chemical composition									Mechanical properties			
		C% max	Mn%	P% max	S% max	Si%	Cr%	Mo%	Ni%	Others	R.m. Tensile Strength MPa	S.m. Yield Strength MPa	A% min.(2" J4D) Elongation	Impact test KCV (2) J
A234	WPB(1)	0.3	0.29-1.06	0.05	0.058	0.10 min	0.4	0.15	0.4	Cu-0.4 V-0.08 Cb-0.02	415-585	240	30	20
	WPC(1)	0.35	0.29-1.06	0.05	0.058	0.10 min	0.4	0.15	0.4	Cu-0.4 V-0.08 Cb-0.02	485-655	275	30	20
A402	WPL6(1)	0.3	0.6-1.35	0.035	0.04	0.15-0.30	0.3	0.12	0.4	Cu-0.4 V-0.08 Cb-0.02	415-585	240	30	16.5
	WPL3	0.2	0.31-0.64	0.05	0.05	0.13-0.37	-	-	3.2-3.8	-	450-620	240	30	20
A234	WP1	0.28	0.30-0.9	0.045	0.045	0.10-0.50	-	0.44-0.65	-	-	380-550	205	30	20
	WP12CL1	0.05-0.2	0.3-0.8	0.045	0.045	0.6	0.8-1.25	0.44-0.65	-	-	415-585	220	30	20
	WP12CL2	-	-	-	-	-	-	-	-	-	485-655	275	30	20
	WP11CL1	0.5-0.15	0.3-0.6	0.3	0.3	0.5-10	1.0-1.5	0.44-0.65	-	-	415-585	205	30	20
	WP11CL2	0.5-0.2	0.3-0.8	0.4	0.4	0.5-10	1.0-1.5	0.44-0.65	-	-	485-655	275	30	20
	WP11CL3	-	-	-	-	-	-	-	-	-	520-690	310	30	20
	WP22CL1	0.05-0.15	0.3-0.8	0.04	0.04	0.5	1.9-2.6	0.87-1.13	-	-	415-585	205	30	20
	WP22CL3	-	-	-	-	-	-	-	-	-	520-690	310	30	20
	WP5	0.15	0.3-0.6	0.04	0.03	0.5	4.0-6.0	0.44-0.65	-	-	415-585	205	30	20
	WP9	0.15	0.3-0.6	0.03	0.03	0.25-10	8.0-10.0	0.9-1.10	-	-	415-585	205	30	20
	WP91	0.08-0.12	0.3-0.6	0.02	0.01	0.2-0.5	8.0-9.5	0.85-1.05	0.4	V-0.10-0.25 Cb-0.06-0.10 N-0.005-0.01 Al-0.04	585-760	415	20	-
A403	WP304	0.08	2	0.045	0.03	1	18-20	-	8.0-11.0	-	515	205	28	20
	WP304L	0.035	2	0.045	0.03	1	18-20	-	8.0-13.0	-	485	170	28	20
	WP304H	0.04-0.10	2	0.045	0.03	1	18-20	-	8.0-11.0	-	515	205	28	20
	WP316	0.08	2	0.045	0.03	1	18-20	2.0-3.0	11.0-14.0	-	515	205	28	20
	WP316L	0.035	2	0.045	0.03	1	18-20	2.0-3.0	10.0-16.0	-	485	170	28	20
	WP321	0.08	2	0.045	0.03	1	17.0-20.0	-	9.0-13.0	Ti-0.05 max 0.75%	515	205	28	20
	WP321H	0.04-0.10	2	0.045	0.03	1	17.0-20.0	-	9.0-13.0	Ti-0.05 max 0.60%	515	205	28	20
	WP347	0.08	2	0.045	0.03	1	17.0-20.0	-	9.0-13.0	Cb-Ta=0.05-0.10% max 0.10%	515	205	28	20
	WP347H	0.04-0.10	2	0.045	0.03	1	17.0-20.0	-	9.0-13.0	Cb-Ta=0.05-0.10% max 0.10%	515	205	28	20
	WPS 31254	0.02	1	0.03	0.01	0.8	19.5-20.5	6.0-6.5	17.5-18.5	N-0.005-0.01 Cu-0.5-1.0	515	205	28	20
A815	S 31803	0.03	2	0.03	0.02	1	21.0-23.0	2.5-3.5	4.5-6.5	N-0.005-0.01	620	450	25	-
	WP410	0.15	1	0.04	0.03	1	11.5-13.5	-	0.5	-	485-655	205	20	-
B366	WPNIC10	0.06-0.10	1.5	-	0.015	1	19.0-23.0	-	30.0-35.0	Cu-0.75	450	170	30	-
	WPNIC11	0.06-0.10	1.5	-	0.015	1	19.0-23.0	-	30.0-35.0	Al-0.15-0.60 Ti-0.15-0.60 Nb-0.35-1.0% Al-Ti-0.85-1.30	450	170	30	-



Titanium alloys, Nickel alloys, Inconel alloys, Coupro nickel & Aluminium alloys are also available upon request.

For each reduction of 0.01% below the specified carbon max., an increase of 0.06% Mn above the specified max. will be permitted up to 1.35% max.

2) Relative to 10x10 specimen.

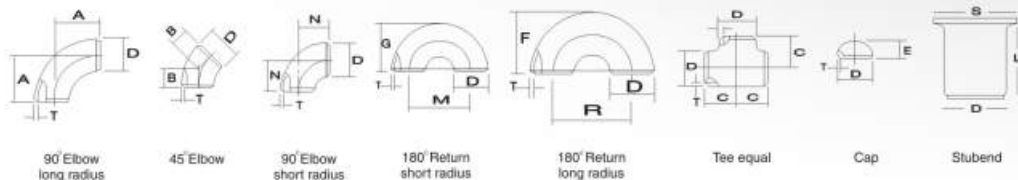


BUTT-WELD FITTINGS



RAJKAMAL METALS

BUTT WELDING PIPE FITTING DIMENSIONAL STANDARD ANSI B-16.9, B-16.28



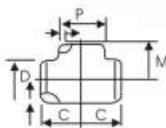
Nominal Pipe Size		Outside Diameter	Center to Face				Back to Face			Center to Center			Length 'L'	
Inch.	mm	D	A	B	C	N	E	F	G	R	M	S	L	L
1/2	15	21.3	38.00	16.0	25.0	—	25.0	48.0	—	76.0		35.0	50.8	76.2
3/4	20	26.7	29.00	11.0	29.0	—	25.0	43.0	—	57.0		43.0	50.8	76.2
1	25	33.4	38.00	22.0	38.0	25.0	38.0	56.0	41.0	76.0	51.0	51.0	50.8	101.6
1.1/4	32	42.2	48.00	25.0	48.0	32.0	38.0	70.0	52.0	95.0	64.0	64.0	50.8	101.6
1.1/2	40	48.3	57.15	29.0	57.0	38.0	38.0	83.0	62.0	114.0	76.0	73.0	50.8	101.6
2	50	60.3	76.00	35.0	64.0	51.0	38.0	106.0	81.0	152.0	102.0	93.0	63.5	152.4
2.1/2	65	73	95.25	44.0	76.0	64.0	38.0	132.0	100.0	191.0	127.0	105.0	63.5	152.4
3	80	88.9	114.30	51.0	86.0	76.0	51.0	159.0	121.0	229.0	152.0	127.0	63.5	152.4
3.1/2	90	101.6	133.35	57.0	95.0	89.0	64.0	184.0	140.0	267.0	178.0	140.0	76.2	152.4
4	100	114.3	152.0	63.0	105.0	102.0	64.0	210.0	159.0	305.0	203.0	157.0	76.2	152.4
5	125	141.3	190.0	79.0	123.0	127.0	76.0	262.0	197.0	381.0	254.0	186.0	76.2	203.2
6	150	168.3	229.0	95.0	143.0	152.0	89.0	313.0	237.0	457.0	305.0	216.0	88.9	203.2
8	200	219.1	305.0	127.0	178.0	203.0	102.0	414.0	313.0	610.0	406.0	270.0	101.6	203.2
10	250	273.1	381.0	159.0	216.0	254.0	127.0	515.0	391.0	762.0	508.0	324.0	127	254
12	300	323.9	457.0	190.0	254.0	303.0	152.0	619.0	467.0	914.0	610.0	381.0	152.4	254
14	350	355.6	533.0	222.0	279.0	356.0	165.0	711.0	533.0	1067.0	711.0	413.0	152.4	305.0
16	400	406.4	610.0	254.0	305.0	406.0	178.0	813.0	610.0	1219.0	813.0	470.0	152.4	305.0
18	450	457.2	686.0	286.0	343.0	457.0	203.0	914.0	686.0	1372.0	914.0	533.0	152.4	305.0
20	500	508	762.0	318.0	381.0	508.0	229.0	1016.0	762.0	1524.0	1016.0	584.0	152.4	305.0
22	550	559	838.0	343.0	419.0	559.0	254.0	1118.0	838.0	1676.0	1118.0	614.4	152.4	305.0
24	600	610	914.0	381.0	432.0	610.0	267.0	1219.0	914.0	1829.0	1219.0	692.0	152.4	305.0
26	650	660	991.0	406.0	495.0	660.0	267.0							
28	700	711	1067.0	438.0	521.0	771.0	267.0							
30	750	762	1143.0	470.0	589.0	762.0	267.0							
32	800	813	1219.0	502.0	597.0	813.0	267.0							
34	850	864	1295.0	533.0	635.0	864.0	267.0							
36	900	914	1372.0	565.0	673.0	914.0	267.0							



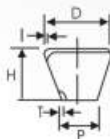
T = Wall Thickness



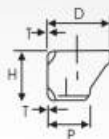
DIMENSIONS OF BUTT-WELDING FITTING ANSI B-16.9 / B-16.28



REDUCING TEES



CONCENTRIC REDUCERS



ECCENTRIC REDUCERS

Nominal Pipe Size		Outside Diameter		Center to End		Length
INCH	MM	D	P	C	M	H
1/2 x 3/8	15 x 10	21.3	17.1	25	25	-
1/2 x 1/4	15 x 8	21.3	13.7	25	25	-
3/4 x 1/2	20 x 15	26.7	21.3	29	29	38
3/4 x 3/8	20 x 10	26.7	17.1	29	29	38
1 x 3/4	25 x 20	33.4	26.7	38	38	51
1 x 1/2	25 x 15	33.4	21.3	38	38	51
1 1/4 x 1	32 x 25	42.2	33.4	48	48	51
1 1/4 x 3/4	32 x 20	42.2	26.7	48	48	51
1 1/4 x 1/2	32 x 15	42.2	21.3	48	48	51
1 1/2 x 1 1/4	40 x 32	48.3	42.2	57	57	64
1 1/2 x 1	40 x 25	48.3	33.4	57	57	64
1 1/2 x 3/4	40 x 20	48.3	26.7	57	57	64
1 1/2 x 1/2	40 x 15	48.3	21.3	57	57	64
2 x 1 1/2	50 x 40	60.3	48.3	64	60	76
2 x 1 1/4	50 x 32	60.3	42.2	64	57	76
2 x 1	50 x 25	60.3	33.4	64	51	76
2 x 3/4	50 x 20	60.3	26.7	64	44	76
2 1/2 x 2	65 x 50	73.0	60.3	76	70	89
2 1/2 x 1 1/2	65 x 40	73.0	48.3	76	67	89
2 1/2 x 1 1/4	65 x 32	73.0	42.2	76	64	89
2 1/2 x 1	65 x 25	73.0	33.4	76	57	89
3 x 2 1/2	80 x 65	88.9	73.0	86	83	89
3 x 2	80 x 50	88.9	60.3	86	76	89
3 x 1 1/2	80 x 40	88.9	48.3	86	73	89
3 x 1 1/4	80 x 32	88.9	42.2	86	70	89
4 x 3 1/2	100 x 90	114.3	101.6	105	102	102
4 x 3	100 x 80	114.3	88.9	105	98	102
4 x 2 1/2	100 x 65	114.3	73.0	105	95	102
4 x 2	100 x 50	114.3	60.3	105	89	102
4 x 1 1/2	100 x 40	114.3	48.3	105	86	102
5 x 4	125 x 100	141.3	114.3	124	117	127
5 x 3 1/2	125 x 90	141.3	101.6	124	114	127
5 x 3	125 x 80	141.3	88.9	124	111	127
5 x 2 1/2	125 x 65	141.3	73.0	124	108	127
5 x 2	125 x 50	141.3	60.3	124	105	127
6 x 5	150 x 125	168.3	141.3	143	137	140
6 x 4	150 x 100	168.3	114.3	143	130	140
6 x 3 1/2	150 x 90	168.3	101.6	143	127	140
6 x 3	150 x 80	168.3	88.9	143	124	140
6 x 2 1/2	150 x 65	168.3	73.0	143	121	140

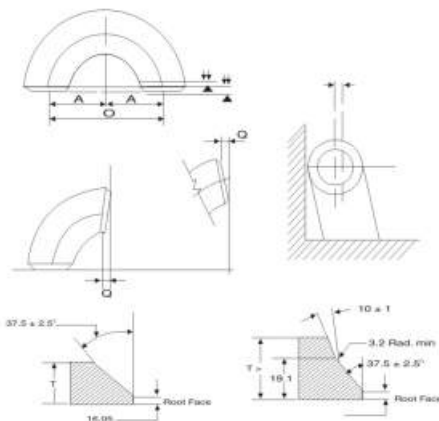
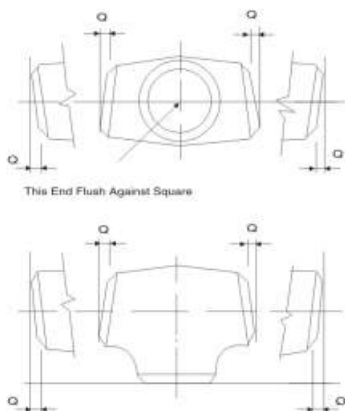
Nominal Pipe Size		Outside Diameter		Center to End		Length
INCH	MM	D	P	C	M	H
8 x 6	200 x 150	219.1	168.3	178	168	152
8 x 5	200 x 125	219.1	141.3	178	162	152
8 x 4	200 x 100	219.1	114.3	178	156	152
8 x 3 1/2	200 x 90	219.1	101.6	178	152	152
10 x 8	250 x 200	273.1	219.1	216	203	178
10 x 6	250 x 150	273.1	168.1	216	194	178
10 x 5	250 x 125	273.1	141.3	216	191	178
10 x 4	250 x 100	273.1	114.3	216	184	178
12 x 10	300 x 250	323.9	273.1	254	241	203
12 x 8	300 x 200	323.9	219.1	254	229	203
12 x 6	300 x 150	323.9	168.3	254	219	203
12 x 5	300 x 125	323.9	141.3	254	216	203
14 x 12	350 x 300	355.6	323.9	279	270	330
14 x 10	350 x 250	355.6	273.1	279	257	330
14 x 8	350 x 200	355.6	219.1	279	248	330
14 x 6	350 x 150	355.6	168.3	279	238	330
16 x 14	400 x 350	406.4	355.6	305	305	356
16 x 12	400 x 300	406.4	323.9	305	295	356
16 x 10	400 x 250	406.4	273.1	305	283	356
16 x 8	400 x 200	406.4	219.1	305	273	356
16 x 6	400 x 150	406.4	168.3	305	264	356
18 x 16	450 x 400	457.0	406.4	343	330	381
18 x 14	450 x 350	457.0	355.6	343	330	381
18 x 12	450 x 300	457.0	323.9	343	321	381
18 x 10	450 x 250	457.0	273.1	343	308	381
18 x 8	450 x 200	457.0	219.1	343	298	381
20 x 18	500 x 450	508.0	457.0	381	368	508
20 x 16	500 x 400	508.0	406.4	381	356	508
20 x 14	500 x 350	508.0	355.6	381	356	508
20 x 12	500 x 300	508.0	323.9	381	346	508
20 x 10	500 x 250	508.0	273.1	381	333	508
20 x 8	500 x 200	508.0	219.1	381	324	508
24 x 22	600 x 550	610.0	559.0	432	432	508
24 x 20	600 x 500	610.0	508.0	432	432	508
24 x 18	600 x 450	610.0	457.0	432	419	508
24 x 16	600 x 400	610.0	406.4	432	406	508
24 x 14	600 x 350	610.0	355.6	432	406	508
24 x 12	600 x 300	610.0	323.9	432	397	508
24 x 10	600 x 250	610.0	273.1	432	384	508

All Dimensions in Millimeters



DIMENSIONAL TOLERANCES AS PER ANSI B 16.9/B 16.28/ MSS SP-43 BUTT WELD FITTING

ALL FITTINGS				90°/60°/45° /30° ELBOWS & TEES		REDUCERS		180° RETURNS				CAPS		ANGULARITY TOLERANCE					
Nominal Pipe Size Inch/mm	Outside Diameter at Level	Inside Dia meter	Wall Thickness at End	Centre to End	Overall Length Dimensions	Centre to End	Back to Face Dimensions	Alignment of End Dimensions	Overall length	Nominal Pipe Size	Off Angle Inch/mm	Off Plane							
D		T		A,B,C,M		H		O		K		U		E		Q		P	
	(1) B16.9	MSS SP43	(2) B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP43	B16.9	MSS SP43		B16.9	MSS SP43	B16.9	
1/2" TO 21/2" 80 TO 90	±1.0		±0.8		FROM 1/2" TO 10" 15 TO 250	FROM 3/4"	FROM 1/2" TO 10" 15 TO 250	FROM 1/2" TO 8" 15 TO 200					±4	±3.17		1/2" TO 4" 15 TO 100	1		1
3" TO 3 1/2" 80 TO 90				±0.79													5" TO 8" 125 TO 200	2	
4" 100	+2 -1		±1.6		±2	±1.59	±2	±1.59	±7	±6.35	±7	±6.35	±1.0	±0.79		10" TO 12" 250 TO 300	3		5
5" TO 6" 125 TO 150	+3 -1	+1.59												±7	±6.35	14" TO 16" 350 TO 400	3	16" TO 24"	7
8" 200	±2	-0.79		Not Less Than	Not Less Than											16" TO 24" 450 TO 600	4	400 TO 600 1.6	10
10" TO 18" 250 TO 450	+4 -3	+2.38 -0.79	±3.2	87.5% Nominal Thk.	87.5% Nominal Thk.	FROM 12" TO 30" ±3 300 TO 750	±2.38	FROM 12" TO 30" ±3 300 TO 750	10" TO 24" ±2.38 250 TO 600		±10"	±9.53		±2.0"	±1.59	26" TO 30" 650 TO 750	5	26" TO 36" 650 TO	10
20" TO 24" 500 TO 600	+6 -5	3.17 0.79														32" TO 42" 800 TO 1050	5	900 2.4	13
26" TO 30" 550 TO 750	+7 -5		±4.8											±10		44" TO 48" 1100 TO 1200	5	38" TO 48"	20
32" TO 48" 800 TO 1200	+7 -5				±5											42" TO 48" 1050 TO 1200	±5	950 TO 1200 3.2	±20



1. Out of round is the sum of absolute values of plus and minus tolerance.
2. The inside diameter at ends and the nominal wall thickness are to be specified by the purchaser.
3. Out of roundness tolerances shall be the difference between the Max. dia measured on any radial cross-section.
4. All dimensions are in millimeters except nominal pipe sizes which are in inches.

WELDING BEVEL STANDARDS ANSI B 16.25

FORGED FITTINGS



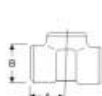
RAJKAMAL METALS

DIMENSION IN MM OF FORGED SCREWED & SOCKET WELD

90° ELBOWS



TEE



45° ELBOW



UNION



COUPLING



PIPE CAP



BUSHING



HEX HEAD PLUG

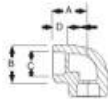


HALF COUPLING = G/2

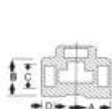
DIMENSION IN MM OF FORGED SCREWED FITTINGS TO ANSI B-16.11 THREADED TO ASA B 2.1

NOM BORE	PIPE O.D.	3000 L.B.S.							COMMON FACTORS							6000 L.B.S.						
		A	B	C	G	H	K	D	E	F	I	J	L	A	B	C	G	H	K			
1/8"	10.3	21	22	17	32	16	19	11	10	40	-	6	-	25	25	19	32	22	-			
1/4"	13.7	25	25	19	35	19	25	16	11	43	3	6	32	29	33	22	35	25	27			
3/8"	17.2	29	33	22	38	22	25	17.5	13	48	4	8	38	33	38	25	38	32	27			
1/2"	21.3	33	38	25	48	29	32	22	15	51	5	8	46	38	46	29	48	38	33			
3/4"	26.7	38	46	29	51	35	37	27	16	57	6	10	51	44	56	33	51	44	38			
1"	33.4	44	56	33	60	44	41	35	19	64	6	10	60	51	62	35	60	57	43			
1 1/4"	42.2	51	62	35	67	57	44	44.5	21	70	7	14	72	60	75	43	67	64	46			
1 1/2"	48.3	60	75	43	79	64	44	51	21	79	8	16	80	64	84	44	79	76	48			
2"	60.3	64	84	45	86	76	48	63.5	22	88	9	17	94	83	102	52	86	92	51			
2 1/2"	73.02	83	102	52	92	92	60	76	27	118	10	21	122	95	121	64	92	108	64			
3"	89.0	95	121	64	108	108	65	89	29	121	10	25	140	106	146	79	108	127	68			
4"	114.5	114	152	79	121	140	68	117.5	32	150	13	25	180	114	152	79	121	159	75			

90° ELBOWS



TEE



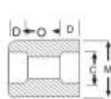
45° ELBOW



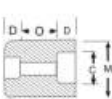
UNION



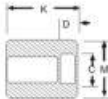
COUPLING



REDUCER



HALF COUPLING



CAP



SOCKET WELD FITTING TO ANSI B-16.11

NOM BORE	PIPE O.D.	3000 L.B.S.							COMMON FACTORS							6000 L.B.S.						
		A	B	K	J	L	M	N	P	Q	C	D	O	O	A	B	M	K	N			
1/8"	10.3	22	18.5	26	16	40	17.3	32	17.5	10	10.7	10	5	8	22	22	20	25	46			
1/4"	13.7	22	22	26	18	43	21.2	32	17.5	10	14.1	10	5	8	27	25	24	25	51			
3/8"	17.2	25	25	26	19	48	25.4	36	19	10	17.6	10	3	9	27	28	28	26	60			
1/2"	21.3	27	32	30	21	51	31	43	22	10	21.7	10	6	13	31	34	34	31	72			
3/4"	26.7	34	38	36	24	57	37	50	25	13	27	13	6	13	37	42	41	35	80			
1"	33.4	37	46	40	25	64	45.2	60	27	13	33.8	13	9	17	42	50	50	40	94			
1 1/4"	42.2	42	56	40	29	70	55	70	30	13	42.6	13	9	17	47	59	58	41	100			
1 1/2"	48.3	47	62	40	30	79	61.4	78	32	13	48.7	13	9	17	53	67	66	43	122			
2"	60.3	56	75	52	37	89	75	95	38	13	61.2	16	15	23	59	84	83	55				
2 1/2"	73.02	60	92	52	48	114	91.3	125	38	16	73.8	16	14	24		102		56				
3"	89.00	76	110	52	51	127	108.8	140	44	16	89.8	16	14	24		121		58				
4"	114.50	88	137	58		150	136.9		48	19	115.5	19	14	24		152		64				

DIMENSIONS AND OTHERS SPECIFICATIONS AS PER CUSTOMERS REQUIREMENTS ARE AVAILABLE ON REQUEST

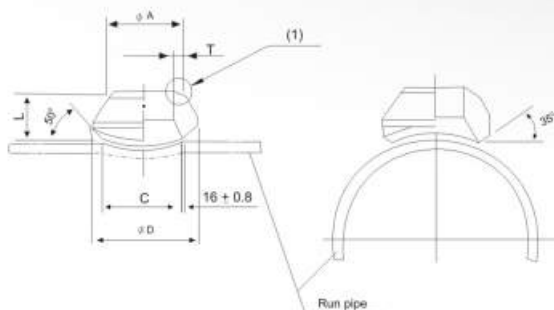


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WELDOLET - STANDARD & DIMENSION



Outlet Nominal Size	A	C			L			D			Weight kg		
		STD	S80 XS	XXS S160	STD	S80 XS	XXS S160	STD	S80 XS	XXS S160	STD	S80 XS	XXS S160
1/8	10.3	15.9	15.9		15.9	15.9		25.4	25.4		0.04	0.05	
1/4	13.7	15.9	15.9		15.9	15.9		25.4	25.4		0.04	0.05	
2/8	17.1	10.1	9.1		19.1	19.1		31.8	31.8		0.07	0.07	
1/2	21.3	23.8	23.8	14.3	19.1	19.1	28.6	34.9	34.9	34.9	0.08	0.09	0.11
3/4	26.7	30.2	30.2	19.1	22.2	22.2	31.8	44.5	44.5	44.5	0.11	0.14	0.32
1	33.5	36.5	36.5	25.4	27.0	27.0	38.1	54.0	54.0	50.8	0.23	0.21	0.38
1 1/4	42.2	44.5	44.5	33.3	31.8	31.8	44.5	65.1	65.1	61.9	0.36	0.41	0.57
1 1/2	43.3	50.8	50.8	38.1	33.3	33.3	50.8	73.0	73.0	69.9	0.45	0.50	0.79
2	60.5	65.1	65.1	42.9	38.1	38.1	55.6	88.9	88.9	81.0	0.79	0.79	0.97
2 1/2	73.2	76.2	76.2	54.0	41.3	41.3	61.9	103.2	103.2	96.8	1.13	1.18	1.53
3	88.9	93.7	93.7	73.0	44.5	44.5	73.0	122.2	122.2	120.7	1.81	1.86	2.87
1 1/2	101.6	101.6	101.6		47.0	47.6		142.9	136.5		2.49	2.54	
4	114.3	120.7	120.7	98.4	50.8	50.8	84.1	152.4	152.4	152.4	2.86	2.90	4.76
5	141.2	141.3	141.3	122.2	57.2	57.2	93.7	179.4	179.4	187.3	4.65	4.72	6.46
6	168.1	169.9	169.9	146.1	60.3	77.8	104.8	215.9	225.4	220.7	5.44	10.43	12.70
8	218.9	220.7	220.7		69.9	98.4		263.5	292.1		10.43	16.78	
10	273.0	274.6	265.1		77.8	93.7		322.3	323.9		16.33	20.90	
12	323.8	325.4	311.5		85.7	103.2		377.8	379.4		26.80	28.00	
14	355.6	357.2	350.9		88.9	100.0		409.6	431.8		30.00	32.00	
16	406.4	408.0	408.2		93.7	106.4		463.6	466.7		34.00	46.50	
18	457.2	458.8	458.6		96.8	111.1		520.7	523.9		44.00	59.00	
20	508.8	508.0	509.6		101.6	119.1		571.5	582.6		53.50	72.00	
24	609.6	614.4	614.4		115.9	139.7		689.0	708.0		99.80	131.50	
25	660.4	666.8	69.2		119.8	146.1		738.2	765.2		120.00	159.00	
30	701.2	(773.1)			136.5			(865.2)			(195.00)		

End Preparation shall be in accordance with ANSI B 16.9 etc.

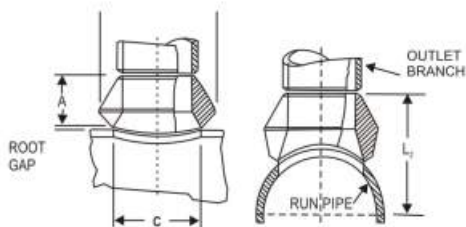


FORGED FITTINGS



RAJKAMAL METALS

REDUCING & FLAT SIZE EXTRA STRONG, RUN AND BRANCH FORGED



Outlet Size Inches	Dimensions (Inches)		
	A	B	C
1/8	5/8	1	5/8
1/4	5/8	1	5/8
3/8	3/4	1-1/4	3/4
1/2	3/4	1-3/8	1-5/16
3/4	7/8	1-3/4	1-3/16
1	1-1/16	2-1/8	1-7/16
1-1/4	1-1/4	2-9/16	1-3/4
1-1/2	1-5/16	2-7/8	2
2	1-1/2	3-1/2	2-9/16
2-1/2	1-5/8	4-1/16	3
3	1-3/4	4-13/16	3-11/16
3-1/2	1-7/8	5-3/8	4
4	2	6	4-3/4
5	2-1/4	7-1/16	5-9/16
6	3-1/16	8-7/8	6-11/16
8	3-7/8	11-1/2	8-11/16
10	3-11/16	12-3/4	10-7/16
12	4-1/16	14-15/16	12-1/2
14	3-15/16	17	13-13/16
16	4-3/16	18-3/8	15-7/8
18	4-3/8	20-3/8	17-15/16
20	4-11/16	22-15/16	20-1/16
24	5-1/2	27-7/8	24-3/16
26	5-3/4	30-1/8	27-1/4

30, 36 and larger sizes available on application.

SIZE ON SIZE EXTRA STRONG, RUN AND BRANCH FORGED

Each Outlet size listed is available to fit any run curvature.
Design per MSS-SP-97. BW ends per B16.9 and B16.25

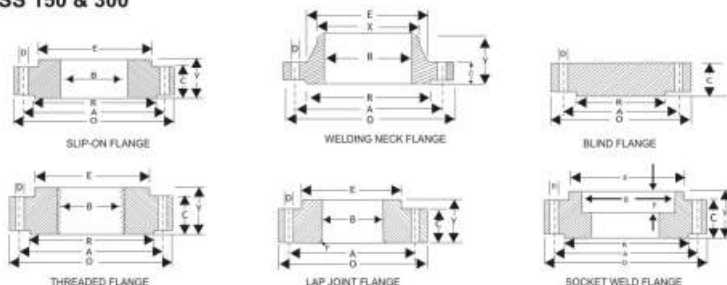
RUN PIPE SIZES Outlet sizes 6" and less fit a number of run sizes, and the fittings are marked accordingly.
See pages 54-55 for run pipe size combination table(s).

SCHEDULES Extra Stron fittings are the same as Schedule 80 through 8". Pipe schedule numbers and weight designation are in accordance with ASME B36.10 A Schedule 80 Weldolet for sizes 10" and larger is available. Dimensions and pr application

Outlet Size Inches	Dimensions (Inches)			
	A	B	C	D
1/2	3/4	1-3/8	1-5/16	5/8
3/4	7/8	1-5/8	1-3/16	1-3/16
1	1-1/16	2	1-7/16	1-1/32
1-1/4	1-1/4	2-7/16	1-3/4	1-3/8
1-1/2	1-5/16	2-7/8	2	1-5/8
2	1-1/2	3-1/2	2-9/16	2-1/16
2-1/2	1-5/8	4-1/16	3	2-7/16
3	1-3/4	4-13/16	3-11/16	3-1/16
3-1/2	2	5-3/8	3-7/8	3-9/16
4	2	6	4-3/4	4
5	2-1/4	7-1/8	5-9/16	5-1/16
6	3-1/16	8-7/8	6-11/16	6-1/16
8	3-7/8	10-5/8	8-11/16	7-5/8
10	3-3/4	12-7/8	10-7/16	9-3/4
12	3-15/16	15-3/16	13	11-3/4
14	4-1/8	16-11/16	14-5/16	13
16	4-7/16	18-7/8	16-1/2	15
18	4-11/16	21-1/8	18-5/8	17
20	5	23-3/8	20-13/16	16
24	5-1/2	27-7/8	25-1/8	23
26	5-3/4	30-1/8	27-1/4	25

30, 36 and larger sizes available on application.

FLANGES CLASS 150 & 300



DIMENSIONS OF CLASS 150 FLANGES AS PER B16.5

Nominal Pipe Size	Flange Dia O	Dia of Bolt Circle A	No. Of Bolt Holes D	No. Of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W Y	W/N Y	L/J Y	S/O & S/W B	L/J B			
15	88.9	60.3	15.9	4	11.1	30.2	15.9	47.6	15.9	22.3	22.9	34.9	9.5	21.33
20	98.4	69.8	15.9	4	12.7	38.1	15.9	52.4	15.9	27.7	28.2	42.9	11.1	26.67
25	107.9	79.4	15.9	4	14.3	49.2	17.5	55.6	17.5	34.5	35.0	50.8	12.7	33.40
32	117.5	88.9	15.9	4	15.9	58.7	20.6	57.1	20.6	43.2	43.7	63.5	14.3	42.16
40	127.0	98.4	15.9	4	17.5	65.1	22.2	61.9	22.2	49.5	50.0	73.0	15.9	48.26
50	152.4	120.6	19.0	4	19.0	77.8	25.4	63.5	25.4	62.0	62.5	92.1	17.5	60.31
65	177.8	139.7	19.0	4	22.2	90.5	28.6	69.8	28.6	74.7	75.4	104.8	19.0	73.02
80	190.5	152.4	19.0	4	23.8	107.9	30.2	69.8	30.2	90.7	91.4	127.0	20.6	88.90
100	226.6	190.5	19.0	8	23.8	134.9	33.3	76.2	33.3	116.1	116.8	157.2	23.8	114.30
125	254.0	215.9	22.2	8	23.8	163.5	36.5	88.9	36.5	143.8	144.5	185.7	23.8	141.30
150	279.4	241.3	22.2	8	25.4	192.1	39.7	88.9	39.7	170.7	171.4	215.9	27.0	168.27
200	342.9	298.4	22.2	8	28.6	246.1	44.4	101.6	44.4	221.5	222.2	269.9	31.7	219.07
250	406.4	361.9	25.4	12	30.2	304.8	49.2	101.6	49.2	276.3	277.4	323.8	33.3	273.05
300	482.6	431.8	25.4	12	31.8	365.1	55.6	114.3	55.6	327.1	328.2	381.0	39.7	323.85
350	533.4	476.2	28.6	12	34.9	400.0	57.1	127.0	79.4	359.1	360.2	412.7	41.3	355.60
400	596.9	539.7	28.6	16	36.5	457.2	63.5	127.0	87.3	410.5	411.2	469.9	44.4	406.40
450	635.0	577.8	31.7	16	39.7	504.8	68.3	139.7	96.8	461.8	463.4	533.4	49.2	457.20
500	698.5	635.0	31.7	20	42.9	558.8	73.0	144.5	103.2	513.1	514.3	584.2	54.0	508.00
600	812.8	749.3	34.9	20	47.6	663.6	82.5	152.4	111.1	615.9	615.9	692.1	63.5	609.60

DIMENSIONS OF CLASS 300 FLANGES AS PER B16.5

Nominal Pipe Size	Flange Dia O	Dia of Bolt Circle A	No. Of Bolt Holes D	No. Of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W Y	W/N Y	L/J Y	S/O & S/W B	L/J B			
15	95.2	66.7	15.9	4	14.3	38.1	22.2	52.4	22.2	22.3	22.9	34.9	9.5	21.33
20	117.5	82.5	19.0	4	15.9	47.6	25.4	57.1	25.4	27.7	28.2	42.9	11.1	26.67
25	123.8	88.9	19.0	4	17.5	54.0	27.0	61.9	27.0	34.5	35.0	50.8	12.7	33.40
32	133.3	98.4	19.0	4	19.0	63.5	27.0	65.1	27.0	43.2	43.7	63.5	14.3	42.16
40	155.6	114.3	22.2	4	20.6	69.8	30.2	68.3	30.2	49.5	50.0	73.0	15.9	48.26
50	165.1	127.0	19.0	8	22.2	84.1	33.3	69.8	33.3	62.0	62.5	92.1	17.5	60.31
65	190.5	149.2	22.2	8	25.4	100.0	38.1	76.2	38.1	74.7	75.4	104.8	19.0	73.02
80	209.5	168.3	22.2	8	28.6	117.5	42.9	79.4	42.9	90.7	91.4	127.0	20.6	88.90
100	254.0	200.0	22.2	8	31.8	146.0	47.6	85.7	47.6	116.1	116.8	157.2	23.8	114.30
125	279.4	234.9	22.2	8	34.9	177.8	50.8	98.4	50.8	143.8	144.5	185.7	-	141.30
150	317.5	269.9	22.2	12	36.5	206.4	52.4	98.4	52.4	170.7	171.4	215.9	-	168.27
200	381.0	330.2	25.4	12	41.3	260.3	61.9	111.1	61.9	221.5	222.2	269.9	-	219.07
250	444.5	387.3	28.6	16	47.6	320.7	66.7	117.5	95.2	276.3	277.4	323.8	-	273.05
300	520.7	450.8	31.7	16	50.8	374.6	73.0	130.2	101.6	327.1	328.2	381.0	-	323.85
350	584.2	514.3	31.7	20	54.0	425.4	76.2	142.9	111.1	359.1	360.2	412.7	-	355.60
400	647.7	571.5	34.9	20	57.2	482.6	82.5	146.0	120.6	410.5	411.2	469.9	-	406.40
450	711.2	628.5	34.9	24	60.3	533.4	88.9	158.7	130.2	461.8	463.4	533.4	-	457.20
500	774.7	685.8	34.9	24	63.5	587.4	95.2	161.9	139.7	513.1	514.3	584.2	-	508.00
600	914.4	812.8	41.3	24	69.8	701.7	106.4	168.3	152.4	615.9	615.9	692.1	-	609.60

Metric values are direct conversion from inches table of B16.5

Flanges except Lap Joint will be furnished with (1.6 mm) raised face, Which is included in "Thickness" (C) and Length Through Hub (Y).

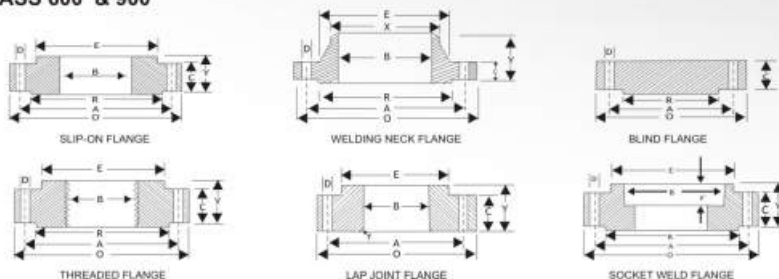


FLANGES



RAJKAMAL METALS

FLANGES CLASS 600 & 900



DIMENSIONS OF CLASS 600 FLANGES AS PER B 16.5

Nominal Pipe Size	Flange Dia O	Dia of Bolt Circle A	No. of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W Y	WN Y	L/J Y	S/O & S/W B	L/J B			
15	95.2	66.7	15.9	4	14.3	38.1	22.2	52.4	22.3	22.3	22.8	34.9	9.5	21.33
20	117.5	82.5	19.0	4	15.9	47.6	25.4	57.1	25.4	27.7	28.1	42.9	11.1	26.67
25	123.8	88.9	19.0	4	17.5	54.0	27.0	61.9	26.9	34.5	35.0	50.8	12.7	33.40
32	133.3	98.4	19.0	4	20.6	63.5	28.6	66.7	28.4	43.2	43.6	63.5	14.2	42.16
40	155.6	114.3	22.2	4	22.2	69.8	31.7	69.8	31.7	49.5	50.0	73.0	15.8	48.26
50	165.1	127.0	19.0	8	25.4	84.1	36.5	73.0	36.5	62.0	62.4	92.1	17.4	60.31
65	190.5	149.2	22.2	8	28.6	100.0	41.3	79.4	41.1	74.7	75.4	104.8	19.0	73.02
80	209.5	168.3	22.2	8	31.8	117.5	46.0	82.5	45.9	90.7	91.4	127.0	-	88.90
100	273.0	215.9	25.4	8	38.1	152.4	54.0	101.6	53.8	116.1	116.8	157.2	-	114.30
125	330.2	266.7	28.6	8	44.4	188.9	60.3	114.3	60.4	143.8	141.5	185.7	-	141.30
150	355.6	292.1	28.6	12	47.6	222.2	66.7	117.5	66.5	170.7	171.4	215.9	-	168.27
200	419.1	349.2	31.7	12	55.6	273.0	76.2	133.3	76.2	222.2	222.2	269.9	-	219.07
250	508.0	431.8	34.9	16	63.5	342.9	85.7	152.4	111.2	276.3	277.3	323.8	-	273.05
300	558.8	488.9	34.9	20	66.7	400.0	92.1	155.6	117.3	327.1	328.1	381.0	-	323.85
350	603.2	527.0	38.1	20	69.9	431.8	93.7	165.1	127.0	359.1	360.1	412.7	-	355.60
400	685.8	603.2	41.3	20	76.2	495.3	106.4	177.8	139.7	410.5	411.2	469.9	-	406.40
450	742.9	654.0	44.4	20	82.6	546.1	117.5	184.1	152.4	461.8	462.2	533.4	-	457.20
500	812.8	723.9	44.4	24	88.9	609.6	127.0	190.5	165.1	513.1	514.3	584.2	-	508.00
600	939.8	838.2	50.8	24	101.6	717.5	139.7	203.2	184.1	615.9	615.9	692.1	-	609.60

DIMENSIONS OF CLASS 900 FLANGES AS PER B 16.5

Nominal Pipe Size	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W Y	WN Y	L/J Y	S/O & S/W B	L/J B			
15	120.6	82.5	22.2	4	22.2	38.1	31.7	60.3	31.7	22.3	22.8	34.9	9.5	21.33
20	130.2	88.9	22.2	4	25.4	44.4	34.9	69.8	35.0	27.7	28.1	42.9	11.1	26.67
25	149.2	101.6	25.4	4	28.6	52.4	41.3	73.0	41.1	34.5	35.0	50.8	12.7	33.40
32	158.7	111.1	25.4	4	28.6	63.5	41.3	73.0	41.1	43.2	43.6	63.5	14.2	42.16
40	177.8	123.8	28.6	4	31.8	69.8	44.4	82.5	44.4	49.5	50.0	73.0	15.8	48.26
50	215.9	165.1	25.4	8	38.1	104.8	57.1	101.6	57.1	62.0	62.4	92.1	17.4	60.31
65	244.5	190.5	28.6	8	41.3	123.8	63.5	104.8	63.5	74.7	75.4	104.8	19.0	73.02
80	241.3	190.5	25.4	8	38.1	127.0	53.9	101.6	53.8	90.7	91.4	127.0	-	88.90
100	292.1	234.9	31.7	8	44.4	158.7	69.8	114.3	69.8	116.0	116.8	157.1	-	114.30
125	349.2	279.4	35.0	8	50.8	190.5	79.3	127.0	79.2	143.7	144.5	185.7	-	141.30
150	381.0	317.5	31.7	12	55.6	234.9	85.8	139.7	85.8	170.6	171.4	215.9	-	168.27
200	469.9	393.7	38.1	12	63.5	298.4	101.6	162.0	114.3	221.4	222.2	269.9	-	219.07
250	546.1	469.9	38.1	16	69.8	368.3	107.9	184.1	127.0	276.3	277.3	323.8	-	273.05
300	609.6	533.4	38.1	20	79.3	419.1	117.4	200.0	142.7	327.1	328.1	381.0	-	323.85

Metric values are direct conversion from inches table of B16.5

RF Thickness 6.3 mm Extra to be provided (Except Lap Joint Flange & FF Flanges).

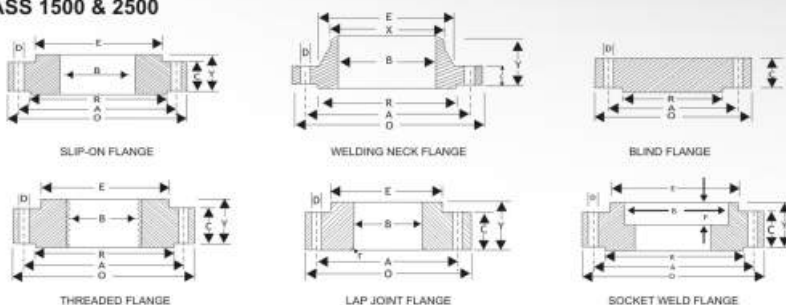


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FLANGES CLASS 1500 & 2500



DIMENSIONS OF CLASS 1500 FLANGES AS PER B16.5

Nominal Pipe Size	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. Of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W Y	WN Y	L/J Y	S/O & S/W B	L/J B			
15	120.6	82.5	22.2	4	22.2	38.1	31.7	60.3	31.7	22.3	22.8	34.9	9.5	21.33
20	130.2	88.9	22.2	4	25.4	44.4	34.9	69.8	34.9	27.7	28.1	42.9	11.1	26.67
25	149.2	101.6	25.4	4	28.6	52.4	41.3	73.0	41.3	34.5	35.0	50.8	12.7	33.40
32	158.7	111.1	25.4	4	28.6	63.5	41.3	73.0	41.3	43.2	43.6	63.5	14.2	42.16
40	177.8	123.8	28.6	4	31.8	69.8	44.4	82.5	44.4	49.5	50.0	73.0	15.8	48.26
50	215.9	165.1	25.4	8	38.1	104.8	57.1	101.6	57.1	62.0	62.0	92.1	17.4	60.31
65	244.5	190.5	28.6	8	41.3	123.8	63.5	104.8	63.5	74.7	75.4	104.8	19.0	73.02
80	266.7	203.2	31.7	8	47.6	133.3	73.0	117.5	73.0	90.7	91.4	127.0	-	88.90
100	311.1	241.3	34.9	8	54.0	161.9	90.5	123.0	90.4	116.1	116.8	157.2	-	114.30
125	374.6	292.1	41.3	8	73.0	196.8	104.8	155.6	104.8	143.8	144.5	185.7	-	141.30
150	393.7	317.5	38.1	12	82.6	228.6	119.1	171.4	119.1	170.7	171.4	215.9	-	168.27
200	482.6	393.7	44.4	12	92.1	292.1	142.9	212.7	142.8	221.5	222.2	269.9	-	219.07
250	584.2	482.6	50.8	12	107.9	368.3	158.7	254.0	177.8	276.3	277.3	323.8	-	273.05
300	673.1	571.5	54.0	16	123.8	450.8	181.0	285.5	218.9	327.1	328.1	381.0	-	323.85

DIMENSIONS OF CLASS 2500 FLANGES AS PER B16.5

Nominal Pipe Size	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. Of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W Y	WN Y	L/J Y	S/O & S/W B	L/J B			
15	133.3	88.9	22.2	4	30.2	42.9	39.7	73.0	39.7	22.3	22.3	34.9	-	21.33
20	139.7	95.2	22.2	4	31.7	50.8	42.9	79.4	42.9	27.7	27.7	42.9	-	26.67
25	158.7	107.9	25.4	4	34.9	57.1	47.7	88.9	47.7	34.5	34.5	50.8	-	33.40
32	184.1	130.2	28.6	4	38.1	73.0	52.4	95.2	52.4	43.2	43.2	63.5	-	42.16
40	203.2	146.0	31.7	4	44.4	79.4	60.3	111.1	60.3	49.5	49.5	73.0	-	48.26
50	234.9	171.4	28.6	8	50.8	95.2	69.8	127.0	69.8	62.4	62.0	92.1	-	60.31
65	266.7	196.8	31.7	8	57.1	114.3	79.4	142.9	79.4	74.7	74.7	104.8	-	73.02
80	304.8	228.6	34.9	8	66.7	133.3	92.1	168.3	92.1	90.7	90.7	127.0	-	88.90
100	355.6	273.0	41.3	8	76.2	165.1	107.9	190.5	107.9	116.1	116.1	157.2	-	114.30
125	419.1	323.8	47.6	8	92.1	203.2	130.0	228.6	130.0	143.8	143.8	185.7	-	141.30
150	482.6	368.3	54.0	8	107.9	234.9	152.4	273.0	152.4	170.7	170.7	215.9	-	168.27
200	552.4	438.1	54.0	12	127.0	304.8	177.8	317.5	177.8	221.5	221.5	269.9	-	219.07
250	673.1	538.7	66.7	12	165.1	374.6	228.6	419.1	228.6	276.3	276.3	323.8	-	273.05
300	782.0	619.1	73.0	12	184.1	441.3	254.0	463.5	254.0	327.1	327.1	381.0	-	323.85

Metric values are direct conversion from inches table of B16.5

RF Thickness 6.3 mm Extra to be provided (Except Lap Joint Flange & FF Flanges).



BRITISH STANDARD - 10

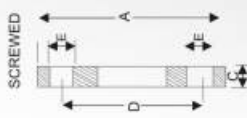
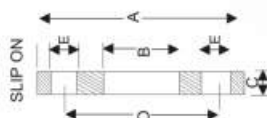


Table D : For Working steam pressure upto 50 lbs per sq. inch.

Nominal pipe size	O.D. of Pipe	Dia. of Flange	Dia. of Bolt Circle	No. of Bolt	Dia. of Bolt	Thickness
1/2"	27/32"	3 3/4"	2 5/8"	4	1/2"	3/16"
3/4"	1 1/16"	4"	2 7/8"	4	1/2"	3/16"
1"	1 11/32"	4 1/2"	3 1/4"	4	1/2"	3/16"
1 1/4"	1 11/16"	4 3/4"	3 7/16"	4	1/2"	1/4"
1 1/2"	1 28/32"	5 1/4"	3 7/8"	4	1/2"	1/4"
2"	2 3/8"	6"	4 1/2"	4	5/8"	5/16"
2 1/2"	3"	6 1/2"	5"	4	5/8"	5/16"
3"	3 1/2"	7 1/4"	5 3/4"	4	5/8"	3/8"
3 1/2"	4"	8"	6 1/2"	4	5/8"	3/8"
4"	4 1/2"	8 1/2"	7"	4	5/8"	3/8"
5"	5 1/2"	10"	8 1/4"	8	5/8"	1/2"
6"	6 1/2"	11"	9 1/4"	8	5/8"	1/2"
7"	7 1/2"	12"	10 1/4"	8	5/8"	1/2"
8"	8 5/8"	13 1/4"	11 1/2"	8	5/8"	1 1/2"
9"	9 5/8"	14 1/2"	12 3/4"	8	5/8"	5/8"
10"	10 3/4"	16"	14"	8	3/4"	5/8"
12"	12 3/4"	18"	16"	12	3/4"	5/8"
14"	14"	20 3/4"	18 1/2"	12	7/8"	3/4"
16"	16"	22 3/4"	20 1/2"	12	7/8"	3/4"
18"	18"	25 1/4"	23"	12	7/8"	7/8"
20"	20"	27 3/4"	25 1/4"	16	7/8"	1"
24"	24"	32 1/2"	29 3/4"	16	1"	1 1/8"

Table E : For Working steam pressure 50 lbs and upto 100 per sq. inch.

Nominal pipe size	Dia. of Flange	Dia. of Bolt Circle	No. of Bolt	Dia. of Bolt	Thickness
1/2"	3 3/4"	2 5/8"	4	1/2"	1/4"
3/4"	4"	2 7/8"	4	1/2"	1/4"
1"	4 1/2"	3 1/4"	4	1/2"	9/32"
1 1/4"	4 3/4"	3 7/16"	4	1/2"	5/16"
1 1/2"	5 1/4"	3 7/8"	4	1/2"	11/32"
2"	6"	4 1/2"	4	5/8"	3/8"
2 1/2"	6 1/2"	5"	4	5/8"	13/32"
3"	7 1/4"	5 3/4"	4	5/8"	7/16"
3 1/2"	8"	6 1/2"	8	5/8"	15/32"
4"	8 1/2"	7"	8	5/8"	1/2"
5"	10"	8 1/4"	8	5/8"	9/16"
6"	11"	9 1/4"	8	3/4"	11/16"
7"	12"	10 1/4"	8	3/4"	3/4"
8"	13 1/4"	11 1/2"	8	3/4"	3/4"
9"	14 1/2"	12 3/4"	12	3/4"	13/16"
10"	16"	14"	12	3/4"	7/8"
12"	18"	16"	12	7/8"	1"
14"	20 3/4"	18 1/2"	12	7/8"	1"
16"	22 3/4"	20 1/2"	12	7/8"	1"
18"	25 1/4"	23"	16	7/8"	1 1/8"
20"	27 3/4"	25 1/4"	16	7/8"	1 1/4"
24"	32 1/2"	29 3/4"	16	1 1/8"	1 1/2"

Table F : For Working steam pressure 100 lbs and upto 150 per sq. inch.

Nominal pipe size	O.D. of Pipe	Dia. of Bolt Circle	No. of Bolt	Dia. of Bolt	Thickness
1/2"	3 3/4"	2 5/8"	4	1/2"	3/8"
3/4"	4"	2 7/8"	4	1/2"	3/8"
1"	4 3/4"	3 7/16"	4	5/8"	3/8"
1 1/4"	5 1/4"	3 7/8"	4	5/8"	1/2"
1 1/2"	5 1/2"	4 1/8"	4	5/8"	1/2"
2"	6 1/2"	5"	4	5/8"	5/8"
2 1/2"	7 1/4"	5 3/4"	8	5/8"	5/8"
3"	8"	6 1/2"	8	5/8"	5/8"
3 1/2"	8 1/2"	7"	8	5/8"	3/4"
4"	9"	7 1/2"	8	5/8"	3/4"
5"	11"	9 1/4"	8	3/4"	7/8"
6"	12"	10 1/4"	12	3/4"	7/8"
7"	13 1/4"	11 1/2"	12	3/4"	7/8"
8"	14 1/2"	12 3/4"	12	3/4"	1"
9"	16"	14"	12	7/8"	1"
10"	17"	15"	12	7/8"	1"
12"	19 1/4"	17 1/4"	16	7/8"	1 1/8"
14"	21 3/4"	19 1/2"	16	1"	1 1/4"
16"	24"	21 3/4"	20	1"	1 1/4"
18"	26 1/2"	24"	20	1 1/8"	1 3/8"
20"	29"	26 1/2"	24	1 1/8"	1 1/2"
24"	33 1/2"	30 3/4"	24	1 1/4"	1 5/8"

Table H : For Working steam pressure 150 lbs and upto 250 per sq. inch.

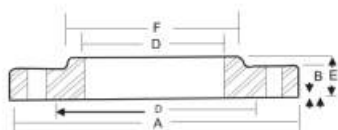
Nominal pipe size	Dia. of Flange	Dia. of Bolt Circle	No. of Bolt	Dia. of Bolt	Thickness
1/2"	4 1/2"	3 1/4"	4	5/8"	1/2"
3/4"	4 1/2"	3 1/4"	4	5/8"	1/2"
1"	4 3/4"	3 7/16"	4	5/8"	9/16"
1 1/4"	5 1/4"	3 7/8"	4	5/8"	11/16"
1 1/2"	5 1/2"	4 1/8"	4	5/8"	11/16"
2"	6 1/2"	5"	4	5/8"	3/4"
2 1/2"	7 1/4"	5 3/4"	8	5/8"	3/4"
3"	8"	6 1/2"	8	5/8"	7/8"
3 1/2"	8 1/2"	7"	8	5/8"	7/8"
4"	9"	7 1/2"	8	5/8"	1"
5"	11"	9 1/4"	8	3/4"	1 1/8"
6"	12"	10 1/4"	12	3/4"	1 1/8"
7"	13 1/4"	11 1/2"	12	3/4"	1 1/4"
8"	14 1/2"	12 3/4"	12	3/4"	1 1/4"
9"	16"	14"	12	7/8"	1 3/8"
10"	17"	15"	12	7/8"	1 3/8"
12"	19 1/4"	17 1/4"	16	7/8"	1 1/2"
14"	21 3/4"	19 1/2"	16	1"	1 5/8"
16"	24"	21 3/4"	20	1"	1 3/4"
18"	26 1/2"	24"	20	1 1/8"	1 7/8"
20"	29"	26 1/2"	24	1 1/8"	2"
24"	33 1/2"	30 3/4"	24	1 1/4"	2 1/4"

DIMENSIONAL TOLERANCES FOR FORGED STEEL FLANGES

Outside Diameter (A)	When O.D. is 24" or less When O. D is over 24"	$\pm 1/16^{**}$ $\pm 1/8^{**}$	Outside Dia. of Hub (F)	12" and smaller Over 12"	$+3/32^{**}-1/16^{**}$ $\pm 1/8^{**}$
Inside Diameter (D)	Threaded Slip on and Lap Joint	Within limits on Boring gauge 10" and smaller $+ 1/32", -0"$ 12" and larger $+ 1/16"-0"$	Drilling	Bolt Circle Bolt hole spacing Eccentricity between 2 1/2" and smaller bolt circle diameter and machined facing Diameter	$\pm 1/16^{**}$ $\pm 1/32^{**}$ 1/32" Max. 3" and larger 1/16" Max.
Diameter of Contact Face (C)	1/4 Raised Face, Tongue and Groove of male and Female	$\pm 1/64^{**}$	Height (E) Thickness (E)	On flanges larger than 13" 13" and smaller Over 18"	$+3/15^{**}-1/16^{**}$ 41/8"-0" $+ 3/16"-0"$
Diameter of Counter bore	Same as for inside diameter			Where allowance has been left On face for finish: All sizes	$+ 1/8^{**}-1/16^{**}$

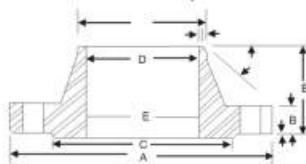
Outside Diameter (A)	When O. D. is 24: or less When O. D. is over 24"	$\pm 1/16^{**}$ $\pm 1/8^{**}$	Drilling	Bolt Circle Bolt hole spacing Eccentricity between 1/2" and smaller 2 1/2" and	$\pm 1/16^{**}$ $\pm 1/32^{**}$
smaller inside Diameter (D)	10" and smaller 12" to 18" Over 18"	$\pm 1/32^{**}$ $\pm 1/16$ $+ 1/8-1/16^{**}$	Width of Land	bolt circle diameter and machined facing diameter All sizes	1/32" max 3" and larger 1/16" max $\pm 1/32^{**}$
Diameter of Contact Face (C)	1/16" Raised Face 1/4" Raised face, Tongue and Groove, or Male and Female	$\pm 1/32^{**}$ $\pm 1/64^{**}$	Angle of Hub Bevel	All Sizes 18" and smaller	$\pm 2 1/2^{**}$ $\pm 1/16$
Diameter of Hub at Point of Welding (G)	5" and smaller 5" and larger	$+3/32"-1/32^{**}$ $+5/32"-1/32$	Overall Height (E) Thickness (E)	12" and larger $\pm$ 10" and smaller Over 18"	$\pm 1/8^{**}$ $+ 1/8"-0"$ $+ 3/16"-0"$
Diameter of Hub at Base (F)	When "F" is 24" and smaller When "F" is over 24"	$\pm 1/8^{**}$ $\pm 1/8$		Where allowance has been left on face for Finish, All size	$+1/8^{**}-1/16^{**}$

Threaded, lap joint, slip-on and Blind Flanges
ANSI B 16.5

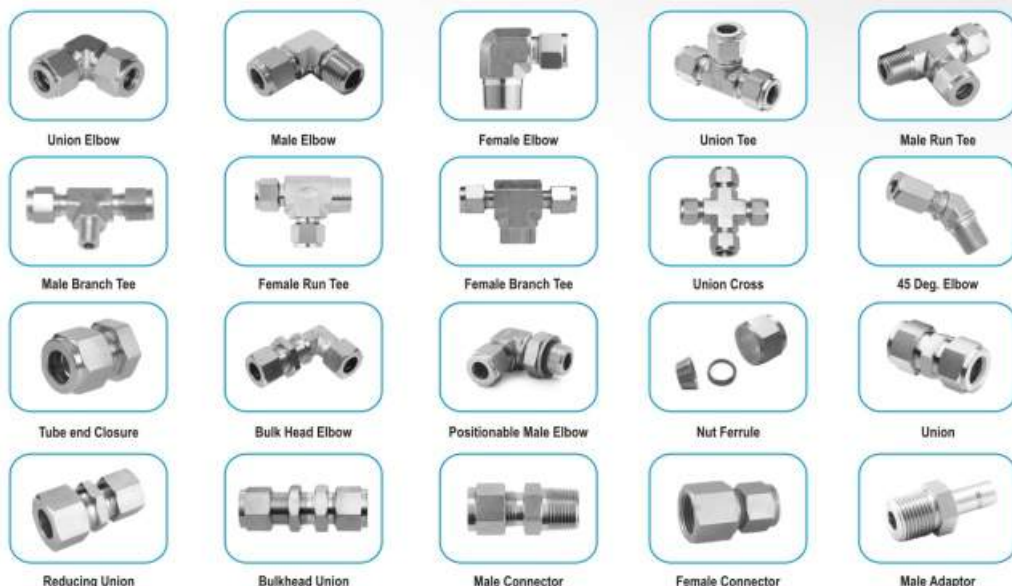


Welding neck flanges
ANSI B 16.5

This tolerance not covered by ANSI B 16.5



S. S. INSTRUMENTAL FERRULE FITTINGS



Syphon Tubes



- Type : Stainless Steel 304 & 316 Gr. in U type, Trumpet Type (Pigtail & Coil Type)
- Application : Connected between the pressure gauge & process in applications where high temperature above 65 Deg C for e.g., stream. These Syphon Tubes acts as a cooling coil and protects the gauge from high temperature vapors.

S. S. Tee / Elbow Ferrule Fittings

- S.S. Union Tee
- S.S. Male Branch Tee
- S.S. Female Branch Tee
- S.S. Male Elbow
- S.S. Cross
- S.S. Valve Body
- S.S. Union
- S.S. Union Tee
- S.S. Male Branch Tee
- S.S. Female Branch Tee
- S.S. Male Elbow
- S.S. Cross
- S.S. Valve Body
- S.S. Union

S.S. Forged Tee / Elbow / Cross

S.S. FORGED BLIND HEX TEE



S.S. FORGED BLIND HEX ELBOW



S.S. ELBOW 45 DEGREE



S.S. CROSS



9.5MM A/F (E)	22MM /AF(E)	12.5MM A/F (E)	24MM A/F (M)	14.2MM A/F
12.5MM A/F (E)	22MM A/F (M)	14MM A/F (M)	SIZE : 24MM A/F NPT	17MM A/F
14MM A/F (E)	22MM A/F NPT	14MM A/F EXTRA LONG	SIZE : 24MM A/F (E)	22MM A/F
14MM A/F EXTRA LONG	24MM A/F (E)	15MM A/F (M)	27MM A/F (E)	14MM A/F
15MM A/F (E)	27MM A/F (E)	16MM A/F NPT	27MM A/F (M)	15.5MM A/F
16MM A/F (M)	27MM A/F (M)	17.5MM A/F(M)	27MM A/F NPT	20.5MM A/F
16MM A/F NPT	27MM A/F NPT	19MM A/F NPT	32MM A/F (E)	Sizes
17MM A/F(E)	32MM A/F (E)	19MM A/F (M)	36MM A/F (M)	
19MM A/F (E)	36MM A/F (E)	20.5MM A/F(E)	36MM A/F NPT	
19MM A/F NPT	36MM A/F (M)	22MM A/F (M)	SIZE : 12.5MM A/F R/S	
20.5MM A/F(E)	41MM A/F (E)	22MM A/F EXTRA LONG	SIZE : 22MM A/F R/S	





DUPLEX & SUPER DUPLEX STEEL

UNS number Duplex Grades	Type ¹	C	Mn	P	S	Si	Cr	Ni	Mo	N	Cu	Other
S31803	-	0.030	2.00	0.030	0.020	1.00	21.0 - 23.0	4.5 - 6.5	2.5 - 3.5	0.08 - 0.20	-	-
S32205	2205	0.030	2.00	0.030	0.020	1.00	19.5 - 21.5	4.5 - 6.5	3.0 - 3.5	0.14 - 0.20	-	-
S32550	255	0.04	1.50	0.040	0.030	1.00	24.0 - 27.0	4.5 - 6.5	2.9 - 3.9	0.10 - 0.25	1.5 - 2.5	-
S32750	2507	0.030	1.20	0.035	0.020	0.80	24.0 - 26.0	6.0 - 8.0	3.0 - 5.0	0.24 - 0.32	0.50	-
S32760	-	0.030	1.00	0.030	0.010	1.00	24.0 - 26.0	6.0 - 8.0	3.0 - 4.0	0.20 - 0.30	0.50 - 1.00	-
S32900	329 ²	0.06	1.00	0.040	0.030	0.75	23.0 - 28.0	2.5 - 5.0	1.0 - 2.0	-	-	-

Duplex Stainless Steel and their characteristics

Duplex Stainless steels were developed more than 70 years ago in Sweden for use in the sulfite paper industry. Duplex alloys were originally created to combat corrosion problems caused by chloride-bearing cooling waters and other aggressive chemical process fluids.

Called Duplex because of its mixed microstructure with about equal proportions of ferrite and austenite, duplex stainless steels are a family of grades, which range in corrosion performance depending on their alloy content. The chemical composition based on high contents of Cr and Mo improves intergranular and pitting corrosion resistance respectively. Additions of nitrogen can promote structural hardening by interstitial solid solution mechanism, which raises the yield strength and ultimate strength values without impairing toughness. Moreover, the two-phase microstructure guarantees higher resistance to pitting and stress corrosion cracking in comparison with conventional stainless steels.

Coinciding with the 1970's development of offshore gas and oilfields in the North Sea, a second-generation Duplex was introduced and quickly became the duplex steel of choice. With deliberate addition of nitrogen as an alloying agent, both improved toughness in the heat-affected zones of welds and excellent chloride corrosion resistance was achieved thus quickly becoming the workhorse of stainless steels, accounting for more than 80% of duplex use. Its popularity is also cost-based as the replacement of the nickel content with the less-expensive addition of nitrogen.

Duplex alloys are essentially a compromise possessing some of the ferritic stress corrosion cracking resistance and much of the superior formability of the common austenitic stainless alloys at a cost saving over the high nickel alloys.

BENEFITS

- High strength,
- High resistance to pitting, crevice corrosion resistance.
- High resistance to stress corrosion cracking, corrosion fatigue and erosion.
- Good sulfide stress corrosion resistance,
- Low thermal expansion and higher heat conductivity than austenitic steels,
- Good workability and weldability.
- High energy absorption.

APPLICATIONS

Heat exchangers, tubes and pipes for production and handling of gas and oil,

Heat exchangers and pipes in desalination plants,

Pressure vessels, pipes, tank and heat exchangers for processing and transport of various chemicals,

Pressure vessels, tanks and pipes in process industries handling solutions containing chlorides,

Rotors, fans, shafts and press rolls where the high corrosion fatigue strength can be utilized,

Cargo tanks, piping and welding consumables for chemical tankers.



ALUMINUM ALLOY : ALLOY EQUIVALENT (APPROX.)

INDIA		U.S.A. (A.A.)	Britain (B.S.)	Canada	Germany (DIN)	Russia	I.S.O	French ND
New IS	Old IS							
19501	1E	1350 (E.C)	1E	C 1S	E-A1-99.5	—	—	—
19500	1B	1050	1B	1S	A1-99.5	—	A1-99.5	1050A
19600	—	1060	—	—	—	—	—	—
19700	—	1070	—	—	A1-99.7	—	A1-99.7	—
19800	1A	1080	1A	—	—	—	A1-99.8	—
19000	1C	1100	1C	2S	A1-99.0	AD	A1-99.0	1200
—	—	2011	FC1	28S	A1-Cu-BiPb	—	A1-Cu-6BiPb	2011
24345	H15	2014	H15	B26S	A1-Cu-Si	AK	—	—
24534	H14	2017	H14	17S/16S	—	D1	A1-Cu-4MgSi	—
—	—	2024	—	24S	A1-Cu Mg 2	—	A1-Cu4Mn1	2024
31000	N3	3003	N3	3S	A1-Mn	A-Mn	A1-Mn1	3003
43000	N21	4043	N21	33S	A1-Si-5	AK	A1-Si5	4043
46000	N2	4047	N2	35S	—	—	—	—
51000A	—	5005	—	B57S	—	—	A1-Mg-1	—
52000	N4	5052	N4	M57S	A1-Mg.2	A-Mg	A1-Mg-2	5051
53000	N5	5086	N5	54S	—	A-Mg-3	A1-Mg-23.5	—
54300	N8	5083	N8	D54S	A1-Mg-4.5Mn	—	A1-Mg-4.5Mn	5083
55000	N6	5056	N6	A56S	A1-Mg-5	—	A1-Mg-5	5356
65032	H20	6061	H20	66S	A1-Mg Si Cu	—	Al-Mg-1Si Cu	—
63400	H9	6063	H9	50S	A1-Mg Si 0.5	—	A1-Mg-Si	—
64430	H30	6351	H30	B51S	A1-Mg Si 1	AV	A1-Si-1Mg	6081
64423	H11	6066	H11	C62S	—	—	—	—
62400	—	6005	—	C51S	—	—	—	—
63401	91E	6101	91E	D50S	E.A.1. Mg Si 0.5	—	—	—
64401	—	6201	—	—	—	—	—	—
74530	—	7039	—	D74S	A1-Zn-Mg.1	—	—	3004
—	—	7075	DTD5124	75S	Al-Zn-Mg Cu 1.5	—	A1-Zn 6 Mg Cu	7075

ALUMINIUM ALLOY : CHEMICAL COMPOSITION STD. (Per Cent)

Alloy (ISS) Old	Equivalent alloy (A.A.)		Copper		Magnesium		Silicon		Iron	Manganese		*Other (total)	Remark
	New	U.S.A.	Min.	Max.	Min.	Max.	Min.	Max.					
1B	19500	1050	—	0.05	—	—	—	0.30	0.4	—	0.05	0.1	Aluminium 99.5% Min.
1 E	19501	1050(EC)	—	0.04	—	—	—	0.15	0.35	—	—	0.1	Aluminium 99.5% Min.
—	19700	1070	—	0.03	—	—	—	0.20	0.25	—	0.03	0.1	Aluminium 99.7% Min.
1 A	19800	1080	—	0.03	—	—	—	0.15	0.15	—	0.03	0.1	Aluminium 99.8% Min.
1 C	19900	1100	—	0.1	—	0.2	—	0.50	0.7	—	0.1	0.2	Aluminium 99.0% Min.
—	—	2011	5.0	6.0	—	0.1	—	0.4	0.7	—	0.1	0.4	Also lead & bismuth - 0.2 - 0.6% each
H 15	24345	2014	3.8	5.0	0.2	0.8	0.5	1.2	0.7	0.3	1.2	0.5	—
H 14	24534	2017	3.5	4.7	0.4	1.2	0.2	0.7	0.7	0.4	1.2	0.5	—
N 3	31000	3003	—	0.1	—	0.1	—	0.6	0.7	0.8	1.5	0.4	—
N 21	43000	4043	—	0.1	—	0.2	4.5	6.0	0.6	—	0.5	0.5	—
N 2	46000	4047	—	0.1	—	0.2	10.0	13.0	0.6	—	0.5	0.5	—
N 4	52000	5052	—	0.1	1.7	2.6	—	0.6	0.7	—	0.5	0.4	—
N 5	53000	5086	—	0.1	2.8	4.0	—	0.6	0.7	—	0.5	0.4	—
N 6	55000	5056	—	0.1	4.5	5.0	—	0.6	0.7	—	1.01	0.4	Chromium upto 0.25
N 8	54300	5083	—	0.1	4.0	4.9	—	0.4	0.7	0.5	1.0	0.4	Chromium upto 0.25
H 20	65032	6061	0.15	0.4	0.8	1.2	0.4	0.8	0.7	0.2	0.8	0.4	Chromium (0.15 - 0.35) Either Mn, Cr Shall be present.
H 9	63400	6063	—	0.1	0.4	0.9	0.3	0.7	0.6	—	0.3	0.4	—
—	—	6066	0.7	1.2	0.8	1.4	0.9	1.8	0.7	0.6	1.1	0.4	—
—	84423	—	0.5	1.0	0.5	1.3	0.7	1.3	0.8	1.0	—	—	—
91 E	63401	6101	—	0.1	0.35	0.8	0.3	0.7	0.5	—	0.03	0.1	—
—	64401	6201	—	0.1	0.6	0.9	0.5	0.9	0.5	—	0.03	0.1	—
H 30	64430	6351	—	0.1	0.4	1.2	0.6	1.3	0.6	0.4	1.0	0.4	—
—	74530	7039	—	0.2	1.0	1.5	—	0.4	0.7	0.2	0.7	0.4	Zinc (4 - 5%)
—	—	7075	1.20	2.0	2.1	2.9	—	0.4	0.5	—	0.3	0.5	Zinc (5.1 - 6.4) & Chromium (0.1 - 0.25)

Titanium and/or other grain refining elements

Either Mn or Cr Shall be present



ALLOYS : GUIDE TO SELECTION

Alloy	Temper	Resistance to Corrosion	Workability (Cold)	Machinability	Brazability	Weldability	Commonly available forms	Indications of use
EC/1050, 1060 (1B) (19501) (19500) (19600)	F, O	A	A	D	A	A	Flats, Rods, Tubes & Other Section	Electrical conductors, cable sheathing, impact-extruded Products, pressing utilities of anodizing quality, pen caps, piping etc.
1100 (1C) (19000)	F, O	A	A	D	A	A	Flats, Rods, Tubes & Other Section	Packaging lightly stresses and decorative assemblies in architecture and transport, equipment for chemical, food and brewing industries.
2014 (H 15) (24345)	T4 T6	C C	C D	B B	D D	C C	Rods & Bars Rods & Bars	Highly stressed component of all types in aircraft, ordnance and general engineering.
2017 (H 14) (24345)	T4	C	C	B	D	C	Rods & Bars	Highly stressed parts in aircraft and other structures, screw machine products.
2024	T4	C	C	B	D	C	Rods & Bars	Load Cell, Highly Stressed component of all types in aircraft, ordnance and general engineering.
4043 (N 21) (43000)	F, O	A	A	D	A	A	Rods & other sections	Welding wire, architectural applications
5005 (52000A)	O, F	A	A	D	B	A	Flats, Rods, other sections	Structures exposed to marine attractive anodized finish, architectural, electrical conductors etc.
5052 (N 4)	O, F	A	A	D	C	A	Flats, Rods, Tubes & other sections	Structures exposed to marine atmosphere, aircraft parts, wire rope ferrules, rivet stock.
5086 (N 5) (53000)	O, F	A	A	D	C	A	Flats, Rods & other sections	Ship building and other marine applications, rivets, coinage etc.
5086 (N 6) (55000)	O, F	A	A	D	C	A	Rods	Zips, Welding Rods and Rivets.
6061 (H 20) (65032)	O, F T4 T6	A A A	A C D	D C C	A A A	A A A	Rods, Flats, Tubes & other sections	Heavy duty structures, building hardware, sections for bus body, truck and rail coach, furniture, rivets etc.
6063 (H9)	O, F T4 T6 T5	A A A A	A B C C	D C C C	A A A A	A A A A	Rods, Flats, Tubes & other sections	Building hardware, architectural section with good surface finish, medium strength furniture and anodized sections.
6066 (22450)	O, F T4 T6	B B B	B B C	D B B	A A A	A A A	Rods and other solid sections	For welded structures, textile parts, heavy duty machine parts.
6101 (91 E) (63401)	T4 T6	A A	B B	C C	A A	A A	Rods, Flats, Tubes & other sections	High strength electrical busbar sections.
6201 (64401)	T4	A	A	C	A	A	Redraw Rod	Overhead conductors, ACAR and AAAC
6351 (H 30) (6430)	O, F T4 T6	A A A	A C D	D C C	A A A	A A A	Rods, Flats, Tubes & other sections	Structural and general engineering items such as rail & road transport vehicles, bridges, cranes, roof trusses, rivets etc.
7039 (D74S) (74530)	O, F T4 T6	A A A	A C D	D C C	A A A	A A A	Flats, Tubes, Rods & other sections	Defence structures like mobile bridges etc. Tread and chequered plates, Excellent welding property with no loss of strength in welded zone.
7075 (DTD5124)	O, F T4 T6	A A A	A A D	A A A	A A A	A A A	Rods	Highly Stressed structural applications

Notes:

- Relative ratings for corrosion, workability and machinability in decreasing order of merit A, B, C and D.
- Weldability & brazability ratings A, B, C and D are relative ratings defined as follows :
A. Generally weldable by the commercial procedure & methods.
B. Weldable with special technique.
- Weldability & brazability ratings A, B, C and D are relative ratings defined as follows :
C. Limited weldability due to crack sensitivity or loss in corrosion resistance and mechanical properties.
D. Generally not weldable.
- Availability of other forms subject to special enquiries and methods.



SUMMARY OF SPECIFICATIONS FOR BRASS BARS, RODS AND SECTIONS

SPECIFICATION			COMPOSITION							PROPERTIES		
Material Designation	Original	Near equivalent	Cu %	Zn	Pb.	Sn.	Fe.	Min.	Al	Other elements	U. TS. Min Kgs/mm	Elongation Min %
1. Free Cutting Brass	BS 2874 C2.124	—	60 to 63	Remainder	2.5 to 3.7	—	—	—	—	—	28	12
2. Free Cutting Brass	BS 2874 CZ121	IS.319	55 to 60	Remainder	2.0 to 3.5	—	—	—	—	—	39	15
3. Lead Brass	Din 1756 MS 58	—	56.5-59.5	Remainder	1.0 to 3	—	—	—	—	—	39.50	9.15
4. Forging Brass	IS 3488.66	BS218/63	56.5-60	Remainder	1.0 to 2.5	—	—	—	—	—	35	25
5. Lead Free Brass	BS 2874 CZ 109	BS 1949	59 to 60	Remainder	—	—	—	—	—	—	34	26
6. High Tensile Brass Rods	BS 2874 CZ 114	BS 250	56 to 60	Remainder	—	.2-1	.25-1.2	3.2	1.5 min	—	47	18
7. High Tensile Brass Rods	BS 2874 CZ 115	BS 1001	56 to 60	Remainder	.5 to 1.5	.6-1.1	.25-1.2	3.2	2 min	—	55	12
8. High Tensile Brass Rods	IS 320/1962	—	56 to 59	Remainder	.5	.25-1.75	—	2.20	.2 min	.5 min	53	15
9. Naval Brass	Alloy I	—	56 to 59	Remainder	.5	0.5 min	—	0.5-1.2	.2-1.2	.25 min	47	20
	Alloy II	—	57 to 61	Remainder	.75 to 1	1.0 min	—	0.1-0.2	.5-2	.5 min	53	15
	Alloy III	—	61 to 64	Remainder	—	1 to 1.5	—	—	—	—	35	18
10. Naval Brass	IS 291/1961 Grade I	BS 2872 CZ 112 BS 251/63	59 to 62	Remainder	.5 to 1	.5 to	—	—	—	—	35	16
11. Aluminium Bronze	BS 2874 CA 103	BS 2032	Remainder	—	—	—	—	—	8.8-10	Iron + 4% max Nickel	53	34
12. Aluminium Bronze	BS 2874 CA 104	BS 2033	Remainder	—	—	—	4.6%	0.5	8.5-11%	Nickel 4-6%	71 min	12 min
13. Aluminium Silicon Bronze	ASTM B 283/56	—	89%	—	—	—	—	—	6.5 to .8	Sill 1.5-3%	67 min	25 min
14. Maganese Bronze	ASTM B-138/58 Alloy A Alloy B	—	57.60 63.68	Remainder	—	0.5-1.5 0.5 max	8.2 2.4	05.5 2.5.5	0.25 max 3.6	—	53 80	25 10
15. Copper Nickel Alloy	ASTM B-411 64	—	Remainder	0.5% max	1% max	—	0.1%	—	—	Ni 1.6-2.2 Sil. 0.4-08	63	8
16. Nickel Silver Alloy	BS 2874 NS 101	—	44.47	Remainder	1.2.5	—	0.40% max	0.20.50	—	Ni.9.0-11.0	47	8 min
17. Electrolytic Tough Pitch	BS 2874 C101	—	99.9% min	—	0.005%	—	—	—	—	Impurities 0.03%	23-35	5.5-6%

TOLERANCES ON MEAN OUTSIDE DIAMETER

Outside Specified	Tolerance	
	Normal	Reduced
mm	mm	mm
	±	±
Up to 10	0.08	0.045
Over 10 to 18	0.10	0.045
Over -18 to 32	0.12	0.055
Over -32 to 50	0.15	0.070



Chemical Compositions (% by weight)									Density		Nominal room-temperature mechanical properties (Annealed material unless noted)					
Designation	UNS	Werkstoff	Ni	Cr	Mo	Fe	Cu	Other	lb/in ³	g/cm ³	Tensile strength		0.2% yield strength		Elongation	Hardness
											ksi	MPa	ksi	MPa	%	Brinell
Nickel 200	N02200	2.4060	99.6					C 0.04	0.321	8.89	65	448	30	207	45	110
Nickel 201	N02201	2.4081	99.6					C 0.02 max.	0.321	8.89	60	414	35	241	50	100
MONEL alloy 400	N04400	2.4360	65.1			1.6	32.0	Mn 1.1	0.318	8.80	80	552	40	276	45	140
MONEL alloy K-500	N05500	2.4375	64.7			1.0	30.2	Al 2.7, Ti 0.6	0.305	8.44	155	1069	100	689	25	310
INCONEL alloy 600	N06600	2.4816	76.0	15.0		8.0			0.306	8.47	100	689	50	345	40	170
INCONEL alloy 622	N06022	2.4602	59.0	20.5	14.2	2.3		W 3.2	0.311	8.61	115	793	55	379	60	170
INCONEL alloys 625	N06625	2.4856	61.0	21.5	9.0	2.5		Nb 3.6	0.305	8.44	125	862	62	448	50	200
INCONEL alloys 625CF									0.305	8.44	130	896	70	483	50	255
INCONEL alloy 686	N06686	2.4606	58.0	20.5	16.3	<1.0		W 3.8	0.315	8.73	110	758	55	379	60	180
INCONEL alloy 690	N06690	2.4642	61.5	29.0		9.0			0.296	8.19	100	689	50	345	45	170
INCONEL alloy 718	N07718	2.4668	54.0	18.0	3.0	18.5		Nb 5.0, Ti 1.0	0.296	8.19	205	1413	165	1138	20	425
INCONEL alloy 725	N07725		57.0	21.0	8.0	7.5		Nb 3.5, Ti 1.5, Al 0.3	0.300	8.30	185	1276	130	896	30	355
INCONEL alloy C-276	N10276	2.4819	57.0	16.0	16.0	5.5		W 4.0	0.321	8.89	110	758	50	345	60	180
INCONEL alloy G-3	N06985	2.4619	44.0	22.0	7.0	19.5	2.0		0.294	8.14	105	724	55	379	40	140
INCONEL alloy 050	N06950		50.0	20.0	9.0	17.0			0.303	8.39	130	896	125	862	13	326
INCOLOY alloy 800	N08800	1.4876	32.5	21.0		46.0		C 0.05	0.287	7.94	90	621	50	345	40	165
INCOLOY alloy 825	N08825	2.4858	42.0	21.5	3.0	28.0	2.0		0.294	8.14	95	655	45	310	45	155
INCOLOY alloy 864	S35135		34.0	21.0	4.2	39.0		Si 0.8, Ti 0.6	0.290	8.02	95	655	40	276	45	150
INCOLOY alloy 925	N09925		44.0	21.0	3.0	28.0	1.8	Ti 2.1, Al 0.3	0.292	8.08	170	1172	120	827	25	320
INCOLOY alloy 020	N08020	2.4660	35.0	20.0	2.5	37.0	3.5	Nb 0.6	0.292	8.08	95	655	60	414	35	180
INCOLOY alloy 028	N08028	1.4563	32	27.0	3.5		1.0	Mn 2.0	0.290	8.03	90	621	40	276	40	160
INCOLOY alloy 25-6Mo	N08926	1.4529	25.0	20.0	6.5	47.0	0.9	N 0.20	0.290	8.03	110	758	55	379	45	180



Nominal chemical compositions (% by weight) & Typical physical and mechanical properties of corrosion-resistant alloys
(Typical data, not suitable for design or specifications)



THE FOLLOWING EXTRA SERVICES ARE AVAILABLE ON REQUEST



Extra Services

Standard Packing

In bundles with protective foil wrapping in wooden crates / cases. For smaller tubes on shelf fittings in carton boxes

Cutting to lengths

Cutting from 3.00 mm O.D. up to 406 mm. high volume tube cutting.

Polishing

We polish over a range of sizes from 6.00 mm O.D. up to 406 mm O.D. although sizes bigger than 168 mm are hand polished, not mechanical. Polishing standards are grit 180, 240, 320, 400 and mirror

On the inside we polish from 6.00 mm up to 168 mm. Other facilities are honing and electro polishing, which we can supply till 0.2 μ m smoothness.

Cleaning

For normal degrease standard and also for the much higher standard of "Oxygen clean" treatment, where air, gas, powder or other substances of high purity require non-contaminated surface finish. Reannealing from 6.00 mm upto 323 mm. Special cleaning will be applied by customers request!

Extra testing

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