



OM STEEL INDUSTRIES



SCIENTIFICALLY DESIGNED WITH
INBUILT HIGH QUALITY & SAFETY

www.omsteel.com



OM GROUP OFFER WORLD CLASS PIPE FITTINGS & FLANGES

Through constant efforts to maintain a high level of service and quality over the years, Om Group has established a long list of satisfied customers & consultants. The continued close relationship with our customers is the most important and satisfying aspect of our business.

They are leading & largest India's most exacting and discriminating companies and to be able to meet their requirements is a matter of great pride and joy to us.

We have always sought their advice and recommendations and through their guidance and continued support we have been able to reach our quest for excellence.

We welcome both their compliments and constructive criticism and we pledge to work even harder in the future to maintain the highest standard of quality and customer satisfaction.



DIMENSION AND WEIGHT OF SEAMLESS PIPES

(in mm) & kg. per Mtr.

Nominal Pipe Size Inches	OD mm	10	20	30	STD	40	60	XS	80	100	120	140	160	XXS	Figures based on austenitic steel				Vol/m m3	
															5S	10S	10S	80S		
1/8	10.30	-	-	-	1.73 0.37	1.73 0.37	-	2.41 0.47	2.41 0.47	-	-	-	-	-	-	-	1.24 0.28	1.73 0.36	2.41 0.48	0.0001
1/4	13.70	-	-	-	2.24 0.63	2.24 0.63	-	3.02 0.80	3.02 0.80	-	-	-	-	-	-	-	1.65 0.51	2.24 0.64	3.02 0.80	0.0002
3/8	17.10	-	-	-	2.31 0.84	2.31 0.84	-	3.20 1.10	3.20 1.10	-	-	-	-	-	-	-	1.65 0.64	2.31 0.86	3.20 1.12	0.0003
1/2	21.30	-	-	-	2.77 1.27	2.77 1.27	-	3.73 1.62	3.73 1.62	-	-	-	4.78 1.95	7.47 2.55	1.65 0.82	2.11 1.01	2.77 1.30	3.73 1.65	0.0004	
3/4	26.70	-	-	-	2.87 1.69	2.87 1.69	-	3.91 2.20	3.91 2.20	-	-	-	5.56 2.90	7.82 3.64	1.65 1.04	2.11 1.31	2.87 1.71	3.91 2.24	0.0007	
1	33.40	-	-	-	3.38 2.50	3.38 2.50	-	4.55 3.24	4.55 3.24	-	-	-	6.35 4.24	9.09 5.45	1.65 1.33	2.77 2.13	3.38 2.55	4.55 3.29	0.0011	
1.1/4	42.20	-	-	-	3.56 3.39	3.56 3.39	-	4.85 4.47	4.85 4.47	-	-	-	6.35 5.61	9.70 7.77	1.65 1.68	2.77 2.76	3.56 3.46	4.85 4.56	0.0018	
1.1/2	48.30	-	-	-	3.68 4.05	3.68 4.05	-	5.08 5.41	5.08 5.41	-	-	-	7.14 7.25	10.15 9.56	1.65 1.95	2.77 3.17	3.68 4.13	5.08 5.51	0.0023	
2	60.30	-	-	-	3.91 5.44	3.91 5.44	-	5.54 7.48	5.54 7.48	-	-	-	8.74 11.11	11.07 13.44	1.65 2.44	2.77 4.01	3.9 5.54	5.54 7.63	0.0036	
2.1/2	73.00	-	-	-	5.16 8.63	5.16 8.63	-	7.01 11.41	7.01 11.41	-	-	-	9.53 14.92	14.02 20.39	2.11 3.77	3.05 5.36	5.16 8.81	7.01 11.64	0.0053	
3	88.90	-	-	-	5.49 11.29	5.49 11.29	-	7.62 15.27	7.62 15.27	-	-	-	11.13 21.35	15.24 27.68	2.11 4.60	3.05 6.59	5.49 11.52	7.62 15.59	0.0079	
3.1/2	101.60	-	-	-	5.74 13.57	5.74 13.57	-	8.08 18.63	8.08 18.63	-	-	-	-	16.15 34.03	2.11 5.29	3.05 7.55	5.74 13.84	8.08 19.01	0.0103	
4	114.40	-	-	-	6.02 16.07	6.02 16.07	-	8.56 22.32	8.56 22.32	-	11.13 28.32	-	13.49 33.54	17.12 41.03	2.11 5.96	3.05 8.52	6.02 16.40	8.56 22.77	0.0130	
5	141.30	-	-	-	6.55 21.77	6.55 21.77	-	9.53 30.97	9.53 30.97	-	12.70 42.28	-	15.88 49.11	19.05 57.43	2.77 9.67	3.40 11.56	6.55 22.20	9.53 31.59	0.0199	
6	168.30	-	-	-	7.11 28.26	7.11 28.60	-	10.97 42.56	10.97 42.56	-	14.27 54.20	-	18.26 67.56	21.95 79.22	2.77 11.55	3.40 14.13	7.11 28.83	10.97 43.42	0.028	
8	219.10	-	6.35 33.31	7.0 36.8	8.18 42.55	8.18 42.55	10.31 53.08	12.70 64.64	12.70 64.64	15.09 75.92	18.26 90.44	20.62 100.92	23.01 111.27	22.23 107.92	2.77 15.09	3.76 22.37	8.18 43.39	12.70 65.95	0.048	
10	273.10	-	6.35 41.77	7.8 51.0	9.27 60.31	9.27 60.31	12.70 81.55	12.70 81.55	15.09 96.01	18.26 114.75	21.44 133.06	25.43 155.15	28.58 172.33	25.40 155.15	3.40 23.08	4.19 28.34	9.27 61.52	12.70 83.19	0.074	
12	323.90	-	6.35 49.73	8.38 65.20	9.53 73.88	10.31 79.73	14.27 108.96	12.70 97.46	17.48 132.0	21.44 159.91	25.40 186.97	28.58 208.14	33.32 238.76	25.40 186.97	3.96 31.24	4.57 35.98	9.52 73.80	12.70 97.46	0.104	
14	355.60	6.35 54.69	7.92 67.90	9.53 81.33	9.53 81.33	11.13 94.55	15.06 126.47	12.70 107.39	19.05 158.10	23.83 194.96	27.79 224.65	31.75 253.56	35.71 281.69	-	3.96 34.34	4.78 41.35	-	-	0.126	
16	406.40	6.35 62.64	7.92 77.83	9.53 93.27	9.53 93.57	12.70 123.30	16.66 160.12	12.70 123.30	21.44 203.52	26.19 245.56	30.96 286.64	36.52 333.11	40.46 365.11	-	4.19 41.56	4.78 47.34	-	-	0.165	
18	457.00	6.35 70.57	7.92 87.71	11.13 122.38	9.53 105.16	14.27 155.80	19.05 205.74	12.70 139.15	23.82 254.45	29.36 309.62	34.92 363.46	39.67 408.26	45.24 459.36	-	4.19 46.79	4.78 53.31	-	-	0.208	
20	508.00	6.35 78.55	9.53 117.15	12.70 155.12	9.53 117.15	15.09 183.42	20.62 247.83	12.70 155.12	26.19 311.17	32.54 381.53	38.10 441.49	44.45 508.11	46.99 564.61	-	4.78 59.32	5.54 68.64	-	-	0.258	
22	559.00	6.35 86.54	9.53 129.13	12.70 171.09	9.53 129.13	15.87 212.56	22.22 294.13	12.70 171.10	28.58 373.83	34.92 451.29	41.28 527.0	47.62 600.52	53.98 672.26	-	4.78 65.33	5.54 75.61	-	-	0.312	
24	610.00	6.35 94.53	9.53 141.12	14.27 209.64	9.53 141.12	17.48 255.41	24.61 355.26	12.70 187.10	30.93 441.68	38.83 546.92	46.02 640.0	52.37 720.15	59.51 807.85	-	5.54 82.58	6.35 94.53	-	-	0.372	
26	660.00	7.92 127.26	12.70 202.72	-	9.53 152.87	-	-	12.70 202.72	-	-	-	-	-	-	-	-	-	-	0.435	
28	711.00	7.92 137.32	12.70 218.69	15.88 272.21	9.53 164.85	-	-	12.70 218.69	-	-	-	-	-	-	-	-	-	-	0.506	
30	762.00	7.92 147.28	12.70 234.68	15.88 292.18	9.53 176.84	-	-	12.90 234.67	-	-	-	-	-	-	6.35 120.72	7.92 150.36	-	-	0.580	
32	813.00	7.92 157.28	12.70 250.64	15.88 312.15	9.53 188.82	17.48 342.91	-	12.70 250.64	-	-	-	-	-	-	-	-	-	-	0.660	
34	864.00	7.92 167.20	12.70 266.61	15.88 332.14	9.53 200.81	17.48 364.89	-	12.70 266.61	-	-	-	-	-	-	-	-	-	-	0.746	
36	914.00	7.92 176.96	12.70 282.27	15.88 351.70	9.53 212.56	19.05 420.42	-	12.70 282.27	-	-	-	-	-	-	-	-	-	-	0.835	
38	965.00	-	-	-	9.53 224.54	-	-	12.70 298.24	-	-	-	-	-	-	-	-	-	-	0.931	
40	1016.00	-	-	-	9.53 236.53	-	-	12.70 314.22	-	-	-	-	-	-	-	-	-	-	1.032	
42	1067.00	-	-	-	9.53 248.52	-	-	12.70 330.19	-	-	-	-	-	-	-	-	-	-	1.138	
44	1118.00	-	-	-	9.53 260.50	-	-	12.70 346.16	-	-	-	-	-	-	-	-	-	-	1.249	
46	1168.00	-	-	-	9.53 272.25	-	-	12.70 361.82	-	-	-	-	-	-	-	-	-	-	1.364	
48	1219.00	-	-	-	9.53 284.24	-	-	12.70 377.79	-	-	-	-	-	-	-	-	-	-	1.485	

without engagement



QUALITY ASSURANCE PLAN

The quality assurance dept. overseas all important quality functions and performs the following activities:

QUALITY CONTROL AT RAW MATERIAL STAGE: This system controls the quality of all the incoming materials as per the raw material test certificate of the material. Randomly checking in each size visual and co-related marking for chemical & physical properties at Government Approved Laboratory

QUALITY CONTROL During forming, pressing, forging and heat treatment. process control system outlines inprocess checks and controls to be followed during heat treatment and testing

MANUFACTURING

All B/W (butt welding) & S. W. (Socket Welding) fittings are designed and manufactured according to the following Codes & Welded as per approved WPS & PQR

DIMENSIONS

AS PER ANSI B 16.9 / B 16.28 / B 16.5 / B 16.47, MSS-SP-43, DIN, BS, ASME SEC. II PART A, ASME SEC. IX

**MANUFACTURING AND MATERIAL SPECIFICATIONS FOR FORGED.
BUTTWELDING (B/W), SOCKET WELDING (S/W) FLANGES & PIPE FITTINGS**

ASTM A403 WPS/WPW-304, 304L, 316, 316L, 317, 321	Stainless Steel Buttwelding Fittings
ASTM A234 WP-5, P-11, P-12 & P-22	Alloy Steel Buttwelding Fittings for elevated temperatures
ASTM A234 WPB, WPB-W	Carbon Steel Buttwelding Fittings for moderate temperatures
ASTM A 420 WPL-6	Carbon Steel Buttwelding Fittings for low temperature service
ASTM A-182 F304, 304L, 316, 316L, 317, 321	Stainless Steel S. W. Fittings & Flanges for various applications
ASTM A-182 F1, F-5, F-9, F-11, F-12, F-22 & F-91	Alloy Steel S. W. Fittings & Flanges for high temperature service
ASTM A-105	Carbon Steel S. W. & Flanges for elevated temperature service
ASTM A-350 LF2	Carbon Steel S. W. Fittings & Flanges for low temperature service
IS 1239 Part I & II	Specification for Mild Steel Tubes & Fittings.
IS 2062 GR. A,B,C	Weldable Structural Steel

RANGES OF PRODUCTS AS PER NATIONAL & INTERNATIONAL STANDARDS

90°, 45°, 180°, L.R./S.R. FLBOWS, EQUAL/UNEQ. TEE, REDUCERS, STUBEND, CAPS, CROSS, FITTINGS, 1.5D, 2D, 3D, 5D, 10D L. R. BENDS ETC.

MATERIAL	SIZE (mm)	SCH. / CLASS	THICKNESS	SPECN.	METHOD
Stainless Steel	15NB to 250NB 40NB to 800NB	5S to XXS 5S to 80S	1.65 to 22mm 1.65 to 25mm	A 403 A 403	Seamless Welded
Alloy Steel	50NB to 500NB 200NB to 800NB	40 to XXS SCH. 10,20,30,40,80	3.91 to 30mm 6.35 to 36mm	A234 WP A234WP	Seamless Welded
Carbon Steel	50 NB to 500NB 200NB to 800NB	SCH 40 to XXS 10, 20, 30, 40, 80	3.91 to 40mm 6.35 to 45mm	A 234 WPB A 234 WPB	Seamless Welded
Low Temp. Carbon Steel	25NB to 400 NB 200NB to 800 NB	SCH 10, 20, 30, 40, 80 10, 20, 30, 40, 80	3.91 to 30mm 6.35 to 40mm	A 420 WPL A 420 WPL	Seamless Welded
SS/AS/CS/LTCS SS/AS/CS/LTCS	15NB to 80NB 15NB to 800NB	<u>WE ALSO SUPPLY</u> 30000, 6000, 9000 # 150, 300, 600, 900 #	Socket Weld WNRF, SORF, BLRF	A182/A105 & A 350Lf	Forged Forged

CHEMICAL COMPOSITION OF STAINLESS STEEL

Grade AISI	Chemical Composition - Per cent									Nearest Equivalent Specification	
	C Max	Mn Max	P Max	S Max	Si Max	Cr	Ni	Mo	Other Element	I.S.	En
301	0.15	2.0max	0.045	0.040	1.0	16.0/18.0	6.0/8.0	-	-	10Cr17Ni7	-
302	0.15	2.0	0.045	0.030	1.0	17.0/19.0	8.0/10.0	-	E-4-3-4%	07Cr18Ni9	En-58A
303	0.15	2.0	0.045	0.15min	1.0	17.0/19.0	8.0/10.0	-	E-4-1% max	15Cr18Ni9	En-58M
304	0.08	2.0	0.045	0.030	1.0	18.0/20.0	8.0/10.0	-	-	04Cr18Ni10	En-5BE
304L	0.030	2.0	0.045	0.030	1.0	18.0/20.0	8.0/10.0	-	-	02Cr18Ni11	-
308	0.08	2.0	0.040	0.030	1.0	10.0/21.0	10.0/12.0	-	-	-	-
309	0.20	2.0max	0.045	0.030	1.0	22.0/24.0	12.0/15.0	-	-	20Cr24Ni12	-
309S	0.08	2.0	0.045	0.030	1.0	22.0/24.0	12.0/15.0	-	-	-	-
310	0.25	2.0	0.045	0.030	1.50	24.0/26.0	19.0/22.0	-	-	10Cr25Ni12	-
310S	0.08	2.0	0.045	0.030	1.50	24.0/26.0	19.0/22.0	-	-	-	-
314	0.25	2.0	0.040	0.030	1.5to3	25.0/26.0	19.0/22.0	-	-	-	-
316	0.08	2.0	0.045	0.030	1.0	16.0/18.0	10.0/14.0	2.0/3.0	-	04Cr17Ni12Mo2	En-58H
316L	0.30	2.0	0.045	0.030	1.0	16.0/18.0	10.0/14.0	2.0/3.0	-	03Cr17Ni12Mo2	-
317	0.08	2.0	0.045	0.030	1.0	10.0/20.0	11.0/15.0	3.0/4.0	-	-	-
317L	0.030	2.0	0.045	0.030	1.0	18.0/20.0	11.0/15.0	3.0/4.0	No-10-0.22	Try5CMin	-
316TL	0.080	2.0	0.045	0.030	1.0	16.0/18.0	10.0/14.0	2.0/3.0	Ti5xCmin	-	-
321	0.08	2.0	0.045	0.030	1.0	17.0/19.0	9.0/12.0	-	Ti5xCmin	04Cr18Ni10Ti20	En-58C
347	0.08	2.0	0.045	0.030	1.0	17.0/19.0	9.0/12.0	-	Nb/Ta10xmin	04Cr18Ni10N5-40	En-58C
302HQ	0.03	2.0	0.045	0.03	1	17.0/19.0	9.0/10.0	-	CU:3-4.0	-	-
201	0.15	5.5/7.5	0.06	0.03	1	16.0/18.0	3.5/5.5	-	-	-	-
202	0.15	7.5/10	0.06	0.03	1	17.0/19.0	4.6	-	-	-	-
303EHS	0.15	2.0	0.02	0.03-0.33	1	17.0/19.0	8.10	-	CU:1%Max	-	-
304H.C	0.05	2.0	0.045	0.03	1	18.0/20.0	8.5/9.5	-	CU:2-2.50	-	-
308LER	0.02	1.5/2.0	0.025	0.02	0.5	19.0/21.0	9.5/11.0	-	-	-	-
309LER	0.03	1.5/2.5	0.02	0.015	0.5	23.0/25.0	12.0/14.0	-	-	-	-
316LER	0.02	1.5/2.0	0.02	0.02	0.5	18.0/20.0	12.0/14.0	2.0/2.75	-	-	-
317 LN	0.03	2.0	0.045	0.03	1	18.0/20.0	11.0/15.0	3.0/4.0	N:0.10/0.22	-	-
904 L	0.02	2.0	0.045	0.03	1	19.0/23.0	23.0/28.0	4.0-5.0	CU:1/2	-	-

Grade AISI	Chemical Composition - Per cent									Nearest Equivalent Specification	
	C Max	Mn Max	P Max	S Max	Si Max	Cr	Ni	Mo	Other Element	I.S.	En
416	0.15	1.25	0.06	0.015min	1.0	12.0/14.0	-	-	-	-	-
430	0.12	1.0	0.04	0.03	1.0	16.0/18.0	-	-	-	-	-
430L	0.03	1.0	0.04	0.03	1.0	16.0/18.0	-	-	-	-	-
430F	0.12	1.25	0.06	0.15min	1.0	16.0/18.0	-	-	-	-	-
431	0.2	1.0	0.04	0.03	1.0	15.0/17.0	1.25/2.5	-	-	-	-
17-PH	0.07	1.0	0.04	0.03	1.0	15.0/17.0	3.5	-	NB:0.15/0.45	-	-

Grade AISI	Chemical Composition - Per cent									Nearest Equivalent Specification	
	C Max	Mn Max	P Max	S Max	Si Max	Cr	Ni	Mo	Other Element	I.S.	En
2005	0.03	2	0.03	0.02	1.0	21.0/23.0	4.5/6.5	2.5/3.5	N.O:0.8/0.20	-	-
1905	0.03	1.2/1.8	0.04	0.03	1.2/2	18.0/19.0	4.3/5.2	2.5/3	N.O:0.5/0.10	-	-
2506	0.08	1.0	0.04	0.03	0.75	26.0/28.0	4.5	1.3/2	-	-	-



EQUIVALANT SPECIFICATIONS OF S.S.

	USA		WEST GERMANY	GREAT BRITAIN			POLAND		ROMANIA	SOVIET UNION	SWEDEN
AISI	SAE	Standard No.	Din Designation	BS 970 Part 4:1970	En Steel Replaced	Spec-replaced	Spec. No. PN	Spec. No. STAS	Type	GOST	SIS14
201											
202	—	1.4371	X8CrMnNi 198	284S16	—	86020	CH17B4G8	3583	10AZMNC170	12KH17G9AN4 12KH18N19	2330
301	30301	1.4310	X12CrNi 177	301S21	—	—	IH18N9				
302	30302	1.4300	X12CrNiS188	302S25	58A	86020			10NCC180		2331
302B	30302B	1.4330	—	—	—	—					2346
303	30303	1.4305	X12CrNiS188	303S21	58M	—				08KH18N10	2346
303se	30303se	1.4305	X12CrNiS188	303S41	58M	—					
304	30304	1.4301	X5Cmi189	304S15	58E	86020	OH18N9				2332
								3583	7NC180	20KH20N14S2 20KH25N20S2	
304L	30304L	1.3406	X2CrNi189	304S15	—	86020		3583			2333
309	30309	1.4828	X15CrNiSi2012	309S24	—	86022	OOH18N10				
309S	3030pS						H20N13S2				2352
310	30310	1.4841	X15CrNiSi2520	310S24	—	86022	H25N20S2	3583	155NC200		
310S	30310S	1.4845	X5CrNi2521	—	—	86022		3583	155NC2250		2361
316	30316	1.4401	Z5CrNiMa1810	316S16	58J	—				03CH17N14M2 1KH18N10T	2347
316L	30316L	1.4404	Z5CrNiMa1810	316S12	—	86020					
317	30317	1.4449	Z5CrNiMa1713	317S16	—	—		6855	T12MSMONC10	08KH18N12B 12KH13	2343
317L	—	1.4435	Z5CrNiMa1812	317S12	—	—		3583			
321	30321	1.4541	X10CrNiTi189	321S20	—	—	OOH17N14M2			12KH13 20KH13 12KH17 29KH17N2	2353
				321S12	58B & 58C	86020					
347	30347	1.4550	X10CrNiNb189	247S17	58F & 58G	86020	OH18N9T				2337
403	51403	1.4006	X10Cr13	403S17	—	—	OH18N1CT	3583	7TNC180		
405	51405	1.4002	X7CrA113	—	—	86020	CH18N12NB				2338
410	51410	1.4006	X10Cr13	410S21	56A	—		3583	7BNC180		
414	51414	—	—	—	—	—	OH13J	3583	12C130		2302
416	51416	1.4005	X12CrS13	416S21	56AM	—					
416Se	51416Se	—	—	416S41	56AM	—	2H13	3583	12C130		2302
420	51420	1.4021	X20Cr13	420S37	56C	86020	H17	3583	20C130		2302
420F	51420F	—	—	—	—	—	2H17N2	3583	10C170		
430	51430	1.4016	X8Cr17	430S15	60	86020					2320
430F	51430F	1.4104	X12CrMoS17	—	—	—					
430Fse	30FSe	1.4104	X12CrMoS17	—	—	—					2321
431	51431	1.4057	X22CrNi17	431S29	57	86020					
436	51446	—	—	—	—	—					2322

APPLICATION OF STAINLESS STEEL

SS301

An austenitic stainless steel, because of its ability to attain high strength and ductility through moderate or severe cold working, can be used for automobile trims, conveyor belts, transportation cars such as railway coaches, metal fixtures for construction purposes, roof drainage products, storm door frames, tableware etc.

SS 304

It is the most widely used austenitic stainless steel. It has excellent corrosion resistance and forming characteristics. Used in chemical petrochemical and fertilizer industries and as equipment in dairy, food processing, pharmaceutical industries in hospitals households as kitchenware, sinks, cutlery, cryogenic vessels and as heat exchangers in air conditioning refrigeration for machinery in paper, pulp, textile beverage sectors etc.

SS 304 L

Is used in place of SS 304 for improved resistance to inter granular corrosion. It is used for parts and structures which cannot be heat treated for stress relieving after welding. Has fewer tendencies to work harden.

SS310S

These are austenitic types with higher Chromium and Nickel content. Because of their relatively high creep strength and mechanical properties at higher temperatures these steel find applications for higher temperatures and severe service conditions. Used for air heaters, annealing, boxes, ovens, carburizing boxes, fire box sheets furnace linings, furnace stacks and dampers, gas turbine parts, heat exchangers kiln lining, nozzle diaphragm assemblies for turbo jet engines, oil burner parts, paper mill equipment, oil refinery equipment, oil refinery equipment, recuperates etc.

SS316

An austenitic stainless steel with 2.0 to 3% Mo. which improves corrosion resistance against halogens and imparts high strength characteristics. Used for applications requiring resistance to pitting corrosion and in halogen atmospheres. Typical applications, architectural trims, marine exteriors, chemical processing equipment food processing equipment, petroleum refining equipment, pharmaceutical equipment, photographic equipment, pulp and paper processing equipment, textile finishing equipment, pollution control etc.

SS316L

Recommended in place of 316 when weld ability has to be improved

SS321

An austenitic stainless steel similar to SS 304 but stabilized with titanium to avoid inter-granular corrosion. Type SS 321 resists scaling and vibration fatigue. It is used for aircraft for aircraft exhaust stacks and manifolds pressure, vessels, large mufflers for stationary diesel engines, carburetors, expansion bellows, stack liners, fire walls, super heaters etc.

SS 409/409 M

It is the lowest alloyed straight Chromium ferrite stainless steel. It replaces carbon steels and low alloy steel where some amount of heat or corrosion resistance and higher strength is required and where appearance is secondary. It is used for fins in heater tubes, transformer and capacitor cases, dry fertilizer spreaders, automotive exhaust systems including mufflers, resonators, silencers pipes and emission control units high pressure agricultural spray tanks, culverts, shipping containers, farm equipment etc.

Type SS 409 M is modification of SS 409 which is used in cars, chutes, laundries, buttons, conveyor equipment and systems, tanks, general handling equipment, structural application in corrosive industries, transport, walkways, cable racks etc.

SS 410 S

is the most commonly used 12% chromium stainless steel. Excellent combination of toughness and strength can be developed. It is a good choice when good formability and high strength are required and the end use demands resistance to mildly corrosive environment. It is used for furnace parts and burners operating below 650 °C, micrometer part, tray supports, caps and vaporizers in petroleum fractionating towers, lining for reaction chambers, coal screens fishing tackles, keys, lamp brackets, rules and tapes, wall screens, steam turbine buckets blades, bucket covers, pump parts, petro-chemical equipment, press plates etc.

Ss420

This steel contains min 0.15% C and 12% Cr. It can be thermally hardened to develop very high strength. Extremely useful for cutlery. Other applications include vegetable choppers, scissors, shears, tweezers, hand tools, dental and surgical instruments etc.

Ss430

SS 430 with 17% Cr. is inferior to SS 304 as regards deep draw ability

**STANDARDS AND SPECIFICATION FOR SEAMLESS TUBES**

ANAIYEE							ANAIYEE					COMPOSITION	
Handelbezeichnung Designation commercial Commercial designation	C %	Co %	Cr %	Mo %	Ni %	V %	W %	Al %	Cu %	Nb/Cb Ta %	Ti %	Fe %	Sonstige Autress-Other %
Monel 400	0.12	--	--	--	65	—	—	—	32.0	—	—	1.5	Mn 10
Monel 401	0.10	—	—	—	43	—	—	—	53.0	—	—	0.75	Si 0.25;Mn2.25
Monel 404	0.15	—	—	—	52.0-57.0	—	—	0.05	Rest/Bal.	—	—	0.50	Mn 0.10;Si0.10;S0.024
Monel 502	0.10	--	--	--	63.0-70.0	—	—	2.5-3.5	Rest/Bal.	—	0.50	2.0	Mn 1.5;Si0.5;S0.010
Monel K-500	0.13	—	—	—	64.0	—	—	2.8	30.0	—	0.6	1.0	Mn 0.8
Monel R-405	0.15	—	—	—	66.0	—	—	—	31.0	—	—	1.2	Mn 1.0;S0.04
Hastelloy B	0.10	1.25	0.60	28.0	Rest/Bal.	0.30	—	—	—	—	—	5.50	Mn 0.80;Si0.70
Hastelloy B2	0.02	1.0	1.0	26.0-30.0	Rest/Bal.	—	—	—	—	—	—	2.0	Mn 1.0;Si0.08
Hastelloy C	0.07	1.25	16.0	17.0	Rest/Bal.	0.30	4.0	—	—	—	—	5.75	Mn 0.80;Si0.70
Hastelloy C4	0.015	2.0	14.0-18.0	14.0-17.0	Rest/Bal.	—	—	—	—	—	0.70	3.0	Mn 1.0;Si0.08
Hastelloy C276	0.02	2.5	14.0-16.5	15.0-17.0	Rest/Bal.	0.35	3.0-4.5	—	—	—	—	4.0-7.0	Mn 1.0;Si0.05
Hastelloy F	0.02	1.25	22.0	6.5	Rest/Bal.	—	0.50	—	—	Nb2.10	—	21.0	Mn 1.50;Si0.50
Hastelloy G	0.05	2.5	21.0-23.5	5.5-7.5	Rest/Bal.	—	1.0	—	1.5-2.5	Nb1.75-2.5	—	18.0-21.0	Ma 1.0-2.0;PO04;Si
Hastelloy G2	0.03	—	23.0-26.0	5.0-7.0	47.0-52.0	—	—	—	0.70-1.20	—	0.70-1.50	Rest/Bal.	1.0;80.03
Hastelloy N	0.06	0.25	7.0	16.5	Rest/Bal.	—	0.20	—	0.10	—	—	3.0	Mn 1.0;Si1.0
Hastelloy S	0.02	2.0	15.5	14.5	Rest/Bal.	0.6	1.0	0.20	—	—	—	3.0	Mn 0.40;Si0.25;B0.01
Hastelloy W	0.06	1.25	5.0	24.5	Rest/Bal.	—	—	—	—	—	—	5.5	Mn 0.50;Si0.40;B0.0009;La0.20
Hastelloy X	0.10	1.50	22.0	9.0	Rest/Bal.	—	0.60	—	—	—	—	18.5	Mn 0.050;Si0.50
Incoloy 800	0.04	—	21.0	—	32.0	—	—	0.3	—	—	0.4	45.5	Mn 0.6; Si0.60
Incoloy 800H	0.08	—	21.0	—	32.0	—	—	0.3	—	—	0.4	45.5	—
Incoloy 801	0.05	—	20.5	—	32.0	—	—	—	—	—	1.1	45.5	—
Incoloy 802	0.35	—	21.0	—	32.0	—	—	0.6	—	—	0.7	45.5	—
Incoloy 804	0.05	—	29.5	—	41.0	—	—	0.3	—	—	0.6	25.4	—
Incoloy 805	0.12	—	7.5	0.50	36.0	—	—	—	0.10	—	—	Rest/bal	—
Incoloy 810	0.25	—	21.0	—	32.0	—	—	—	0.50	—	—	Rest/bal	Mn 0.60;Si0.50
Incoloy 825	0.04	—	21.0	3.0	42.0	—	—	—	2.0	—	1.0	30.0	Mn 0.90;Si0.80
Incoloy 825CP	0.04	—	21.5	3.0	42.0	—	—	—	2.2	Nb0.9	—	30.0	—
Incoloy 840	0.08	—	20.0	—	20.0	—	—	—	—	—	—	Rest/bal	—
Incoloy 901	0.05	—	12.5	6.0	Rest/Bal.	—	—	0.15	—	—	2.70	34.0	Mn 1.0;Si1.0
Incoloy 901MOD	0.05	—	12.5	5.80	Rest/Bal.	—	—	—	—	—	2.9	34.0	Mn 0.24;Si0.12;B0.015
Incoloy 903	0.02	15.0	—	—	38.0	—	—	0.7	—	Nb3.0	1.4	41.0	Mn 0.09;Si0.08;B0.015
Incoloy 904	0.02	14.0	—	—	33.0	—	—	—	—	—	1.7	50.0	—
Incoloy Ds	0.06	—	18.0	—	37.0	—	—	—	—	—	—	42.0	—
Incoloy Ma956	—	—	20.0	—	—	—	—	4.5	—	—	0.5	74.4	Mn1.0;Si2.3
Incoloy 600	0.05	—	15.5	—	75.5	—	—	—	—	—	—	8.0	Y2030.5
Incoloy 601	0.05	—	23.0	—	70.5	—	—	1.4	—	—	—	14.0	—
Incoloy 604	0.04	—	15.8	—	Rest/Bal.	—	—	—	0.10	Nb2.0	—	7.20	—
Incoloy 610	0.20	—	15.5	—	Rest/Bal.	—	—	—	0.50	Nb1.0	—	9.0	Mn 0.20;Si0.20
Incoloy 617	0.07	12.5	22.0	9.0	54.0	—	—	1.0	—	—	—	—	Mn 0.90;Si2.0
Incoloy 625	0.05	—	21.5	9.0	61.0	—	—	0.40	—	Nb3.65	0.40	2.5	Mn 0.50;Si0.50
Incoloy 671	0.05	—	48.0	—	51.0	—	—	—	—	—	0.35	—	—
Incoloy 700	0.12	28.5	15.0	3.75	46.0	—	—	3.0	0.05	—	2.20	0.70	Mn 0.10;Si0.30
Incoloy 702	0.04	—	15.6	—	Rest/Bal.	—	—	3.4	0.10	—	0.70	0.35	Mn 0.05;Si0.20
Incoloy 705	0.30	—	15.5	—	Rest/Bal.	—	—	—	0.50	—	—	8.0	Mn 0.90;Si5.5

SPECIFICATION & APPLICATION OF NON-FERROUS METALS

MATERIAL	CHEMICAL COMPOSITION	TENSIL STRENGTH TONS /SQ.IN	STANDARD SPECIFICATIONS (NEAREST TO)					APPLICATIONS
			BRINNEL HARDNESS	BSS BRITISH	ISS INDIAN	ASTM AMERICA	DIN GERMAN	
Gun Metals	—	—	—	—	—	—	—	For items superior to Brass. castings, Elbow, Pipes, taps, corks other Hydraulic fittings Pressure tight bearings bushes Pumps valves valve bodies guides
Leaded Gun Metal	83-3-9-5	11	55.65	LGI-C	—	—	—	
Leaded Gun Metal	85-5-5-5	13	65.75	LG 2 C	318-III	B-30-4St-54	1705	
Gun Metal	88-8-4	16	65.85	G4-C	306-I	B-143	—	
Gun Metal	88-10-2	17	70-95	G4-C	306	B-143	—	
Bronzes	76-9-0-15	11	50-70	LB1-C	318Gr.IV	B-30-45-30	1716	Greases and oil lubricated motion bearings Bearings for mills railway oil and rubber industries
Leaded Bronze	80-10-0-10	12	65-85	LB-C	—	B144-523A	1716	
Leaded Bronze	—	—	—	—	—	—	—	Bearings and bushings for heavy loads Bearings for Diesel Engines Electrical Generators Aero Engines Also for Worm Gears and Worm Wheels
Phosphor Bronze	93-7	12	60-70	—	28Sn-7	B-139-467D	17662	
Phosphor Bronze	90-10	14	70-100	PBI-C	28Sn-9	—	1705	
Aluminium bronze	29-9-2-	32	90-140	AB1-C	305-I	B150-46T	1714	Impellers, Automobile Engines, Gear Blanks Worm Wheels, Fluid Control Valves.
Aluminium bronze	80-10-5-5	41	140-180	AB2-C1	305-II	B148-45190	1714	
Brasses	52-2-2-2-39	30	100-150	HTB1-C	320-1	B147.48(8A)	1709	Marine castings propellers Impellers Hydraulic equipment boots nuts door and furniture fitting marine fittings electrical trade brush holders
High Tensile Brass	55-3-5-3-34	48	150-230	HTB2-C	320-3	B147.48(8A)	1709	
High Tensile Brass	60-2-38	25	50-75	DCB3-C	319	—	1709	
Leaded Brass	70-2-38	11	53	SCB2-C	292	B146.52(6A)	1709	
Leaded Brass	—	—	—	—	—	—	—	
Aluminium	92-3-5	9	70	LM-4	617A-4	B179.62-SX	1725	General purpose alloy for castings with medium strength and good properties die castings corrosion resistance and intricate casting
Aluminium Alloy	88-0-12	11	55	LM-6	617A-6	64D	1725	
Aluminium Alloy	—	—	—	—	—	B179-62-SC. 12C	—	

Description of Material	Specification B.S.S. or I.S.S.	NOMINAL COMPOSITION				Other Elements (Max)	U.T.S. Kg/mm ²	Elongation % (Min.)	End uses
		Copper	Lead	Zinc	Tin				
Free cutting Brass Rods	BSS 249 OR	56 TO 59	2 to 3.5	Bal.	—	—	39	15	Free cutting tUmong & machining
	ISS 319	59 TO 60	2.5 to 3.5	Bal.	—	—	39	15	
Hot forging Brass Rods	TYPE 1	—	—	—	—	—	—	—	Hot forging and stamping
	BSS218 OR	56 TO 60	1 to 2.5	-do-	—	—	35	15	
Naval Brass Rods	1SS3488	56 TO 60	1 to 2	-do-	—	—	35	15	marine hardware
	BSS251 OR	61 TO 64	0.2	-do-	1 to 1.5	—	35	18	
Cold Headings Brass Rods	1SS291	—	—	—	—	—	—	—	spoke nipples rivets and cold heading jobs
	BSS2874	59 TO 62	0.1	-do-	—	—	34	26	
	Cz109	—	—	—	—	—	—	—	high tensile jobs like railly
	DTD627	—	—	—	—	—	—	—	
High Tensile Brass Rods. (Min. Bronze)	BSS250	56 TO 61	0.5	-do-	Sn 0.5	Fe. 1.0 Mn. 1.0 A 1.0.8	53	15	harare valve spindles-etc. highrensil forging
	ISS320	—	—	—	—	to 2 Fe.0.25 to 1.2 .03	47	15	
High Tensile Forging Brass Roads	BSS 1001	56 TO 60	5 to 1.5	-do-	.6 to 1.1	—	—	—	electrical equipment bus-bars railways components
	—	—	—	—	—	—	—	—	
Copper Electrolytic high conductivity Rods	ISS 613	99.9	—	—	—	—	24	45	electrical components
	—	—	—	—	—	—	—	—	
Arenical Copper Rods (0.3% to 0.5% Arsenic)	ISS 288	99.2	—	—	—	—	22	40	electrical components
Ph : Deoxidised Copper	ISS 41171	99.85	—	—	—	—	23	33	

EUAIVALENT SPECIFICATION OF ALLOY STEELS

TYPE OF STEEL	QUALITY	AISI OSB ORN	ASP (HSL)	BOILER VIEW	GERMAN NO./TEN (DEW)	JAPAN	POLDI	STYRIA	SCHOELLER BECKMAN	VISL	IS: 1570/1961	
HIGH SPEED	18% W	T 1	HS-1	VIEW S 200	3355	SKH - 2	MAXIMUM		HANSA	M-WKZ	T 70 W	
STEEL						SPECIAL	MAMUT	PLUTO G	18 Cr V1			
						MAXIMUM	SPECIAL	HANSA	T 75 W 18CO6			
						SPECIAL	PANTHER	SPECIAL K5	CR 4 V1 MO			
		T4	HS-3	VIEW S 305	3255		55	EXTRA				T 75 W 18 CO 1
					SKH - 4 A	MKH	SPECIAL	HANSA				
						PANTHER	SPECIAL K 10	0 Cr 4				
		18% W + 5 % CO	T5	HS-4	VIEW S 300	3265		ULTRA				V 2 MO 75
HOT WORK	18% W + 10 % CO	M 2	HS-M2	VIEW S 600	3343	SKH 9	MAXIMUM		DHS		T 83 MO W	
STEEL	6/5/2	H 21	HW-3	VIEW W 100	2531		SPECIAL	SS 652			6 CR 4 V2	
						MO5						
						SKD 5	212		SHNV/SG	M-WKZ	T 33 W 9 CR 3	
NON	9 % W	H11	Hw1	VIEW W 300	2343	SKD 6	TLH		EWPX		V38	
									WCD2	M-US	T 35 CR 5 MO	
							SPG		ULTRA	1V30		
SHRINKING	5 % CR	D3	CW-4	VIEW K 100	2080	SKD 1	2002	EXTRA	HANSA	M-SPECIAL	T215 CR 12	
DIE STEEL	HC HC D3	D2	Cw3	VIEW K 105				CHROM	TRIMPHATOR	K		
						SKD 11	2002R	SPECIAL	CRD	HANSA		
					2601		SPECIAL	TRIMPHATOR				
PNEUMATIC	OHNS 01	02	CW-1	VIEW K 460	2510	SKS 3	STABIL K		MW	M-AMU	T1.60CR12	
							SWS		TIT S	190 MN2W50		
							STABIL		HANSA	M-MST	CR45	
STEEL	ONNS 02	S2	SR-4	MY EXTRA	2542	SKS 41	TENAX N	SPECIAL	CONSTANT	FAVORIT	T0W2CR	
								TENITW	EXTRA	EXTRA	V18	

EQUIVALENT SPECIFICATION & CHEMICAL COMPOSITION OF ALUMINIUM ALLOYS

[illegible]

CHEMICAL COMPOSITION OF ALLOY STEELS

STEEL TYPE	QUANTITY	AISI	C	SI
High Speed Steel	18 % W	T1	0.75	0.40
	18 % W+5%Co	T4	0.80	0.40
	18 % W+10%Co	T5	0.75	0.40
	6/5/2	M2	0.80	0.40
Hot Work Steel	9% W	H21	0.30	0.20
	5% Cr	H11	0.36	1.00
Non Shrinking Die Steel	HCHC	D3	2.0	0.30
	OHNS	D2	1.70	0.30
	"	01	1.95	---
	"	02	0.90	0.20
	"	EO300	1.00	0.14
Pneumatic Steel		S2	0.48	0.90
Shock Resisting Steel	V6N		0.90	---
Stainless Steel	Magnetic	410	0.10	0.20
	Non Magnetic	304	0.08	0.20
Carbon Tool Steel		1095	0.90	0.10/ 0.35
Constructional Steel	EN-8	1040	0.35 0.45	0.10 0.35
	EN-9	1055	0.45 0.60	0.10/ 0.35
	EN-19	4140	0.35/ 0.45	0.10/ 0.35
	EN-24	4340	0.35/ 0.45	0.10/ 0.35
	EN-30 B		0.26/ 0.34	0.10/ 0.35
	EN-31	52100	0.95/ 1.20	0.10/ 0.35
	EN-36	3310	0.15	0.10/ 0.35
Springing	EN-45	9255	0.50/ 0.60	0.50/ 2.00
Steel	EN-47	6150	0.45/ 0.55	0.50
Case Hardening Steel	SAE	8620	0.18 6.23	0.20/ 0.35
	16M/NCR5 20M/N CR 5	---	0.14-0.19 0.17-0.22	0.17-0.37 1.17-0.37

CHEMICAL COMPOSITION OF ALLOY STEELS

Mn	Cr	W	V	Co	Mo	Ni
0.40	4.30	18.0	1.00	---	---	---
0.40	4.30	18.0	1.60	5.0	0.80	---
0.40	4.30	18.0	1.60	9.5	0.80	---
0.40	4.30	6.5	2.00	---	5.00	---
0.30	2.60	8.5	0.40	---	---	---
0.40	5.00	---	0.40	---	1.10	---
0.30	12.00	---	---	---	---	---
0.30	12.00	0.5	0.10	---	0.60	---
1.00	0.50	0.5	0.10	---	---	---
1.90	0.30	---	0.10	---	---	---
1.00	1.00	---	0.10	---	0.10	---
0.30	1.10	1.90	0.20	---	---	---
---	---	---	0.20	---	---	0.70
1.00	13.00	---	---	---	---	0.60
2.00	18.00	---	---	---	---	10.00
0.40	---	---	---	---	---	---
0.60/ 0.90	---	S & P	Each (Max)	0.06	---	---
0.50/ 0.80	---	S & P	Each (Max)	0.06	---	---
0.50/ 0.80	0.90/ 1.50	S & P	Each (Max)	0.05	0.20/ 0.40	---
0.45/ 0.70	0.90/ 1.40	S & P	Each (Max)	0.05	0.20/ 0.35	1.30/ 1.80
0.40 0.60	1.10/ 1.40	S & P	Each (Max)	0.05	0.20/ 0.40	3.90/ 4.30
0.30/ 0.75	1.00/ 1.60	S & P	Each (Max)	0.025	---	---
0.30/ 0.60	0.60 1.10	S & P	Each (Max)	0.05	---	3.00 3.75
0.70 1.00 0.50 0.80	0.80/ 1.20	S & P	Each (Max)	0.05 S & P	Each (Max)	0.05
0.70 0.90	0.40 0.60	S & P	Each (Max)	0.04	0.15/ 0.26	0.40/ 0.70
1.00-1.30 1.10-1.40	0.80-1.10 1.00-1.30	S & P S & P	---	0.035 0.035	---	---

M. S. SECTION

M. S. ANGLES		M. S. BEAMS	
Size in mm	Weight Kg/m	Size in mm	Weight Kg/m
**45x30x5	2.8	100x116	23.0
45x30x6	3.3	125x70	13.2
75x50x6	5.6	150x75	15.0
75x50x8	7.4	175x85	19.5
90x60x6	6.8	200x100	25.4
90x60x8	8.9	225x110	31.2
90x60x10	11.0	250x125	37.3
100x75x6	8.0	300x140	44.5
100x75x8	10.5	300x140	52.4
100x75x10	13.5	400x140	61.6
125x75x8	12.1	440x150	72.4
125x75x10	14.9	500x180	86.9
150x7x8	13.7	600x210	122.6
150x75x10	16.9	---	---
150x75x12	20.1	---	---
150x115x10	20.0	---	---
150x115x12	23.8	---	---

Notes : O=Oil; CA = Compressed Air; M = Martempering Bath; W = Water; A=Air

M. S. CHANNELS

M. S. CHANNELS		BLACK SHEETS	
Size in mm	Weight Kg./m	Size in mm	Weight Kg./m
41x32	5.05	3.15	24.75
75x40	7.1	2.80	22.00
100x50	9.6	2.50	19.00
125x65	13.1	2.24	17.60
150x75	16.8	2.00	15.70
175x75	19.6	1.80	14.15
200x75	22.3	1.60	12.55
225x80	26.1	1.40	11.00
250x80	30.6	1.25	9.80
300x90	36.3	1.12	8.80
350x80	42.7	1.00	7.85
400x100	50.1	0.90	7.05
		0.80	6.30
		0.63	4.95
		0.50	3.90
		0.40	3.15



APPLICATION OF TOOL & ALLOY STEELS

HIGH SPEED STEEL

Lathe Tools, Planer tools, Milling Cutter, Cutter blades Boring tools. Twist drills Milling knives. Reamers Taps, Metal cutting saws, Thread cutting tools, Screw cutting tools, File cutter's chisels Blotter Drills, Hobs.

A top quality steel which offers greater hardness and suitable for cutting at high speed and good wear of resistance.

HOT WORK TOOL STEEL

9% TUNGSTEN HOT WORK STEEL

Pressure casting moulds, cores, dies for non ferrous products tools for screws products hot extrusion dies, lower dies for valve cone products for pressing dies. Hot shear blades and trimmer dies for upsetting tools used in bolt, rivet nut and pin manufacturing for heading punches swaging dies.

It is suitable for oil and air hardening and it offers high hardness retention. It provides good resistance to hot wear and heat checking.

5% CHROMIUM HOT WORK STEEL

Extrusion dies, Gripper dies, Rams Drop forging dies, Pressure casting moulds for light alloys, Metal track pressure tools, High stressed internal boxes, little tube pressing mandrels for water cooling, Die-casting tools Punches.

It has very good high temperature characteristics and excellent toughness combined with resistivity to heat checking.

NON SHRINKING DIE STEEL

High Carbon High Chromium Die Steel

Thread Rolling dies, Hobs Cold extrusion tools and dies Punches Draw plates and dies, Cutters, Measuring tools Pressure casting moulds, Blanking, Reamer, Finishing rolls for type mills this type of steel has high dimensional stability with added wear resistance coupled with excellent edge holding qualities.

OIL HARDENING NON SHRINKING DIE STEEL

Blanking and stamping dies, Punches, Rotary Shear blades, Thread cutting tools, Milling cutters, Reamer, Measuring Tools, Gauging tools, Wood working tools, Breaches, Chasers. An Ideal type oil-hardened steel, which is economical and dependable for gauging, cutting and blanking tools, as well as can be relied for hardness and cutting performance.

PNEUMATIC STEEL

Hot cutting dies and punches, Hot trimming tools, Punching tools, Blanking punches, Cold shear blades, Wood working tools. Hobbing Tools, Headers Chisels, Caulking tools, Piercing Mandrels, Beams Fishplates, Grates, Beading and flanging rolls.

It is a popular type of steel known for its extreme toughness and fatigue resistance. It is also recommended for intricate tools.

SHOCK RESISTING STEEL

Coining tools e. g. mint and medallion dies, Dial plate and watch cases, dies, High-duty tools, for Jewellery grippers, Dies and punches for screws, Balls, Rivets, Wire Nails. Most eminently suited for meeting severe pressure impact and shock requiring a shallow hardening grade.

STAINLESS STEEL

Magnetic Stainless Steel

Structural Parts, Armatures Building Fitting, Air craft rivets, Printing Machine components Cutlery, Surgical and Dental instruments, Plastic and Bakelite dies Pump shafts, spring components for hydraulic or steam work etc. It has higher protection against corrosion.

Non Magnetic Stainless Steel

Equipments of food-stuff industry, Surgical instruments Equipments for petroleum and chemical industries, Containers Cooling equipments. It is suitably recommended for handling and processing acids and it is also non rusting natured steel.

CARBON TOOL STEEL

Cutting and punching dies, Shear blades, Hollow and massive embossing dies, Milling cutters, Scrapers, Cutting Tools, Twist Drills, Reamers, Paper knives, Woods Working Tools, Thread Cutting tools, Chisels, Tube drawing plugs, Files, Letter and figure stamps.

It is general purpose tool steel with high surface hardness and core toughness which provides good resistance to wear impact and shock

CONSTRUCTIONAL STEEL

- EN-8** Crank shafts, Automobile axle beams, connecting rods, Lightly Stressed gears. Generally used for moderately stressed parts of Moto Vehicles and general Engineering works
- EN-9** Crank shafts, Cylinder, Gears and Sprockets, Mainly used in machine parts which require moderate wear resistance.
- EN-19** Axle shafts Crank shafts, Gears, Connecting rods, Studs, Bolts, Propeller shaft joint. Suitable for heat treated parts where high tensile and impacts are required along with high endurance
- EN-24** Aircraft and heavy vehicle crank shafts, Connecting rods, Gear shafts, Chain parts, Clutches, Propeller Shafts, Cam Shafts, Spindles Screws, Studs, Pinions Tappets, Boring Bars. Preferred to be applied for heat treated components having large sections and subject to exacting requirements
- EN-30** Application similar to EN-24 Steel More suitable for extra ordinary high toughness purpose
- EN-31** Ball and Roller Bearing, Spinning tools, Beading Rolls Punches and Dies. By its character this type of steel has high resisting nature against wear and can be used for components which are subjected to severe abrasion, wear or high surface loading
- EN-36** Disc wheels, Grooved shafts, Cams, Gears, Heavy Duty gears for air craft, Heavy vehicle and automobile transmission parts, General engineering works, Universal joints
Mainly used for highly stressed machine parts which are intended for cementation with high strength and core toughness.

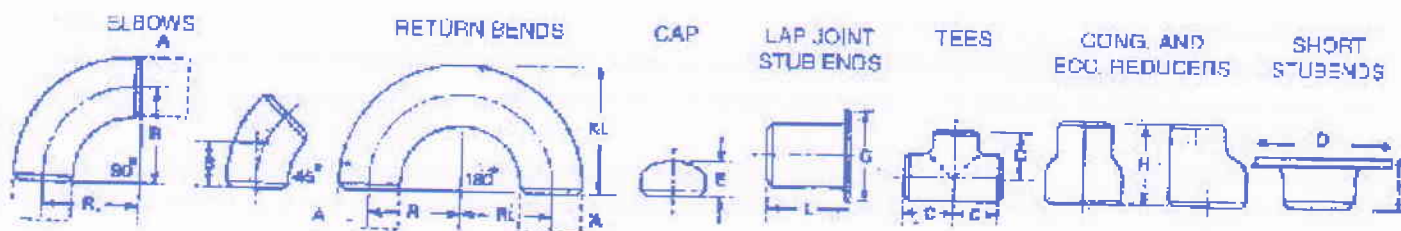
SPRING STEEL

- EN-45** Leaf and volute springs Road and railway vehicle Springs including helical and plate springs. This steel is capable of taking up a good harness and Possesses an increased stability in tempering.
- EN-47** High duty volute and leaf spring Heavy engine valve springs Helical and torsional bar springs. It has a high ratio of yield point to tensile strength and high torsional fatigue strengths

CASE HARDENING STEEL

SAE-862U Gear, Pinions, lay shafts, Camshafts, Mining Haulage suspension, Lifting gear. Generally used for parts where direct hardening is preferred, It can also be used as an alternative to EN-35 and EN-36A Steels.

DIMENSIONS IN M.M. OF BUTT WELDING FITTINGS TO ANSI B 16.9

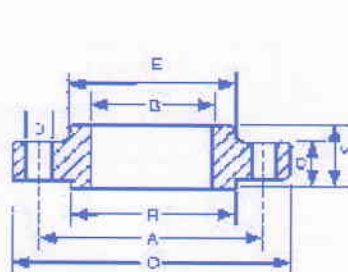


NOM BORE	Pipe O.D.	WALL THICKNESS				RADIUS			R	B	C	E	G	L		H	D	h
		SS	10S	40S	80S	1 D	1.5 D	2 D	3 D					SHORT	LONG			
1/2	21.34	1.66	2.11	2.77	3.73	12.7	19.05	25.4	38.1	15.9	25.4	25.4	34.9	50.8	76.2	38.1	45	8
3/4	26.67	1.65	2.11	2.87	3.91	19.05	28.57	38.10	57.15	11.1	28.6	25.4	42.8	50.8	76.2	38.1	54	8
1	33.40	1.65	2.77	3.38	4.55	25.4	38.1	50.8	76.2	22.2	38.1	38.1	50.8	50.8	101.6	50.8	64	10
1 1/4	42.16	1.65	2.77	3.56	4.85	31.75	47.6	63.5	95.25	25.0	47.6	38.1	63.5	50.8	101.6	50.8	74	12
1 1/2	48.26	1.65	2.77	3.68	5.08	38.1	57.15	76.2	114.3	28.6	57.2	38.1	73.0	50.8	101.6	63.5	84	12
2	60.32	1.65	2.77	3.91	5.54	50.8	76.2	101.6	152.4	34.0	63.5	38.1	92.0	63.5	152.4	76.2	102	16
2 1/2	73.02	2.11	3.05	5.16	7.01	63.5	95.25	127.0	190.5	44.0	76.2	38.1	104.8	63.5	152.4	88.9	122	16
3	88.90	2.11	3.05	5.49	7.62	76.2	114.30	152.4	228.6	50.8	85.7	50.8	127.0	63.5	152.4	88.9	138	18
3 1/2	101.60	2.11	3.05	5.74	8.08	88.9	133.35	177.8	266.7	57.2	95.3	63.5	139.7	76.2	152.4	101.6	148	18
4	114.30	2.11	3.005	6.02	8.56	101.6	152.4	203.2	304.8	63.5	104.8	63.5	157.2	76.2	152.4	101.6	158	20
5	141.30	2.77	3.40	6.55	9.52	127.0	190.5	254.0	381.0	79.4	123.8	76.2	185.7	76.2	203.2	127.0	188	25
6	168.28	2.77	3.40	7.11	10.97	152.4	228.6	304.8	457.2	95.3	142.8	88.9	215.9	88.9	203.2	139.7	212	25
8	219.08	2.77	3.76	8.18	12.7	203.2	304.8	406.4	609.6	127.0	177.8	101.6	270.0	101.6	203.2	152.4	270	30
10	273.05	3.40	4.19	9.27	12.7	254.0	381.0	508.0	762.0	158.7	215.9	127.0	324.0	127.0	254.0	177.8	325	30
12	323.85	3.96	4.57	9.52	12.7	304.8	457.2	609.6	914.4	190.5	254.0	152.4	381.0	152.4	254.0	203.2	380	35
14	355.60	3.96	4.78	9.52	12.7	355.6	533.4	711.2	1066.8	222.2	280.0	165.1	412.8	152.4	305.0	330.2	415	40
16	406.40	4.19	4.78	9.52	12.7	406.4	609.6	812.8	1219.2	254.0	304.8	177.8	470.0	152.4	305.0	355.6	470	40
18	457.20	4.19	4.78	9.52	12.7	457.2	685.8	914.4	1371.6	285.7	343.0	203.2	533.4	152.4	305.0	381.0	535	40
20	508.00	4.78	5.54	9.52	12.7	508.00	762.0	101.6	1524.0	317.6	381.0	228.6	584.2	152.4	305.0	508.0	585	40
22	558.8	4.78	6.35	9.52	12.7	558.8	838.2	1117.6	1676.4	343	419	254	641.4	152.4	305	508	642	40
24	609.6	5.54	6.35	9.52	12.7	609.6	914.4	1219.2	1828.8	381	432	266.7	692.2	152.4	305	508	693	40

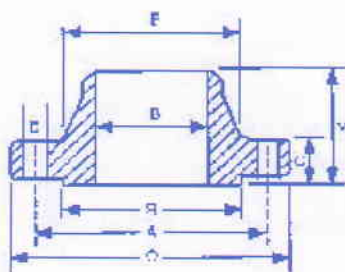
Standards : All dimensions are in mm and confirm to ANSI B 16.9 and M.S.S.SP - 43 where applicable - Dimensional tolerances are in accordance with ANSI B 16.9 and M.S.S.SP - 43 where applicable.

RADIUS : Radius of Short Radius Elbows is 1 times nominal pipe diameter, Radius of Long Radius Elbows is 1 1/2 time nominal pipe diameter.

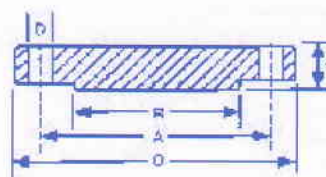
Material Of Construction : S. S. 304/304L/316/316L/317/317/321 Nickel alloys.



SLIP ON WELDING



WELDING NECK



BLIND

DIMENSIONS OF CLASS 150 FLANGES (ANSI B 16.5)

(in mm)

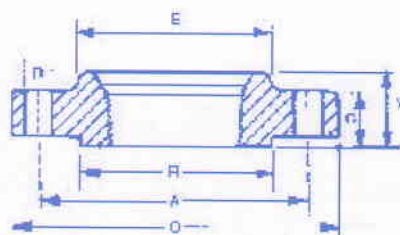
Nominal Pipe Size (inch)	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F
							S/o & S/w, Y	W/N Y	L/J Y	S/O & S/W B	L/J B		
1/2	15	90	60.3	15.9	4	9.6	14	46	16	22.2	22.9	34.9	10
3/4	20	100	69.9	15.9	4	11.2	14	51	16	27.7	28.2	42.9	11
1	25	110	79.4	15.9	4	12.7	16	54	17	34.5	34.9	50.8	13
1.1/4	32	115	88.9	15.9	4	14.3	19	56	21	43.2	43.7	63.5	14
1.1/2	40	125	98.4	15.9	4	15.9	21	60	22	49.5	50.0	73.0	16
2	50	150	120.7	19.0	4	17.5	24	62	25	61.9	62.5	92.1	17
2.1/2	65	180	139.7	19.0	4	20.7	27	68	29	74.6	75.4	104.8	19
3	80	190	152.4	19.0	4	22.3	29	69	30	90.7	91.4	127.0	21
4	100	230	190.5	19.0	8	22.3	32	75	33	116.1	116.8	157.2	-
5	125	255	215.9	22.2	8	22.3	35	87	36	143.8	144.4	185.7	-
6	150	280	241.3	22.2	8	23.9	38	87	40	170.7	171.4	215.9	-
8	200	345	298.5	22.2	8	27.0	43	100	44	221.5	222.2	269.9	-
10	250	405	362.0	25.4	12	28.6	48	100	49	276.2	277.4	323.8	-
12	300	485	431.8	52.4	12	30.2	54	113	56	327.0	328.2	381.0	-
14	350	535	476.3	28.6	12	33.4	56	125	59	359.2	360.2	412.8	-
16	400	595	539.8	28.6	16	35.0	62	125	87	410.5	411.2	469.9	-
18	450	635	577.9	31.7	16	38.1	67	138	97	461.8	462.3	533.4	-
20	500	700	635.0	31.7	20	41.3	71	143	103	513.1	514.3	584.2	-
24	600	815	749.3	34.9	20	46.1	81	151	111	616.0	616.0	692.2	-

DIMENSIONS OF CLASS 300 FLANGES (ANSI B 16.5)

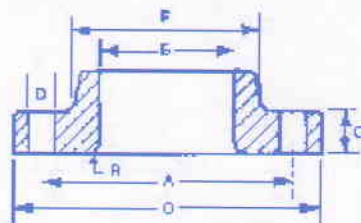
(in mm)

Nominal Pipe Size (inch)	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 of Bore		Dia of R/F R	Depth of Socket F
							S/o & S/w, Y	W/N Y	L/J Y	S/O & S/W B	L/J B		
1/2	15	95	66.7	15.9	4	14.3	21	51	22	22.2	22.9	34.9	10
3/4	20	115	82.6	19.0	4	15.9	24	56	25	27.7	28.2	42.9	11
1	25	125	88.9	19.0	4	17.5	25	60	27	34.5	34.9	50.8	13
1.1/4	32	135	98.4	19.0	4	19.1	25	64	27	43.2	43.7	63.5	14
1.1/2	40	155	114.3	22.2	4	20.7	29	67	30	49.5	50.0	73.0	16
2	50	165	127.0	19.0	8	22.3	32	68	33	61.9	62.5	92.1	17
2.1/2	65	190	149.2	22.2	8	25.4	37	75	38	74.6	75.4	104.8	19
3	80	210	168.3	22.2	8	28.6	41	78	43	90.7	91.4	127.0	21
4	100	255	200.0	22.2	8	31.8	46	84	48	116.1	116.8	157.2	-
5	125	280	235.0	22.2	8	35.0	49	97	51	143.8	144.4	185.7	-
6	150	320	269.9	22.2	12	36.6	51	97	52	170.7	171.4	215.9	-
8	200	380	330.2	25.4	12	41.3	60	110	62	221.5	222.2	269.9	-
10	250	445	387.4	28.6	16	47.7	65	116	95	276.2	277.4	323.8	-
12	300	520	450.8	31.7	16	50.8	71	129	102	327.0	328.2	381.0	-
14	350	585	514.4	31.7	20	54.0	75	141	111	359.2	360.2	412.8	-
16	400	650	571.5	34.9	20	57.2	81	144	121	410.5	411.2	469.9	-
18	450	710	628.6	34.9	24	60.4	87	157	130	461.8	462.3	533.4	-
20	500	775	685.8	34.9	24	63.4	94	160	140	513.1	514.3	584.2	-
24	600	915	812.8	41.3	24	69.9	105	167	152	616.0	616.0	692.2	-

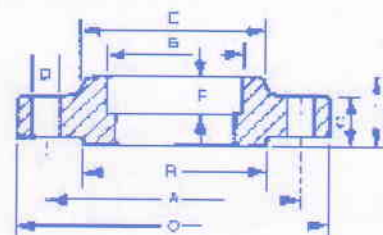
1) Thickness 'C' is Exclusive of Raised Face Thickness of 2mm For Class 150 and 300.



THREADED



LAPPED



**SOCKET WELDING
(1/2 TO 3 ONLY)**

DIMENSIONS OF CLASS 600 FLANGES (ANSI B 16.5)

(in mm)

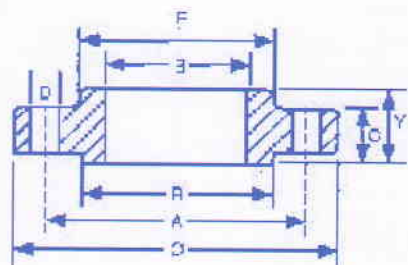
Nominal Pipe Size (inch)	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F
							S/o & S/w, Y	W/N Y	L/J Y	S/O & S/W B	L/J B		
1/2	15	95	66.7	15.9	4	14.3	22	52	22	22.2	22.9	34.9	10
3/4	20	115	82.6	19.0	4	15.9	25	57	25	27.7	28.2	42.9	11
1	25	125	88.9	19.0	4	17.5	27	62	27	34.5	34.9	50.8	13
1.1/4	32	135	98.4	19.0	4	20.7	29	67	29	43.2	43.7	63.5	14
1.1/2	40	155	114.3	22.2	4	22.3	32	70	32	49.5	50.0	73.0	16
2	50	165	127.0	19.0	8	25.4	37	73	37	61.9	62.5	92.1	17
2.1/2	65	190	149.2	22.2	8	28.6	41	79	41	74.6	75.4	104.8	19
3	80	210	168.3	22.2	8	31.8	46	83	46	90.7	91.4	127.0	-
4	100	275	215.9	25.4	8	38.1	54	102	54	116.1	116.8	157.2	-
5	125	330	266.7	28.6	8	44.5	60	114	60	143.8	144.4	185.7	-
6	150	355	272.1	28.6	12	47.7	67	117	67	170.7	171.4	215.9	-
8	200	420	349.2	31.7	12	55.6	76	133	76	221.5	222.2	269.9	-
10	250	510	431.8	34.9	16	63.5	86	152	111	276.2	277.4	323.8	-
12	300	560	489.0	34.9	20	66.7	92	156	117	327.0	328.2	381.0	-
14	350	605	527.0	38.1	20	69.9	94	165	127	359.2	360.2	412.8	-
16	400	685	603.2	41.3	20	76.2	106	178	140	410.5	411.2	469.9	-
18	450	745	654.0	44.4	20	82.6	117	184	152	461.8	462.3	533.4	-
20	500	815	723.9	44.4	24	88.9	127	190	165	513.1	514.3	584.2	-
24	600	940	838.2	50.8	24	101.6	140	203	184	616.0	616.0	692.2	-

DIMENSIONS OF CLASS 900 FLANGES (ANSI B 16.5)

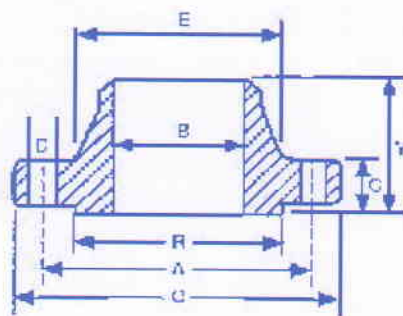
(in mm)

Nominal Pipe Size (inch)	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 of Bore		Dia of R/F R	Depth of Socket F
							S/o & S/w, Y	W/N Y	L/J Y	S/O & S/W B	L/J B		
1/2	15	120	82.6	22.2	4	22.3	32	60	32	22.2	22.9	34.9	10
3/4	20	130	88.9	22.2	4	25.4	35	70	35	27.7	28.2	42.9	11
1	25	150	101.6	25.4	4	28.6	41	73	41	34.5	34.9	50.8	13
1.1/4	32	160	111.1	25.4	4	28.6	41	73	41	43.2	43.7	63.5	14
1.1/2	40	180	123.8	28.6	4	31.8	44	83	44	49.5	50.0	73.0	16
2	50	215	165.1	25.4	8	38.1	57	102	57	61.9	62.5	92.1	17
2.1/2	65	245	190.5	28.6	8	41.3	64	105	64	74.6	75.4	104.8	19
3	80	240	190.5	25.4	8	38.1	54	102	54	90.7	91.4	127.0	-
4	100	290	235.0	31.7	8	44.5	70	114	70	116.1	116.8	157.2	-
5	125	350	279.4	35.0	8	50.8	79	127	79	143.8	144.4	185.7	-
6	150	380	317.5	31.7	12	55.6	86	140	86	170.7	171.4	215.9	-
8	200	470	393.7	38.1	12	63.5	102	162	114	221.5	222.2	269.9	-
10	250	545	469.9	38.1	16	69.5	108	184	127	276.2	277.4	323.8	-
12	300	610	533.4	38.1	20	79.4	117	200	143	327.0	328.2	381.0	-

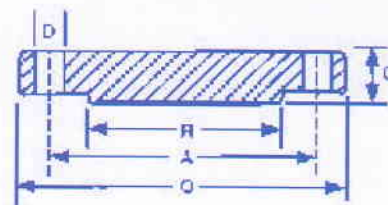
1) Thickness 'C' is Exclusive of Raised Face Thickness of 7mm For Class 600 and 900.



SLIP-ON WELDING



WELDING NECK



BLIND

DIMENSIONS OF CLASS 1500 FLANGES (ANSI B 16.5)

(in mm)

Nominal Pipe Size (inch)	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 of Bore		Dia of R/F R	Depth of Socket F
							S/o & S/w, Y	W/N Y	L/J Y	S/O & S/W B	L/J B		
1/2	15	120	82.6	22.2	4	22.3	32	60	32	22.2	22.9	34.9	10
3/4	20	130	88.9	22.2	4	25.4	35	70	35	27.7	28.2	42.9	11
1	25	150	101.6	25.4	4	28.6	41	73	41	34.5	34.9	50.8	13
1.1/4	32	160	111.1	25.4	4	28.6	41	73	41	43.2	43.7	63.5	14
1.1/2	40	180	123.8	28.6	4	31.8	44	83	44	49.5	50.0	73.0	16
2	50	215	165.1	25.4	8	38.1	57	102	57	61.9	62.5	92.1	17
2.1/2	65	245	190.5	28.6	8	41.3	64	105	64	74.6	75.4	104.8	19
3	80	265	203.2	31.7	8	47.7	73	102	73	90.7	91.4	127.0	-
4	100	310	241.3	34.9	8	54.0	91	114	90	116.1	116.8	157.2	-
5	125	375	292.1	41.3	8	73.1	105	127	105	143.8	144.4	185.7	-
6	150	395	317.5	38.1	12	82.6	119	140	119	170.7	171.4	215.9	-
8	200	485	393.7	44.4	12	92.1	143	162	143	221.5	222.2	269.9	-
10	250	585	482.6	50.8	12	105.0	159	184	178	276.2	277.4	323.8	-
12	300	675	571.5	54.0	16	123.9	181	200	219	327.1	328.2	381.0	-

DIMENSIONS OF CLASS 2500 FLANGES (ANSI B 16.5)

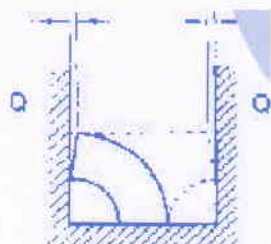
(in mm)

Nominal Pipe Size (inch)	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 of Bore		Dia of R/F R	Depth of Socket F
							S/o & S/w, Y	W/N Y	L/J Y	S/O & S/W B	L/J B		
1/2	15	135	88.9	22.2	4	30.2	40	73	40	22.3	22.9	34.9	10
3/4	20	140	95.2	22.2	4	31.8	43	79	43	28.2	28.2	42.9	11
1	25	160	108.0	25.4	4	35.0	48	89	48	34.9	34.9	50.8	13
1.1/4	32	185	103.2	28.6	4	38.1	52	95	52	43.7	43.7	63.5	14
1.1/2	40	205	146.0	31.7	4	44.5	60	111	60	50.0	50.0	73.0	16
2	50	235	171.4	28.6	8	50.9	70	127	70	62.5	62.5	92.1	17
2.1/2	65	265	196.8	31.7	8	57.2	79	143	79	75.4	75.4	104.8	19
3	80	305	228.6	34.9	8	66.7	92	168	92	91.4	91.4	127.0	-
4	100	355	273.0	41.3	8	76.2	108	190	108	116.8	116.8	157.2	-
5	125	420	323.8	47.6	8	92.1	130	229	130	144.4	144.4	185.7	-
6	150	485	368.3	54.0	12	108.0	152	273	152	171.4	171.4	215.9	-
8	200	550	438.2	54.0	12	127.0	178	318	178	222.2	222.2	269.9	-
10	250	675	539.8	66.7	12	165.1	229	419	229	277.4	277.4	323.8	-
12	300	760	619.1	73.0	16	184.2	254	464	254	328.2	328.2	381.0	-

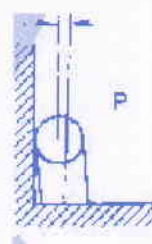
1) Thickness 'C' is Exclusive of Raised Face Thickness of 7mm For Class 1500 and 2500.

DIMENSIONAL TOLERANCES OF FLANGES (ANSI B 16.5)

Welding neck				Threaded, Slipon, Lap Joint, Socket Welding and Blind			
* Outside diameter	NPS ≤ 125	+ 2.0	- 1.0	* Outside diameter	NPS ≤ 125	+ 2.0	- 1.0
	NPS ≥ 150	+ 4.0	- 1.0		NPS ≥ 150	+ 4.0	- 1.0
Inside diameter (Bore)	NPS ≤ 250		± 1.0	Inside diameter	Threaded : to standard gauge limits		
	300 ≤ NPS ≤ 450		± 1.5	(bore)	Slipon : Lab Joint :		
	NPS ≥ 500	+ 3.0	- 1.5		Socket-welding : Threaded		
Diameter of contact face	2mm raised face		± 1.0		NPS ≤ 250	+ 1.0	- 0.0
	7mm raised face : tongue & grooved male and female	± 0.5			NPS ≥ 300	+ 1.5	- 0.0
* Diameter of hub at base	NPS ≥ 600	± 1.6		Diameter of contact face	2mm raised face		± 1.0
Diameter of hub at point of welding	NPS ≥ 125	+ 0.7	- 0.7		7mm raised face tongue & grooved male & female		± 0.5
	150 ≤ NPS ≤ 600	+ 4.0	- 0.0	* Outside diameter of hub	NPS ≤ 300	+ 2.3	- 1.6
Thickness	NPS ≥ 450	+ 3.0	- 0.0		NPS ≥ 350		± 3.1
	NPS ≥ 500	+ 2.0	- 0.0	Thickness	NPS ≤ 450	+ 3.0	- 0.0
Length through hub	NPS ≥ 100		± 1.5		NPS ≥ 500	+ 5.0	- 0.0
	125 ≤ NPS ≤ 250	+ 1.5	- 3.0	* Length through hub	NPS ≤ 100		± 1.5
	NPS ≥ 300	+ 3.0	- 5.0		125 ≤ NPS ≤ 250	+ 1.5	- 3.0
Drilling	Bolt circle (PCD)		± 1.5		NPS ≥ 300	+ 3.0	- 5.0
	Bolt hole spacing		± 0.8	Drilling	Bolt circle (PCD)		± 1.5
	Concentricity with respect to bore		± 0.8		Bolt hole spacing		± 0.8
	NPS ≤ 65		0.8mm max		Concentricity with respect to bore		± 0.8
	NPS ≥ 80		1.5mm max		NPS 65		0.8mm max
					NPS 80		1.5mm max



OFF ANGLE



OFF PLANE

DIMENSIONS TOLERANCES OF FITTINGS

ANSI B 16.9, B 16.28													(in mm)
All Fittings				90° & 45° Elbows	Tees	Reducers	Caps	180° Returns			Angularity Tolerance		
Nominal Pipe Size	Outside Diameter at Bevel OD	Inside Diameter at end ID	Wall Thickness T	Center To-End Dimension A, B A1	Center To-End Dimension C, M	Overall Length H	Overall Length E	Center to Center Dimension P, P1	Back to-Face Dimension K, K1	Alignment of Ends U	Nominal Pipe Size	Off Angle Q	Off Plane P
1/2-2/1/2	± 1.5 - 0.8	± 0.8	Not less than 87.5% Of Nominal Thickness							± 0.8	1/2-4	0.8	1.5
03-04	± 1.5						± 3.0				5-8	1.5	3.0
05-08	± 2.3 - 1.5	± 1.5		± 1.5	± 1.5	± 1.5	± 6.4	± 6.4			10-12		4.8
10-18	+ 4.0 - 3.0	± 3.0		± 2.3	± 2.3	± 2.3		± 9.7	± 6.4	± 1.5	14-16		6.4
20-24	+ 6.4										18-24	3.0	
26-30		± 4.8		± 3.0	± 3.0	± 4.8	± 9.7				26-30		9.7
32-48	- 4.8			± 4.8	± 4.8						32-42	4.8	12.7
											44-48		19.0

STANDARDS AND SPECIFICATION FOR SEAMLESS TUBES

		TENSILERENGTH		YIELD POINT		ELONGATION	%	%	%	%
		da N/mm2 kgf.mm2 abt.	it n/ln2 abt.	da N/mm2 kgf.mm2 abt.	it n/ln2 abt.					
ASTM	ASTM 53 A	> 33.7	> 21	21.1	13.5	35	—	0.10/0.30	—	0.048
	A 53 B	> 42.2	> 27	24.6	13.5	30	—	0.10/0.30	—	0.048
	A 106 A	> 33.7	> 21	21.1	13.5	35	< 0.25	0.10	0.27/0.93	0.048
	A 106 B	> 42.2	> 27	24.6	13.5	30	< 0.30	0.10	0.29/1.06	0.048
	ASTMA33/1	> 38.7	> 24.5	21.1	13.5	35	< 0.30	—	0.40/10.6	0.05
	A 333/3	> 45.2	> 29	24.6	13.5	30	< 0.19	0.18/0.37	0.31/0.64	0.05
	ASTMA 335P1	> 38.7	> 24.5	21.1	13.5	30	0.10/0.20	0.10/0.50	0.30/0.80	0.045
	P2	> 38.7	> 24.5	21.1	13.5	30	0.10/0.20	0.10/0.30	0.30/0.61	0.045
	P11	> 42.2	> 27	21.1	13.5	30	< 0.15	0.50/1.00	0.30/0.60	0.03
	P12	> 42.2	> 27	21.1	13.5	30	< 0.15	0.50	0.30/0.61	0.045
	P22	> 42.2	> 27	21.1	13.5	30	< 0.15	0.50	0.30/0.60	0.03
	P5	> 42.2	> 27	21.1	13.5	30	0.15	0.50	0.30/0.60	0.03

						700 ts=ton/in2				
	BS3601 HFS 22	> 34.6	> 22	21.3	13.5	—	< 0.21	—	0.70	0.06
	BS3601 HFS 27	> 42.5	> 27	25.2	16	—	< 0.25	—	0.70	0.05
	BS3601 HFS 35	> 55.1	> 35	31.5	20	—	< 0.40	—	1.20	0.05
	BS3602 HFS 23	36.3-47.2	23.30	21.3	13.5	—	< 0.20	0.10-0.35	0.30/0.7	0.05
	BS3602 HFS 27	45.5-55.1	27-35	25.2	16	—	< 0.25	0.10-0.35	0.30/0.70	0.05
	BS3602 HFS 35	55.1-67.7	35-43	31.5	20	—	< 0.35	0.10-0.35	0.70/1.10	0.05
	BS3059/3/ERW	31.5-44.1	20-28	—	—	—	—	—	—	0.05

		%	%	%	%	STANDARD FOR SIZE + TDL	TECHNICAL SPEC.	CORRESPONDING QUALITY		
		s = max	Mo	Cr	Ni			ASA	DIN	BS
DIN	St 00	—	—	—	—	DIN 2448	DIN 1629/2	—	—	—
	St 36	0.05	—	—	—	DIN 2448	DIN 1629/2	A 53 A	—	3601 HFS 22
	St 45	0.05	—	—	—	DIN 2448	DIN 1629/2	A 53 B	—	3601 HFS 27
	St 55	0.05	—	—	—	DIN 2448	DIN 1629/2	—	—	3601 HFS 35
	St 52	0.05	—	—	—	DIN 2448	DIN 1629/2	—	—	—
	St 35.8	0.05	—	—	—	DIN 2448	DIN 17175	A 106 A	—	3059/1-2
	St 45.8	0.05	—	—	—	DIN 2448	DIN 17175	1 106 A	—	3059/5-6
	Tt St 35NO. 0.45	—	—	—	DIN 2448	S.E.WEAKSOFF	A 333 Gr 1	—	3603 Lt 27	—
	15 Mo 3	0.04	0.25/0.35	—	—	DIN 2448	DIN 17175	A 335 P1	—	3059/7-8
	16 Mo 5	0.045	0.45/0.65	—	—	DIN 2448	WEAKST.BLE 210	A 355 P1	—	3059/7-8
	13 Cr Mo 44	0.04	0.40/0.50	2.70/1.00	—	DIN 2448	DIN 17175	A33P12/P11	—	3604 Gr 620
	10 Cr Mo 910	0.04	0.90/1.10	2.0/2.50	—	DIN 2448	DIN 17175	A335P22	—	360 Gr 622
	12 Cr Mo 195	0.03	0.45/0.65	4.6	—	DIN 2448	WEAKST.BLE 231	A335P5	—	3604 Gr 625
	Mechanical C 35	0.035	—	—	—	DIN 2448	DIN 17200	—	—	—
	St 52.3	0.05	—	—	—	DIN 2448	DIN 17100	—	—	—



STANDARDS AND SPECIFICATION FOR SEAMLESS TUBES

		% s=max	% Mo	% Cr	% Ni	STANDARD FOR SIZE + TOL	TECH- NICAL SPEC	CORRESPONDING QUALITY		
								ASA	DIN	BS
ASTM	ASTMA 53 A	—	—	—	—	ASA B 36.10	—	API 5L GRA	St 35	3601 HFS 22
	A 53 B	—	—	—	—	ASA B 36.10	—	API 5L GRB	St 45	3601 HFS 27
	A 106 A	0.058	—	—	—	ASA B 36.10	—	API 5L GRA	St 35.8	3059/5-6
	A 106 B	0.058	—	—	—	ASA B 36.10	—	API 5L GRB	St 35.8	3603/5-6
	ASTM A333/1	0.06	—	—	—	ASA B 36.10	—	—	TTSt35N	3603 Lt27
	A333/3	0.05	—	—	3.18/3.82	ASA B 36.10	—	—	10 Ni 14	3603 503 LT 100
	ASTM A335P1	0.45	0.44/0.65	—	—	ASA B 36.10	—	—	16 Mo 5	3059/7-8
	P2	0.045	0.44/0.65	0.50/0.85	—	ASA B 36.10	—	—	13 Cr Mo 44	—
	P11	0.03	0.44/0.65	1-1.0	—	ASA B 36.10	—	—	13 Cr Mo 44	3604 Gr 621
	012	0.045	0.444/0.65	0.8/1.25	—	ASA B 36.10	—	—	13 Cr Mo 44	3604 Gr 620
	P22	0.03	0.87/1.13	1.9/2.6	—	ASA B 36.10	—	—	10 Cr Mo 910	3604 Gr 625
	P5	0.03	0.45/0.65	4.6	—	ASA B 36.10	—	—	12 Cr Mo 195	3604 Gr 625
BS	BS 3601 HFS 22	0.6	—	—	—	—	—	A 53 A	St 35	—
	BS 3601 HFS 27	0.05	—	—	—	—	—	A 53 B	St 45	—
	BS 3601 HFS 35	0.05	—	—	—	—	—	—	St 55	—
	BS 3602 HFS 23	0.05	—	—	—	—	—	A106 A	St 35 B	—
	BS 3602 HFS 27	0.05	—	—	—	—	—	A 106 B	ST 45 B	—
	BS 3602 HFS 35	0.05	—	—	—	—	—	A 106 C	—	—
	BS 3059/3 ERW	0.05	—	—	—	—	—	—	ST 35 B	—

CHEMICAL ANALYSIS

	STANDARD	C. %	SI%	MN%	S% P% MAX. MAX.	CR%	MO%
1	ASTMA 179	06/18	—	0.27/0.63	0.58 0.48	—	—
2	BS 3059/1/33	0.15 MAX	—	0.30/0.70	0.50 0.50	—	—
3	BS 3059/2/33	0.15 MAX	.10/35	0.40/0.70	0.50 0.50	—	—
4	BS 3059/2/45	12.18	.10/35	0.50/1.20	.035 .040	—	—
5	BS 3059/2/620	.10/.15	.10/35	0.40/.070	.040 .040	0.70/0.10	0.45/0.65
6	ASTMA 333/6	.30 MAX	.10MIN	0.29/1.06	0.58 0.488	—	—
7	ASTMA 210/A1	.27 MAX	.10MIN	0.93 MAX	0.58 0.48	—	—
8	ASTMA 209/T1	.10/20	-10/50	0.30/0.80	0.45 0.45	—	0.44/0.65

NOTE



Handwriting practice lines consisting of multiple horizontal blue lines.

NOTE

FORMULA OF WEIGHT



- **WEIGHT OF STAINLESS STEEL PIPES & TUBES**
 $[O.D.(mm)W.T.(mm)] \times W. T. (mm) \times 0.02466 = \text{kg. per meter}$
- **WEIGHT OF STAINLESS STEEL SHEETS**
 $\text{Length (Mtr.)} \times \text{Width (Mtr.)} \times \text{Thk (mm)} \times 8 = \text{Kg. Per Sheet}$
- **WEIGHT OF STAINLESS STEEL CIRCLE & BLANKS**
 $O. D. (mm) \times O. D. (mm) \times \text{Thk (mm)} \div 160 \div 1000 = \text{Kg. Per Pcs.}$
- **WEIGHT OF STAINLESS STEEL ROUND**
 $\text{Dia. (mm)} \times \text{Dia. (mm)} \times 0.00623 = \text{Kg. Per Meter}$
- **WEIGHT OF STAINLESS STEEL HEXAGONAL RODS**
 $\text{Dia. (mm)} \times \text{Dia. (mm)} \times 0.00679 = \text{Kg. Per Meter}$
- **WEIGHT OF STAINLESS STEEL SQUARE BARS**
 $\text{Dia. (mm)} \times \text{Dia. (mm)} \times 0.00787 = \text{Kg. Per Meter}$
- **WEIGHT OF CARBON STEEL PIPES & TUBES**
 $[O. D. (mm) - W. T. (mm)] \times W. T. (mm) \times 0.02466 = \text{kg. per meter}$
- **WEIGHT OF CARBON STEEL SHEETS - PLATES**
 $\text{Length (Mtr.)} \times \text{Width (Mtr.)} \times \text{Thk (mm)} \times 7.85 = \text{Kg. Per Sheet}$
- **WEIGHT OF COPPER PIPES**
 $[O. D. (mm) - W. T. (mm)] \times W. T. (mm) \times 0.0256 = \text{kg. per meter}$
- **WEIGHT OF LEAD PIPES (APPROX)**
 $[O. D. (mm) - W. T. (mm)] \times W. T. (mm) \times 0.0345 = \text{kg. per meter}$
- **WEIGHT OF LEAD SHEETS (APPROX)**
 $\text{Length (Mtr.)} \times \text{Width (Mtr.)} \times \text{Thk (mm)} \times 11.2 = \text{Kg. Per Meter}$
- **WEIGHT OF ALUMINIUM PIPES (APPROX)**
 $[O. D. (mm) - W. T. (mm)] \times W. T. (mm) \times 0.0082 = \text{kg. per meter}$
- **WEIGHT OF ALUMINIUM SHEETS (APPROX)**
 $\text{Length (Mtr.)} \times \text{Width (Mtr.)} \times \text{Thk (mm)} \times 2.66 = \text{Kg. Per Sheet}$
- **SHEET WIDTH REQUIRED FOR ROLLED AND WELDED PIPES**
 $[O. D. (mm) - \text{Thk. (mm)}] \times 3.14 = \text{Sheet Width}$

TENSILE STRENGTH CONVERSION TABLE

Kg / mm ² x 9.81	=	N/mm ² = Mpa
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PSi x 0.0007	=	Kg/mm ²
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Ksi x 1000	=	PSi
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Kg/mm ² x 1.422	=	Ksi
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Corporate Office :

203, Decision Tower, 2nd Floor, Pune-Satara Road,
Pune - 411 037. Tel. : 020-30484452/53/54/55 Fax : 020-30484451
Email : omsteel@omsteel.com Website : www.omsteel.com

Works:

S. No.65/66, Vadgaon - Dhayari, Nr. Bharti Sahakari Bank Ltd.
Dhayari Phata, Sinhgad Road, Wadgaon Bdk., Pune - 411 041.
Telefax : +91-20-24390844, Cell : 9325404015/9225516761,
E-mail : ommetalab@gmail.com

www.omsteel.com