

# PIPING HANDBOOK



شرکت پخش فولاد  
ماهان تهران  
(سهامی خاص)

تلفن: ۸۸۷۲۷۵۶۹

فکس: ۸۸۵۵۵۴۰۷

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*PFM's activities focus upon the manufacture and distribution, at the international level, of pipes, fittings, valves and special industrial equipment, for the transfer of fluids, and address all customers concerned with the construction and maintenance of units and networks, whether these are of industrial type or take place in urban development.*

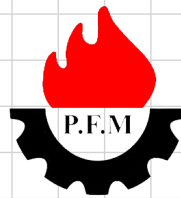
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The American Society of  
Mechanical Engineers

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# ASME B36.10 PIPE DIMENSIONS & WEIGHT

NOMINAL PIPE SIZE INCHES	OD MM	10	20	30	STD	40	60	XS	80	100	120	140	160	XXS	5S	10S	40S	80S	
1/8	10.30	1.24 0.28		1.45 0.32	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	
1/4	13.70	1.65 0.49		1.85 0.54	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 0.82	
3/8	17.10	1.65 0.63		1.85 0.70	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	
1/2	21.30	2.11 1.00		2.41 1.12	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	
3/4	26.70	2.11 1.28		2.41 1.44	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	
1	33.40	2.77 2.09		2.90 2.18	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	
1 1/4	42.20	2.77 2.70		2.97 2.87	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	
1 1/2	48.30	2.77 3.11		3.18 3.53	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	
2	60.30	2.77 3.93		3.18 4.48	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	3.91 5.54	5.54 7.63	
2 1/2	73.00	3.05 5.26		4.78 8.04	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	
3	88.90	3.05 6.45		4.78 9.92	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	
3 1/2	101.60	3.05 7.40		4.78 11.41	5.74 13.57	5.74 13.57		8.08 18.63	8.08 18.63							2.11 5.29	3.05 7.55	5.74 13.84	8.08 19.01
4	114.30	3.05 8.36		4.78 12.91	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	
5	141.30	3.40 11.57			6.55 21.77	6.55 21.77		9.53 30.97	9.53 30.97		12.70 40.28		15.88 49.11	19.05 57.43	2.77 9.67	3.40 11.82	6.55 22.20	9.53 31.59	
6	168.30	3.40 13.84			7.11 28.26	7.11 28.26		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	
8	219.10	3.76 19.96	6.35 33.31	7.04 36.81	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 20.37	8.18 43.39	12.70 65.59	
10	273.10	4.19 27.78	6.35 41.77	7.80 51.03	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	25.40 155.15	28.58 172.33	25.40 155.15	3.40 23.08	4.19 28.34	9.27 61.52	12.70 83.19	
12	323.90	4.57 36.00	6.35 49.73	8.38 65.20	9.53 73.88	9.53 73.88	10.31 108.96	12.70 97.46	12.70 132.08	15.09 159.91	18.26 186.97	21.44 208.14	25.40 238.76	25.40 186.97	3.96 31.89	4.57 36.73	9.52 75.52	12.70 99.43	
14	355.60	6.35 54.69	7.92 67.90	9.53 81.33	9.53 81.38	11.13 94.55	15.09 126.71	12.70 107.39	12.70 158.10	15.09 194.96	19.05 224.65	23.83 253.56	27.79 281.70	35.71 281.70		3.96 35.06	4.78 42.14		
16	406.40	6.35 62.64	7.92 77.83	9.53 93.27	9.53 93.27	11.13 123.30	15.09 160.12	12.70 123.30	12.70 203.53	15.09 245.56	18.26 286.64	21.44 333.19	25.40 365.35	36.53 365.35		4.19 42.41	4.78 48.26		
18	457	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	12.70 254.55	15.09 309.62	19.05 363.56	23.83 408.26	27.79 459.37	35.71 459.37		4.19 47.77	7.78 60.46		
20	508	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	12.70 311.17	15.09 381.53	18.26 441.49	21.44 508.11	25.40 564.81	44.45 564.81		4.78 60.46	5.54 70.00		
22	559	6.35 86.54	9.53 129.13	12.70 171.09	9.53 129.13		22.23 294.27	12.70 171.09	12.70 373.83	15.09 451.42	19.05 527.02	23.83 600.63	27.79 672.26	35.71 672.26		4.78 66.57	5.54 77.06		
24	610	6.35 94.53	9.53 141.12	12.70 209.64	9.53 141.12	17.48 255.41	24.61 355.26	12.70 187.06	12.70 442.08	15.09 547.71	18.26 640.03	21.44 720.15	25.40 808.22			5.54 84.16	6.35 96.37		
26	660	7.92 127.36	12.70 202.72		9.53 152.87			12.70 202.72											
28	711	7.92 137.32	12.70 218.69	15.88 271.21	9.53 164.85			12.70 218.69							6.35 120.72	7.92 150.36			
30	762	7.92 147.28	12.70 234.67	15.88 292.18	9.53 176.84			12.70 234.67											
32	813	7.92 157.24	12.70 250.64	15.88 312.15	9.53 188.82	17.48 342.91		12.70 250.64											
34	864	7.92 167.20	12.70 266.61	15.88 332.12	9.53 200.31	17.48 364.90		12.70 266.61											
36	914	7.92 176.96	12.70 282.27	15.88 351.70	9.53 212.56	19.05 420.42		12.70 282.27											
38	965				9.53 224.54			12.70 298.24											
40	1016				9.53 236.53			12.70 314.22											
42	1067				9.53 248.52			12.70 330.19											
44	1118				9.53 260.50			12.70 346.16											
46	1168				9.53 272.25			12.70 351.82											
48	1219				9.53 284.24			12.70 377.79											

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# API 5L

## TOLERANCES ON DIMENSIONS AND WEIGHTS

On outside diameter D		
Pipe body		
1.900 in. (48.3 mm) and smaller	+ 0,016 in. (+0,41 mm)	- 0,031 in. (- 0,79 mm)
2.375 in. (60.3 mm) through 18 in. (457.0 mm)	± 0.75 percent	
20 in. (508.0 mm) through 36 in. (914,0 mm)	± 1.00 percent	
- non expanded	+ 0.75 percent	
- cold expanded	- 0.25 percent	
larger than 36 in. (914,0 mm)	± 1.00 percent	
- non expanded	+ 1/4 in. (+ 6.35 mm)	
- cold expanded*	- 1/8 in. (- 3,20 mm)	
Pipe ends [For a distance of 4 in. (101.6 mm) from the end of the pipe]		
pipe 10.750 in. (273.0 mm) and smaller	+ 1/16 (+ 1.59 mm)	- 1/64 (- 0.40 mm)
pipe 12.750 in. (323,8 mm) and larger	+ 3/32 (+ 2.38 mm)	- 1/32 (- 0.79 mm)

\* In the case of pipe hydrostatically tested to pressures in excess of standard test pressures, other tolerances may be agreed upon between the manufacturer and purchaser.

Out of roundness		
For pipe larger than 20 in. (508.0 mm) and for a distance of 4 in. (101.6 mm) from the ends of the pipe	± 1,00 percent	

On wall thickness	OD and process	Grades	
		A and B	X42 through X80
	2.875 in. (73 mm) and smaller seamless and welded	+ 20.0 %	+ 15.0 %
		- 12.5 %	- 12.5 %
	3.50 in. (88.9 mm) through 18 in. (457.0 mm) seamless and welded	+ 15.0 %	+ 15.0 %
		- 12.5 %	- 12.5 %
	20 in. (508 mm) and larger seamless	+ 15.0 %	+ 17.5 %
		- 12.5 %	- 10.0 %
	20 in. (508 mm) and larger welded	+ 17.5 %	+ 19.5 %
		- 12.5 %	- 8.0 %

On weight	For single lengths	
	- all sizes except «special» sizes	+ 10 %
- «special» sizes (noted with an * in tables «dimensions»)	+ 10 %	- 5.0 %
For carload lots, minimum of 40,000 lb (18.144 kg)		- 1.75 %

On lengths	Nominal length (a)	Minimum length	Minimum average length for each order item (b)	Maximum length
	Threaded-and-coupled pipe			
	20 ft (6 m)	16.0 ft (4.88 m)	17.5 ft (5.33 m)	22.5 ft (6.86 m)
	40 ft (12 m)	22.0 ft (6.71 m)	35.0 ft (10.67 m)	45.0 ft (13.72 m)
Plain-end pipe				
	20 ft (6 m)	9.0 ft (2.74 m)	17.5 ft (5.33 m)	22.5 ft (6.86 m)
	40 ft (12 m)	14.0 ft (4.27 m)	35.0 ft (10.67 m)	45.0 ft (13.72 m)
	50 ft (15 m)	17.5 ft (5.33 m)	43.8 ft (13.35 m)	55.0 ft (16.76 m)
	60 ft (18 m)	21.0 ft (6.40 m)	52.5 ft (16.00 m)	65.0 ft (19.81 m)
	80 ft (24 m)	28.0 ft (8.53 m)	70.0 ft (21.34 m)	80.0 ft (25.91 m)

### Notes :

a - Nominal lengths of 20 ft (6 m) were formerly designated «single random lengths» and those of 40 ft (12 m) «double random lengths».

b - By agreement between the purchaser and the manufacturer, these tolerances shall apply to each carload.

### HYDROSTATIC TESTS (Section 9)

**Note :** The hydrostatic test pressures given herein are mill-inspection test pressures ; they are not intended as a basic for design, and do not necessarily have any direct relationship to working pressures.

The test pressures are computed by the following formula and rounded to the nearest 10 PSI (1 bar)

$$P = \frac{2ST}{D}$$

where P = hydrostatic test pressure in PSI (0,1 bar).

S = fiber stress in PSI equal to a percentage of the specified minimum yield strength for the various sizes as shown below.

T = specified wall thickness in inch.

D = specified outside diameter in inch.

Grade	Size	Percent of specified minimum yield strength	
		Standard test pressure	Alternate test pressure
A and B	2 3/8 in. (60.3 mm) and larger*	60	75
X42 through X80**	5 9/16 in. (141.3 mm) and smaller	60	75
	6 5/8 in. (168.3 mm) and 8 5/8 in. (219.1 mm)	75	-
	10 3/4 in. (273.0 mm) to 18 in. (457.0 mm) included	85	-
	20 in. (508.0 mm) and larger	90	-

\* Test pressures were limited to 2500 PSI (172 bar) for 3 1/2 in. (88.9 mm) OD and smaller and to 2800 PSI (193 bar) for sizes larger than 3 1/2 in. (88.9 mm) OD. Test pressures for other sizes are established arbitrarily.

\*\* Test pressures for grades X42 through X80 were limited to 3000 PSI (207 bar) to accommodate hydrostatic tester limitations.

## MINIMUM WALL THICKNESS

X2.1 Table X2.1 lists minimum wall thicknesses for nominal pipe wall thickness.

**TABLE X2.1 Minimum Wall Thicknesses on Inspection for Nominal (Average) Pipe Wall Thicknesses**

NOTE 1—The following equation, upon which this table is based, may be applied to calculate minimum wall thickness from nominal (average) wall thickness:

$$t_n \times 0.875 = t_m$$

where:

$t_n$  = nominal (average) wall thickness, in. and

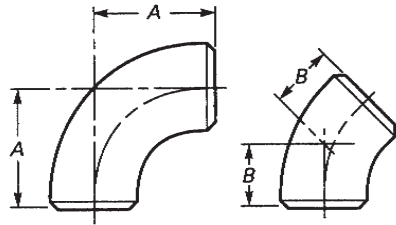
$t_m$  = minimum wall thickness, in.

The wall thickness is expressed to three decimal places, the fourth decimal place being carried forward or dropped, in accordance with Practice E 29.

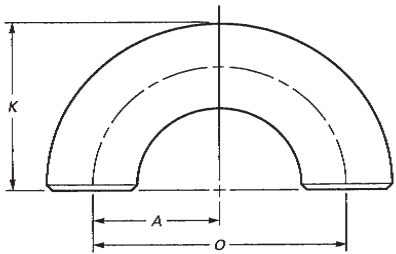
NOTE 2—This table covers some wall thicknesses associated with standard pipe sizes but is not meant to imply that these are the only thicknesses obtainable under this specification.

Nominal (Average) Thickness ( $t_n$ )		Minimum Thickness on Inspection ( $t_m$ )		Nominal (Average) Thickness ( $t_n$ )		Minimum Thickness on Inspection ( $t_m$ )		Nominal (Average) Thickness ( $t_n$ )		Minimum Thickness on Inspection ( $t_m$ )	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
0.068	1.73	0.060	1.52	0.281	7.14	0.246	6.25	0.864	21.94	0.756	19.20
0.083	2.11	0.073	1.85	0.294	7.47	0.257	6.53	0.875	22.22	0.766	19.46
0.088	2.24	0.077	1.96	0.300	7.62	0.262	6.65	0.906	23.01	0.793	20.14
0.091	2.31	0.080	2.03	0.307	7.80	0.269	6.83	0.938	23.82	0.821	20.85
0.095	2.41	0.083	2.11	0.308	7.82	0.270	6.86	0.968	24.59	0.847	21.51
0.109	2.77	0.095	2.41	0.312	7.92	0.273	6.93	1.000	25.40	0.875	22.22
0.113	2.87	0.099	2.51	0.318	8.07	0.278	7.06	1.031	26.19	0.902	22.91
0.119	3.02	0.104	2.64	0.322	8.18	0.282	7.16	1.062	26.97	0.929	23.60
0.125	3.18	0.109	2.77	0.330	8.38	0.289	7.34	1.094	27.79	0.957	24.31
0.126	3.20	0.110	2.79	0.337	8.56	0.295	7.49	1.125	28.58	0.984	24.99
0.133	3.38	0.116	2.95	0.344	8.74	0.301	7.64	1.156	29.36	1.012	25.70
0.140	3.56	0.122	3.10	0.358	9.09	0.313	7.95	1.219	30.96	1.066	27.08
0.141	3.58	0.123	3.12	0.365	9.27	0.319	8.10	1.250	31.75	1.094	27.79
0.145	3.68	0.127	3.23	0.375	9.52	0.328	8.33	1.281	32.54	1.121	28.47
0.147	3.73	0.129	3.28	0.382	9.70	0.334	8.48	1.312	33.32	1.148	29.16
0.154	3.91	0.135	3.43	0.400	10.16	0.350	8.89	1.375	34.92	1.203	30.56
0.156	3.96	0.136	3.45	0.406	10.31	0.355	9.02	1.406	35.71	1.230	31.24
0.172	4.37	0.150	3.81	0.432	10.97	0.378	9.60	1.438	36.53	1.258	31.95
0.179	4.55	0.157	3.99	0.436	11.07	0.382	9.70	1.500	38.10	1.312	33.32
0.188	4.78	0.164	4.17	0.438	11.12	0.383	9.73	1.531	38.89	1.340	34.04
0.191	4.85	0.167	4.24	0.469	11.91	0.410	10.41	1.562	39.67	1.367	34.72
0.200	5.08	0.175	4.44	0.500	12.70	0.438	11.13	1.594	40.49	1.395	35.43
0.203	5.16	0.178	4.52	0.531	13.49	0.465	11.81	1.635	41.53	1.431	36.35
0.210	5.33	0.184	4.67	0.552	14.02	0.483	12.27	1.750	44.45	1.531	38.89
0.216	5.49	0.189	4.80	0.562	14.27	0.492	12.50	1.781	45.24	1.558	39.57
0.218	5.54	0.191	4.85	0.594	15.09	0.520	13.21	1.812	46.02	1.586	40.28
0.219	5.56	0.192	4.88	0.600	15.24	0.525	13.34	1.875	47.62	1.641	41.68
0.226	5.74	0.198	5.03	0.625	15.88	0.547	13.89	1.969	50.01	1.723	43.76
0.237	6.02	0.207	5.26	0.656	16.66	0.574	14.58	2.000	50.80	1.750	44.45
0.250	6.35	0.219	5.56	0.674	17.12	0.590	14.99	2.062	52.37	1.804	45.82
0.258	6.55	0.226	5.74	0.688	17.48	0.602	15.29	2.125	53.98	1.859	47.22
0.276	7.01	0.242	6.15	0.719	18.26	0.629	15.98	2.200	55.88	1.925	48.90
0.277	7.04	0.242	6.15	0.750	19.05	0.656	16.66	2.344	59.54	2.051	52.10
0.279	7.09	0.244	6.19	0.812	20.62	0.710	18.03	2.500	63.50	2.188	55.58
0.280	7.11	0.245	6.22	0.844	21.44	0.739	18.77				

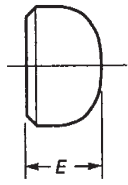
# CARBON STEEL BUTTWELDING FITTINGS • Dimensions



ELBOW



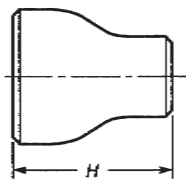
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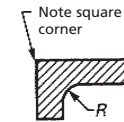
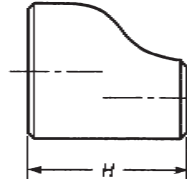
CAP

Nominal size		OD	Elbows			Returns				Caps	Reducers Note 1	Stub Ends			
			Long		Short	Long		Short				Long	Short	Radius of Fillet	Diam of Lap
			90 deg	45 deg	90 deg	O	K	O	K						
DN	NPS	D	A	B	A	O	K	O	K	E	H	F	F	R	G
15	1/2	21.3	38	16		76	48			25		76	51	3	35
20	3/4	26.7	38	19		76	51			25	38	76	51	3	43
25	1	33.4	38	22	25	76	56	51	41	38	51	102	51	3	51
32	1 1/4	42.2	48	25	32	95	70	64	52	38	51	102	51	5	64
40	1 1/2	48.3	57	29	38	114	83	76	62	38	64	102	51	6	73
50	2	60.3	76	35	51	152	106	102	81	38	76	152	64	8	92
65	2 1/2	73.0	95	44	64	190	132	127	100	38	89	152	64	8	106
80	3	88.9	114	51	76	229	159	152	121	51	89	152	64	10	127
90	3 1/2	101.6	133	57	89	267	184	178	140	64	102	152	76	10	140
100	4	114.3	152	64	102	305	210	203	159	64	102	152	76	11	157
125	5	141.3	190	79	127	381	262	254	197	76	127	203	76	11	185
150	6	168.3	229	95	152	457	313	305	237	89	140	203	89	13	218
200	8	219.1	305	127	203	610	414	406	313	102	152	203	102	13	270
250	10	273.0	381	159	254	762	518	508	391	127	178	254	127	13	324
300	12	323.8	457	190	305	914	619	610	467	152	203	254	152	13	381
350	14	355.6	533	222	356	1067	711	711	533	165	330	305	152	13	413
400	16	406.4	610	254	406	1219	813	813	610	178	356	305	152	13	470
450	18	457	686	286	457	1372	914	914	686	203	381	305	152	13	533
500	20	508	762	318	508	1524	1016	1016	762	229	508	305	152	13	584
550	22	559	838	343	559	1676	1118	1118	838	254	508	305	152	13	641
600	24	610	914	381	610	1829	1219	1219	914	267	508	305	152	13	692
650	26	660	991	405						267	610				
700	28	711	1067	438						267	610				
750	30	762	1143	470						267	610				
800	32	813	1219	502						267	610				
850	34	864	1295	533						267	610				
900	36	914	1372	565						267	610				
950	38	965	1448	600						305	610				
1000	40	1016	1524	632						305	610				
1050	42	1067	1600	660						305	610				
1100	44	1118	1676	695						343	610				
1150	46	1168	1753	727						343	711				
1200	48	1219	1829	759						343	711				

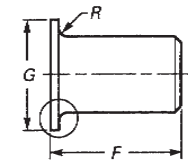
**Note 1:** Reducer dimension "H" is based on large end nominal size



REDUCER



Enlarged Section  
of Lap



STUB END



# CARBON STEEL BUTTWELDING FITTINGS • Weights

Buttwelding Fittings (kgs per unit)																												
Standard Weight												XS									Sch 160							
Nominal size		OD	Elbows			Returns		Caps	Reducers	Stub Ends		Tees	Elbows			Returns		Caps	Reducers	Stub Ends		Tees	Elbows			Caps	Reducers	Tees
			Long		Short	Long	Short			MSS	ASME		Long	Short	Long	Short	MSS			ASME	Long		Short	Long	Short			
DN	NPS	mm	90 deg	45 deg	90 deg							90 deg	45 deg	90 deg								90 deg	45 deg	90 deg				
15	1/2	21.3	0.08	0.04		0.16		0.04		0.12	0.14	0.09	0.10	0.05		0.20		0.05		0.13	0.12	0.11	0.12			0.06		0.12
20	3/4	26.7	0.11	0.06		0.21		0.05	0.06	0.15	0.18	0.13	0.14	0.70		0.21		0.07	0.08	0.17	0.2	0.17	0.13			0.09		0.21
25	1	33.4	0.16	0.08	0.11	0.31	0.21	0.11	0.12	0.19	0.3	0.25	0.20	0.10	0.14	0.41	0.26	0.15	0.15	0.24	0.38	0.32	0.25	0.13	0.17	0.2	0.19	0.41
32	1 1/4	42.2	0.26	0.13	0.18	0.52	0.35	0.14	0.16	0.26	0.41	0.43	0.35	0.18	0.23	0.70	0.46	0.20	0.21	0.35	0.55	0.56	0.42	0.21	0.28	0.25	0.25	0.69
40	1 1/2	48.3	0.37	0.19	0.25	0.74	0.49	0.17	0.25	0.38	0.55	0.61	0.50	0.25	0.33	1.02	0.66	0.24	0.33	0.46	0.68	0.81	0.65	0.33	0.43	0.35	0.43	1.07
50	2	60.3	0.66	0.33	0.44	1.3	0.87	0.24	0.38	0.54	0.99	0.88	0.90	0.45	0.6	1.88	1.19	0.33	0.51	0.74	1.36	1.2	1.33	0.67	0.89	0.54	0.75	1.78
65	2 1/2	73.0	1.29	0.69	0.91	2.73	1.82	0.42	0.73	0.8	1.56	1.74	1.79	0.90	1.19	3.56	2.38	0.57	0.95	1.06	2.08	2.28	2.33	1.17	1.49	0.77	1.2	2.86
80	3	88.9	2.04	1.02	1.36	4.07	2.71	0.67	0.94	1.13	2.13	2.41	2.74	1.37	1.83	5.74	3.65	0.92	1.25	1.51	2.84	3.25	3.83	1.92	2.55	1.4	1.71	4.55
90	3 1/2	101.6	2.94	1.47	1.97	5.65	3.77	0.92	1.19	1.47	2.58	3.26	4.05	2.02	2.07	12.72	5.21	1.3	1.64	2.01	3.51	4.51	5.92	2.96	3.95	2.1	2.35	6.52
100	4	114.3	3.84	1.92	2.56	7.67	5.11	1.17	1.45	1.81	3.04	4.12	5.36	2.68	3.58	15.76	7.15	1.68	2.02	2.52	4.23	5.77	8.02	4.01	5.35	2.76	3	8.5
125	5	141.3	6.48	3.24	4.32	13	8.64	1.9	2.5	2.53	5.3	6.54	9.13	4.57	6.09	19.39	12.2	2.73	3.52	3.6	7.52	9.2	14.7	7.35	9.79	4.85	5.59	14.8
150	6	168.3	9.94	4.97	6.63	19.9	13.3	2.83	3.6	3.73	6.89	9.58	15	7.50	10	31.98	20	4.38	5.38	5.57	10.42	14.5	24.2	12.1	16.2	7.81	8.63	23.3
200	8	219.1	20.1	10.1	13.4	40.3	26.8	5.11	5.7	5.89	10.42	17.9	30.5	15.3	20.3	64.33	40.7	7.91	8.63	10.12	15.86	27.1	53.2	26.6	35.5	15.2	15	47.2
250	10	273.0	35.4	17.7	23.6	70.8	47.2	8.92	9.6	10.42	18.12	30.4	47.7	23.9	31.8	99.66	74.9	12.2	12.9	13.95	24.28	41	103	51.5	68.6	28.9	27.5	88
300	12	323.8	52	26	34.6	112	71.9	13.1	13.6	14.9	22.2	43.6	68.7	34.4	45.8	144.96	94.9	17.4	18	19.93	29.81	57.7	171	85.5	114	47.7	44.6	143
350	14	355.6	67.9	34	45.3			15.9	25.4	15.5	28.3	53.5	89.9	15	60			21.2	33.6	21	38	70.9	236	118	158	61.2	88.5	186
400	16	406.4	89	44.5	59.1			20	31	18	32.7	66.1	118	59	78.3			26.7	41.1	24	44	87.7	350	175	234	92.8	121	260
450	18	457	113	56.5	75.3			25.5	37.8	21	37.5	83.9	150	75.5	100			34.1	50.1	28	50	111	495	247	330	131	165	356
500	20	508	140	70	93.1			31.8	55.4	23.3	41.7	104	186	93	124			42.5	74.9	31	56	138	676	338	451	179	233	502
550	22	559	169	84.5	113			38.8	62.4	25.8	46.3	126	225	113	150			51.7	82.9	33	61	167	886	443	591	219		657
600	24	610	202	101	135			45.1	68.4	28.4	50.5	139	268	134	179			60.1	91	37	67	186	1160	580	773	307		800
650	26	660	237	119	158			50.5	89.4			176	315	158	210			67.3	119			234						
700	28	711	276	138	184			56.2	96.6			198	367	184	245			74.9	129			264						
750	30	762	316	158	211			62.1	104			228	421	211	281			82.8	138			304						
800	32	813	361	180	241			68.4	111			259	480	240	320			91.2	148			347						
850	34	864	406	204	272			75.4	116			295	543	272	362			100	158			393						
900	36	914	457	228	304			81.9	125			331	608	304	405			109	167			441						
950	38	965	510	255	340			94.7	133			370	679	339	453			126	177			493						
1000	40	1016	565	282	377			102	140			411	753	376	502			137	187			547						
1050	42	1067	622	311	416			110	147			422	828	414	554			147	196			562						
1100	44	1118	684	342	456			126	155			475	912	456	608			167	206			633						
1150	46	1168	748	374	499			134	189			521	997	498	665			179	252			695						
1200	48	1219	814	407	543			143	197			569	1085	542	724			191	263			759						

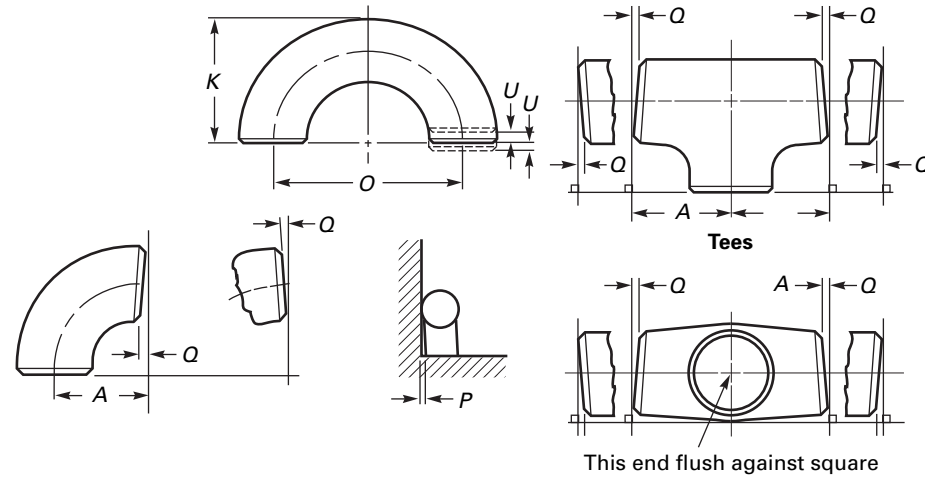
**Note 1:** All weights are approximate

**Note 2:** Weights shown are based on carbon steel.

**Note 3:** As a guide to stainless steel fittings weight use carbon steel Standard Weight for Sch 40S and carbon steel XS for Sch 80S



# ASME B16.9 TOLERANCES



All Fittings [Notes (1) and (2)]		Center-to-End Dimensions		Overall Length of Reducers and Lap Joint Stub Ends, F, H		180-deg Returns			
Nominal Pipe Size (NPS)	DN	Outside Diameter at Bevel, D [Notes (3) and (4)]	Inside Diameter at End [Notes (3) and (5)]	90-deg and 45-deg Long and Short Radius Elbows and Tees, A, B, C, M	3D Radius Elbows, A, B	Overall Length of Caps, E	Center-to-Center Dimension, O	Back-to-Face Dimension, K	Alignment of Ends, U
1/2 to 2 1/2	15-65	+1.6, -0.8	0.8	2	3	3	6	6	1
3 to 3 1/2	80-90	1.6	1.6	2	3	3	6	6	1
4	100	1.6	1.6	2	3	3	6	6	1
5 to 8	125-200	+2.4, -1.6	1.6	2	3	6	6	6	1
10 to 18	250-450	+4.0, -3.2	3.2	2	3	6	10	6	2
20 to 24	500-600	+6.4, -4.8	4.8	2	3	6	10	6	2
26 to 30	650-750	+6.4, -4.8	4.8	3	6	10	.	.	.
32 to 48	800-1 200	+6.4, -4.8	4.8	5	6	10	.	.	.

## GENERAL NOTES:

- (a) All dimensions are in millimeters.
- (b) Tolerances are equal plus and minus except as noted.

## NOTES:

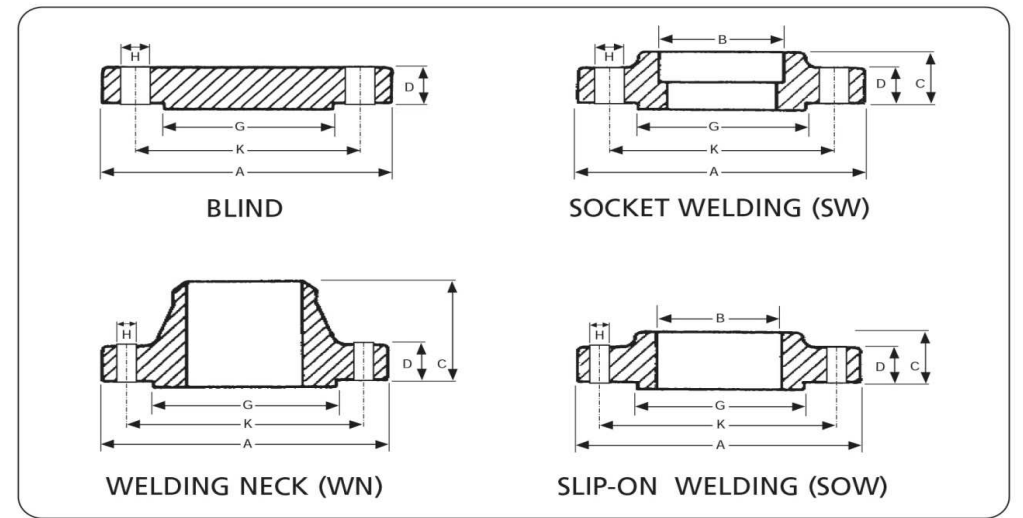
- (1) The inside diameter and the nominal wall thicknesses at ends are to be specified by the purchaser.
- (2) A minimum wall thickness of 87.5% applies unless the purchaser specifies a different wall thickness tolerance. See Fig. 1, Note (1)(a).
- (3) Out-of-round is the sum of absolute values of plus and minus tolerances.
- (4) This tolerance may not apply in localized areas of formed fittings where increased wall thickness is required to meet design requirements of para. 2.2.
- (5) Unless otherwise specified by the purchaser, these tolerances apply to the nominal inside diameter, which equals the difference between the nominal outside diameter and twice the nominal wall thickness.

# ASME B16.5 Flanges . Dimensions & Weights

CLASS 150 FLANGES TO ASME B16.5																
Nominal Size		Dimensions											Weight (Kg)			
DN	NPS	Flange OD A mm	Flange thickness D mm	Bore SOW B mm	Raised Face Diam G mm	Length Thru Hub		Bolt Drilling				RF Stud Bolt Length mm	RTJ Stud Bolt Length mm	SOW SW	WN	Blind
						SOW,SW Threaded C mm	Welding Neck C mm	Circle Diam. K mm	Hole Diam. H Inch	Bolts No.	Bolt Diam. Inch					
15	1/2"	90	9.6	22.2	34.9	14	46	60.3	5/8	4	1/2	55	-	0.4	0.5	0.4
20	3/4"	100	11.2	27.7	42.9	14	51	69.9	5/8	4	1/2	65	-	0.6	0.7	0.6
25	1"	110	12.7	34.5	50.8	16	54	79.4	5/8	4	1/2	65	75	0.8	1.0	0.9
32	1 1/4"	115	14.3	43.2	63.5	19	56	88.9	5/8	4	1/2	70	85	1.0	1.3	1.2
40	1 1/2"	125	15.9	49.5	73.0	21	60	98.4	5/8	4	1/2	70	85	1.3	1.7	1.5
50	2"	150	17.5	61.9	92.1	24	62	120.7	3/4	4	5/8	85	95	2.1	2.6	2.4
65	2 1/2"	180	20.7	74.6	104.8	27	68	139.7	3/4	4	5/8	90	100	3.3	4.1	3.9
80	3"	190	22.3	90.7	127.0	29	68	152.4	3/4	4	5/8	90	100	3.9	4.9	4.9
90	3 1/2"	215	22.3	103.4	139.7	30	70	177.8	3/4	8	5/8	90	100	4.8	6.1	6.2
100	4"	230	22.3	116.1	157.2	32	75	190.5	3/4	8	5/8	90	100	5.3	6.8	7.0
125	5"	255	22.3	143.8	185.7	35	87	215.9	7/8	8	3/4	95	110	6.1	8.6	8.6
150	6"	280	23.9	170.7	215.9	38	87	241.3	7/8	8	3/4	100	115	7.5	10.6	11.3
200	8"	345	27.0	221.5	269.9	43	100	298.5	7/8	8	3/4	110	120	12.1	17.6	19.6
250	10"	405	28.6	276.2	323.8	48	100	362.0	1	12	7/8	115	125	16.5	24.0	28.8
300	12"	485	30.2	327.0	381.0	54	113	431.8	1	12	7/8	120	135	26.2	36.5	43.2
350	14"	535	33.4	359.2	412.8	56	125	476.3	1 1/8	12	1	135	145	34.6	48.4	58.1
400	16"	595	35.0	410.5	469.9	62	125	539.8	1 1/8	16	1	135	145	44.8	60.6	76.1
450	18"	635	38.1	461.8	533.4	67	138	577.9	1 1/4	16	1 1/8	145	160	48.9	68.3	93.7
500	20"	700	41.3	513.1	584.2	71	143	635.0	1 1/4	20	1 1/8	160	170	61.9	84.5	122.0
600	24"	815	46.1	616.0	692.2	81	151	749.3	1 3/8	20	1 1/4	170	185	86.9	115.0	185.0

CLASS 600 FLANGES TO ASME B16.5																
Nominal Size		Dimensions											Weight (Kg)			
DN	NPS	Flange OD A mm	Flange thickness D mm	Bore SOW B mm	Raised Face Diam G mm	Length Thru Hub		Bolt Drilling				RF Stud Bolt Length mm	RTJ Stud Bolt Length mm	SOW SW	WN	Blind
						SOW,SW Threaded C mm	Welding Neck C mm	Circle Diam. K mm	Hole Diam. H Inch	Bolts No.	Bolt Diam. Inch					
15	1/2"	95	14.3	22.2	34.9	22	52	66.7	5/8	4	1/2	75	75	0.7	0.9	0.8
20	3/4"	115	15.9	27.7	42.9	25	57	82.6	3/4	4	5/8	90	90	1.3	1.5	1.3
25	1"	125	17.5	34.5	50.8	27	62	88.9	3/4	4	5/8	90	90	1.5	1.8	1.6
32	1 1/4"	135	20.7	43.2	63.5	29	67	98.4	3/4	4	5/8	95	95	2.0	2.5	2.2
40	1 1/2"	155	22.3	49.5	73.0	32	70	114.3	7/8	4	3/4	110	110	3.0	3.5	3.3
50	2"	165	25.4	61.9	92.1	37	73	127.0	3/4	8	5/8	110	110	3.6	4.4	4.2
65	2 1/2"	190	28.6	74.6	104.8	41	79	149.2	7/8	8	3/4	120	120	5.3	6.4	6.1
80	3"	210	31.8	90.7	127.0	46	83	168.3	7/8	8	3/4	125	125	7.0	8.5	8.4
90	3 1/2"	230	35.0	103.4	139.7	49	86	184.2	1	8	7/8	140	140	8.8	10.7	11.0
100	4"	275	38.1	116.1	157.2	54	102	215.9	1	8	7/8	145	145	14.5	17.4	17.3
125	5"	330	44.5	143.8	185.7	60	114	266.7	1 1/8	8	1	165	165	24.4	29.2	29.4
150	6"	355	47.7	170.7	215.9	67	117	292.1	1 1/8	12	1	170	170	28.7	34.9	36.1
200	8"	420	55.6	221.5	269.9	76	133	349.2	1 1/4	12	1 1/8	190	195	43.4	53.9	58.9
250	10"	510	63.5	276.2	323.8	86	152	431.8	1 3/8	16	1 1/4	215	215	70.3	86.5	97.5
300	12"	560	66.7	327.0	381.0	92	156	489.0	1 3/8	20	1 1/4	220	220	84.2	103.0	124.0
350	14"	605	69.9	359.2	412.8	94	165	527.0	1 1/2	20	1 3/8	235	235	98.7	122.0	151.0
400	16"	685	76.2	410.5	469.9	106	178	603.2	1 5/8	20	1 1/2	255	255	142.0	170.0	214.0
450	18"	745	82.6	461.8	533.4	117	184	654.0	1 3/4	20	1 5/8	275	275	173.0	204.0	272.0
500	20"	815	88.9	513.1	584.2	127	190	723.9	1 3/4	24	1 5/8	285	290	220.0	254.0	349.0
600	24"	940	101.6	616.0	692.2	140	203	838.2	2	24	1 7/8	330	335	312.0	358.0	533.0

CLASS 300 FLANGES TO ASME B16.5																
Nominal Size		Dimensions											Weight (Kg)			
DN	NPS	Flange OD A mm	Flange thickness D mm	Bore SOW B mm	Raised Face Diam G mm	Length Thru Hub		Bolt Drilling				RF Stud Bolt Length mm	RTJ Stud Bolt Length mm	SOW SW	WN	Blind
						SOW,SW Threaded C mm	Welding Neck C mm	Circle Diam. K mm	Hole Diam. H Inch	Bolts No.	Bolt Diam. Inch					
15	1/2"	95	12.7	22.2	34.9	21	51	66.7	5/8	4	1/2	65	75	0.6	0.8	0.6
20	3/4"	115	14.3	27.7	42.9	24	56	82.6	3/4	4	5/8	75	90	1.1	1.3	1.1
25	1"	125	15.9	34.5	50.8	25	60	88.9	3/4	4	5/8	75	90	1.4	1.5	1.4
32	1 1/4"	135	17.5	43.2	63.5	25	64	98.4	3/4	4	8/8	85	95	1.7	2.0	1.8
40	1 1/2"	155	19.1	49.5	73.0	29	67	114.3	7/8	4	3/4	90	100	2.5	2.9	2.7
50	2"	165	20.7	61.9	92.1	32	68	127.0	3/4	8	5/8	90	100	2.9	3.4	3.2
65	2 1/2"	190	23.9	74.6	104.8	37	75	149.2	7/8	8	3/4	100	115	4.3	5.2	4.9
80	3"	210	27.0	90.7	127.0	41	78	168.3	7/8	8	3/4	110	120	5.9	6.9	6.8
90	3 1/2"	230	28.6	103.4	139.7	43	79	184.2	7/8	8	3/4	110	125	7.3	8.7	8.7
100	4"	255	30.2	116.1	157.2	46	84	200.0	7/8	8	3/4	115	125	9.6	11.2	11.5
125	5"	280	33.4	143.8	185.7	49	97	235.0	7/8	8	3/4	120	135	12.3	15.1	15.6
150	6"	320	35.0	170.7	215.9	51	97	269.9	7/8	12	3/4	120	140	15.6	19.1	20.9
200	8"	380	39.7	221.5	269.9	60	110	330.2	1	12	7/8	140	150	24.2	29.9	34.3
250	10"	445	46.1	276.2	323.8	65	116	387.4	1 1/8	16	1	160	170	34.1	42.7	53.3
300	12"	520	49.3	327.0	381.0	71	129	540.8	1 1/4	16	1 1/8	170	185	49.8	61.8	78.8
350	14"	585	52.4	359.2	412.8	75	141	514.4	1 1/4	20	1 1/8	180	190	69.9	85.8	105.0
400	16"	650	55.6	410.5	469.9	81	144	571.5	1 3/8	20	1 1/4	190	205	88.1	106.0	137.0
450	18"	710	58.8	461.8	533.4	87	157	628.6	1 3/8	24	1 1/4	195	210	109.0	131.0	175.0
500	20"	775	62.0	513.1	584.2	94	160	685.8	1 3/8	24	1 1/4	205	220	134.0	158.0	221.0
600	24"	915	68.3	616.0	692.2	105	167	812.8	1 5/8	24	1 1/2	230	255	201.0	230.0	339.0



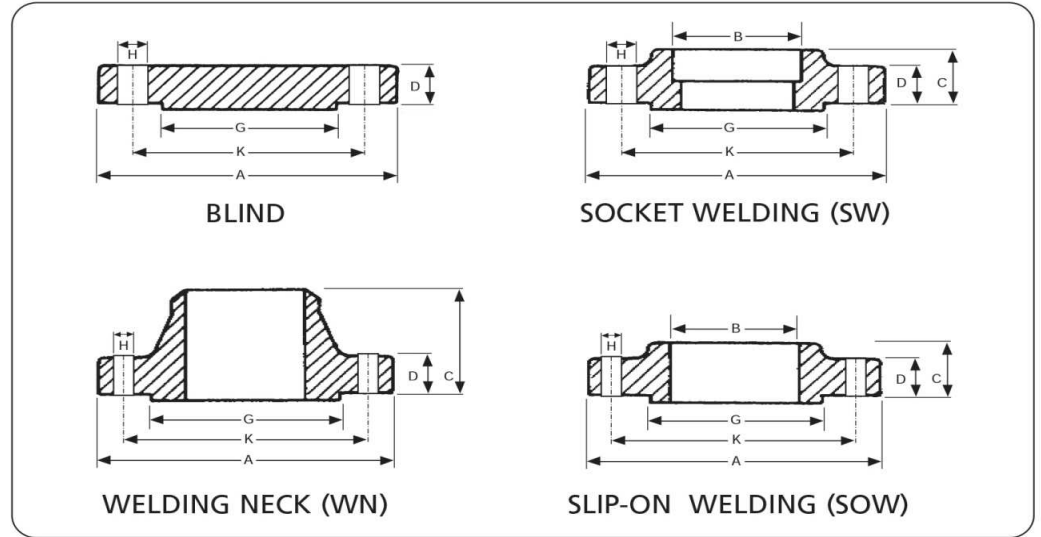
- Note 1:** all weights are approximate.
- Note 2:** For class 150,300 the Raised face height is 2mm and for class 400 to 2500 raised face height must be 7mm.
- Note 3:** Welding neck bore is derived from the pipe schedule.

# ASME B16.5 Flanges . Dimensions & Weights

CLASS 900 FLANGES TO ASME B16.5																
Nominal Size		Dimensions											Weight (Kg)			
		Flange OD	Flange thickness	Bore SOW	Raised Face Diam	Length Thru Hub		Bolt Drilling				RF Stud Bolt Length	RTJ Stud Bolt Length	SOW SW	WN	Blind
DN	NPS	A mm	D mm	B mm	G mm	sow,sw Threaded C mm	Welding Neck C mm	Circle Diam. K mm	Hole Diam. H Inch	Bolts No.	Bolt Diam. Inch	mm	mm	SOW SW	WN	Blind
15	1/2"	120	22.3	22.2	34.9	32	60	82.6	7/8	4	3/4	110	110	1.8	1.9	1.8
20	3/4"	130	25.4	27.7	42.9	35	70	88.9	7/8	4	3/4	115	115	2.4	2.6	2.4
25	1"	150	28.6	34.5	50.8	41	73	1.6	1	4	7/8	125	125	3.6	3.7	3.6
32	1 1/4"	160	28.6	43.2	63.5	41	73	111.1	1	4	7/8	125	125	4.0	4.3	4.1
40	1 1/2"	180	31.8	49.5	73.0	44	83	123.8	1 1/8	4	1	140	140	5.5	5.9	5.8
50	2"	215	38.1	61.9	92.1	57	102	165.1	1	8	7/8	145	145	10.2	10.8	10.1
65	2 1/2"	245	41.3	74.6	104.8	64	105	190.5	1 1/8	8	1	160	160	13.9	15.0	14.0
80	3"	240	38.1	90.7	127.0	54	102	190.5	1	8	7/8	145	145	11.6	13.7	13.1
100	4"	290	44.5	116.1	157.2	70	114	235.0	1 1/4	8	1 1/8	170	170	19.7	22.5	26.9
125	5"	350	50.8	143.8	185.7	79	127	279.4	1 3/8	8	1 1/4	190	190	31.9	37.4	36.5
150	6"	380	55.6	170.7	215.9	86	140	317.5	1 1/4	12	1 1/8	190	195	41.1	47.7	47.5
200	8"	470	63.5	221.5	269.9	102	162	393.7	1 1/2	12	1 3/8	220	220	70.7	81.3	82.5
250	10"	545	69.9	276.2	323.8	108	184	469.9	1 1/2	16	1 3/8	235	235	101.0	119.0	122.0
300	12"	6110	79.4	327.0	381.0	117	200	533.4	1 1/2	20	1 3/8	255	255	133.0	157.0	173.0
350	14"	640	85.8	359.2	412.8	130	213	558.8	1 5/8	20	1 1/2	275	280	153.0	180.0	206.0
400	16"	705	88.9	410.5	469.9	133	216	616.0	1 3/4	20	1 5/8	285	290	185.0	217.0	259.0
450	18"	785	101.6	461.8	533.4	152	229	685.8	2	20	1 7/8	325	335	258.0	292.0	367.0
500	20"	855	108.0	513.1	584.2	159	248	749.3	2 1/8	20	2	350	360	317.0	362.0	463.0
600	24"	1040	139.7	616.0	692.2	203	292	901.7	2 5/8	20	2 1/2	440	455	606.0	665.0	876.0

CLASS 1500 FLANGES TO ASME B16.5																
Nominal Size		Dimensions											Weight (Kg)			
		Flange OD	Flange thickness	Bore SOW	Raised Face Diam	Length Thru Hub		Bolt Drilling				RF Stud Bolt Length	RTJ Stud Bolt Length	SOW SW	WN	Blind
DN	NPS	A mm	D mm	B mm	G mm	sow,sw Threaded C mm	Welding Neck C mm	Circle Diam. K mm	Hole Diam. H Inch	Bolts No.	Bolt Diam. Inch	mm	mm	SOW SW	WN	Blind
15	1/2"	120	22.3	22.2	34.9	32	60	82.6	7/8	4	3/4	110	110	1.8	1.9	1.8
20	3/4"	130	25.4	27.7	42.9	35	70	88.9	7/8	4	3/4	115	115	2.4	2.6	2.4
25	1"	150	28.6	34.5	50.8	41	73	1.6	1	4	7/8	125	125	3.6	3.7	3.6
32	1 1/4"	160	28.6	43.2	63.5	41	73	111.1	1	4	7/8	125	125	4.0	4.3	4.1
40	1 1/2"	180	31.8	49.5	73.0	44	83	123.8	1 1/8	4	1	140	140	5.5	5.9	5.8
50	2"	215	38.1	61.9	92.1	57	102	165.1	1	8	7/8	145	145	10.2	10.8	10.1
65	2 1/2"	245	41.3	74.6	104.8	64	105	190.5	1 1/8	8	1	160	160	13.9	15.0	14.0
80	3"	265	47.7	90.7	127.0		117	203.2	1 1/4	8	1 1/8	180	180		19.9	19.1
100	4"	310	54.0	116.1	157.2		124	241.3	1 3/8	8	1 1/4	195	195		29.9	29.9
125	5"	375	73.1	143.8	185.7		156	292.1	1 5/8	8	1 1/2	250	250		55.4	58.4
150	6"	395	82.6	170.7	215.9		171	317.5	1 1/2	12	1 3/8	260	265		68.4	71.8
200	8"	485	92.1	221.5	269.9		213	393.7	1 3/4	12	1 5/8	290	300		117.0	122.0
250	10"	585	108.0	276.2	323.8		254	482.6	2	12	1 7/8	335	345		194.0	210.0
300	12"	675	123.9	327.0	381.0		283	571.5	2 1/8	16	2	375	385		288.0	316.0
350	14"	750	133.4	359.2	412.8		298	635.0	2 3/8	16	2 1/4	405	425		380.0	420.0
400	16"	825	146.1	410.5	469.9		311	704.8	2 5/8	16	2 1/2	445	470		485.0	558.0
450	18"	915	162.0	461.8	533.4		327	774.7	2 7/8	16	2 3/4	495	525		644.0	760.0
500	20"	985	177.8	513.1	584.2		356	931.8	3 1/8	16	3	540	565		775.0	965.0
600	24"	1170	203.2	616.0	692.2		406	990.6	3 5/8	16	3 1/2	615	650		1232.0	1558.0

CLASS 2500 FLANGES TO ASME B16.5																
Nominal Size		Dimensions											Weight (Kg)			
		Flange OD	Flange thickness	Bore SOW	Raised Face Diam	Length Thru Hub		Bolt Drilling				RF Stud Bolt Length	RTJ Stud Bolt Length	SOW SW	WN	Blind
DN	NPS	A mm	D mm	B mm	G mm	sow,sw Threaded C mm	Welding Neck C mm	Circle Diam. K mm	Hole Diam. H Inch	Bolts No.	Bolt Diam. Inch	mm	mm	SOW SW	WN	Blind
15	1/2"	135	30.2	22.2	34.9	40	73	88.9	7/8	4	3/4	120	120		3.1	3.0
20	3/4"	140	31.8	27.7	42.9	43	79	95.2	7/8	4	3/4	125	125		3.7	3.5
25	1"	160	35.0	34.5	50.8	48	89	108.0	1	4	7/8	140	140		5.2	5.0
32	1 1/4"	185	38.1	43.2	63.5	52	95	130.2	1 1/8	4	1	150	150		7.7	7.4
40	1 1/2"	205	44.5	49.5	73.0	60	111	146.0	1 1/4	4	1 1/8	170	170		10.9	10.4
50	2"	235	50.9	61.9	92.1	70	127	171.4	1 1/8	8	1	180	180		16.2	15.6
65	2 1/2"	265	57.2	74.6	104.8	79	143	196.8	1 1/4	8	1 1/8	195	205		23.7	22.6
80	3"	305	66.7	90.7	127.0		168	228.6	1 3/8	8	1 1/4	220	230		36.2	34.8
100	4"	355	76.2	116.1	157.2		190	273.0	1 5/8	8	1 1/2	255	260		55.3	53.9
125	5"	420	92.1	143.8	185.7		229	323.8	1 7/8	8	1 3/4	300	310		92.5	90.8
150	6"	485	108.0	170.7	215.9		273	368.3	2 1/8	8	2	345	355		143.0	141.0
200	8"	550	127.0	221.5	269.9		318	438.2	2 1/8	12	2	380	395		215.0	214.0
250	10"	675	165.1	276.2	323.8		419	539.8	2 5/8	12	2 1/2	490	510		406.0	411.0
300	12"	760	184.2	327.0	381.0		464	619.1	2 7/8	12	2 3/4	540	560		572.0	592.0



**Note 1:** all weights are approximate.  
**Note 2:** For class 150,300 the Raised face height is 2mm and for class 400 to 2500 raised face height must be 7mm.  
**Note 3** height must be 7mm.

# ASME B16.5 - 2013 FLANGE TOLERANCES

For the purpose of determining conformance with this Standard, the convention for fixing significant digits where limits, maximum or minimum values, are specified shall be rounded as defined in ASTM Practice E 29. This requires that an observed or calculated value shall be rounded to the nearest unit in the last right-hand digit used for expressing the limit. The listing of decimal tolerances does not imply a particular method of measurement.

## 2 Center-to-Contact Surfaces and Center-to-End Tolerances

Required tolerances for various flanges and flanged fitting elements are as follows:

(a) *Center-to-Contact Surfaces Other Than Ring Joint*

Size	Tolerance
NPS ≤ 10	±1.0 mm (±0.03 in.)
NPS ≥ 12	±1.5 mm (±0.06 in.)

(b) *Center-to-End (Ring Joint)*

Size	Tolerance
NPS ≤ 10	±1.0 mm (±0.03 in.)
NPS ≥ 12	±1.5 mm (±0.06 in.)

(c) *Contact Surface-to-Contact Surface Other Than Ring Joint*

Size	Tolerance
NPS ≤ 10	±2.0 mm (±0.06 in.)
NPS ≥ 12	±3.0 mm (±0.12 in.)

(d) *End-to-End (Ring Joint)*

Size	Tolerance
NPS ≤ 10	±2.0 mm (±0.06 in.)
NPS ≥ 12	±3.0 mm (±0.12 in.)

## 3 Facings

Tolerances that apply to both flange and flanged fitting facings are as follows:

(a) Inside and outside diameter of large and small tongue and groove and female, ±0.5 mm (±0.02 in.).

(b) Outside diameter, 2.0 mm (0.06 in.) raised face, ±1.0 mm (±0.03 in.).

(c) Outside diameter, 7.0 mm (0.25 in.) raised face, ±0.5 mm (±0.02 in.).

(d) Ring joint groove tolerances are shown in Table 5 (Table II-5 of Mandatory Appendix II).

Tolerances that apply to flanges are as follows:

(e) Perpendicularity of the face with the bore

Size	Tolerance
NPS ≤ 5	1 deg
NPS ≥ 6	0.5 deg

## 4 Flange Thickness

Required tolerances for flange thickness are as follows:

Size	Tolerance
NPS ≤ 18	+3.0, -0.0 mm (+0.12, -0.00 in.)
NPS ≥ 20	+5.0, -0.0 mm (+0.19, -0.00 in.)

The plus tolerance is applicable to bolting bearing surfaces whether as-forged, as-cast, spot-faced, or back-faced (see para. 6.6).

## 5 Welding End Flange Ends and Hubs

5.1 **Outside Diameter.** Required tolerances for the nominal outside diameter dimension *A* of Figs. 7 and 8 (Figs. II-7 and II-8 of Mandatory Appendix II) of welding ends of welding neck flanges are as follows:

Size	Tolerance
NPS ≤ 5	+2.0, -1.0 mm (+0.09, -0.03 in.)
NPS ≥ 6	+4.0, -1.0 mm (+0.16, -0.03 in.)

5.2 **Inside Diameter.** Required tolerances for the nominal inside diameter of welding ends of welding neck flanges and smaller bore of socket welding flanges (dimension *B* in the referenced figures) are as follows:

(a) For Figs. 7 and 8 (Figs. II-7 and II-8 of Mandatory

Appendix II) and Fig. 4, the tolerances are

Size	Tolerance
NPS ≤ 10	±1.0 mm (±0.03 in.)
12 ≤ NPS ≤ 18	±1.5 mm (±0.06 in.)
NPS ≥ 20	+3.0, -1.5 mm (+0.12, -0.06 in.)

(b) For Fig. 9 (Fig. II-9 of Mandatory Appendix II), the tolerances are

Size	Tolerance
NPS ≤ 10	+0.0, -1.0 mm (+0.0, -0.03 in.)
NPS ≥ 12	+0.0, -1.5 mm (+0.0, -0.06 in.)

5.3 **Backing Ring Contact Surface.** Required tolerances for the bore of the backing ring contact surface of welding neck flanges, dimension *C* of Figs. 9 and 10 (Figs. II-9 and II-10 of Mandatory Appendix II) are as follows:

Size	Tolerance
2 ≤ NPS ≤ 24	+0.25, -0.0 mm (+ 0.01, -0.0 in.)

5.4 **Hub Thickness.** Despite the tolerances specified for dimensions *A* and *B*, the thickness of the hub at the welding end shall not be less than 87½% of the nominal thickness of the pipe, having an under-tolerance of 12.5% for the pipe wall thickness to which the flange is to be attached or the minimum wall thickness as specified by the purchaser.

## 6 Length Through Hub on Welding Neck Flanges

The required tolerances for the length through hubs on welding neck flanges are as follows:

Size	Tolerance
NPS ≤ 4	±1.5 mm (±0.06 in.)
5 ≤ NPS ≤ 10	+1.5, -3.0 mm (+0.06, -0.12 in.)
NPS ≥ 12	+3.0, -5.0 mm (+0.12, -0.18 in.)

## 7 Flange Bore Diameter

7.1 **Lapped and Slip-On Flange Bores.** The required tolerances for lapped and slip-on flange bore diameters are as follows:

Size	Tolerance
NPS ≤ 10	+1.0, -0.0 mm (+0.03, -0.0 in.)
NPS ≥ 12	+1.5, -0.0 mm (+ 0.06, -0.0 in.)

7.2 **Counterbores, Threaded Flanges.** The required tolerances for threaded flange counterbores are as follows:

Size	Tolerance
NPS ≤ 10	+1.0, -0.0 mm (+0.03, -0.0 in.)
NPS ≥ 12	+1.5, -0.0 mm (+0.06, -0.0 in.)

7.3 **Counterbores, Socket Welding Flanges.** The required tolerance for socket end counterbores is as follows:

Size	Tolerance
½ ≤ NPS ≤ 3	±0.25 mm (±0.010 in.)

## 8 Drilling and Facing

7.8.1 **Bolt Circle Diameter.** The required tolerance for all bolt circle diameters is as follows:

±1.5 mm (±0.06 in.)

7.8.2 **Bolt Hole to Bolt Hole.** The required tolerance for the center-to-center of adjacent bolt holes is as follows:

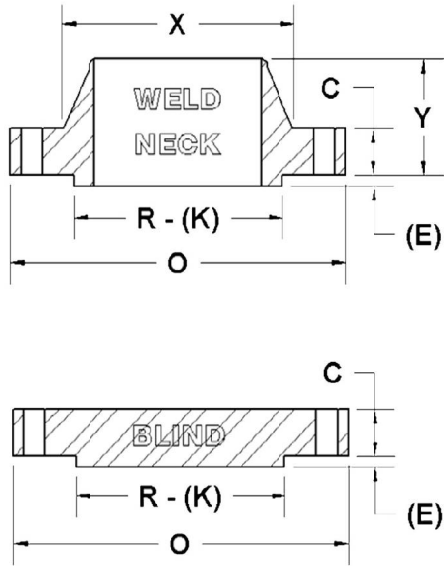
±0.8 mm (±0.03 in.)

7.8.3 **Bolt Circle Concentricity.** The required tolerances for concentricity between the flange bolt circle diameter and machined facing diameters are as follows:

Size	Tolerance
NPS ≤ 2½	0.8 mm (0.03 in.)
NPS ≥ 3	1.5 mm (0.06 in.)

# CARBON STEEL FLANGES • Dimensions

# ANSI B16.47 SERIE.A



SIZE	CLASS 150 $\ddagger$												
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	FACE DIA.	OAL W/ FACE	DRILLING		FILLET RAD. (Min.)	(RTJ FACE)			
							B.C. DIA.	QTY. & SIZE		HEIGHT	r1	(E)	(K)
26	870.0	68.3	68.3	676.1	749.3	120.7	806.5	24	35.1	9.7	...	...	...
28	927.1	71.4	71.4	726.9	800.1	125.5	863.6	28	35.1	11.2	...	...	...
30	984.3	74.7	74.7	781.1	857.3	136.7	914.4	28	35.1	11.2	...	...	...
32	1060.5	81.0	81.0	831.9	914.4	144.5	977.9	28	41.1	11.2	...	...	...
34	1111.3	82.6	82.6	882.7	965.2	149.4	1028.7	32	41.1	12.7	...	...	...
36	1168.4	90.4	90.4	933.5	1022.4	157.2	1085.9	32	41.1	12.7	...	...	...
38	1238.3	87.4	87.4	990.6	1073.2	157.2	1149.4	32	41.1	12.7	...	...	...
40	1289.1	90.4	90.4	1041.4	1124.0	163.6	1200.2	36	41.1	12.7	...	...	...
42	1346.2	96.8	96.8	1092.2	1193.8	171.5	1257.3	36	41.1	12.7	...	...	...
44	1403.4	101.6	101.6	1143.0	1244.6	177.8	1314.5	40	41.1	12.7	...	...	...
46	1454.2	103.1	103.1	1196.8	1295.4	185.7	1365.3	40	41.1	12.7	...	...	...
48	1511.3	108.0	108.0	1247.6	1358.9	192.0	1422.4	44	41.1	12.7	...	...	...
50	1568.5	111.3	111.3	1301.8	1409.7	203.2	1479.6	44	47.8	12.7	...	...	...
52	1625.6	115.8	115.8	1352.6	1460.5	209.6	1536.7	44	47.8	12.7	...	...	...
54	1682.8	120.7	120.7	1403.4	1511.3	215.9	1593.9	44	47.8	12.7	...	...	...
56	1746.3	124.0	124.0	1457.5	1574.8	228.6	1651.0	48	47.8	12.7	...	...	...
58	1803.4	128.5	128.5	1508.3	1625.6	235.0	1708.2	48	47.8	12.7	...	...	...
60	1854.2	131.8	131.8	1559.1	1676.4	239.8	1759.0	52	47.8	12.7	...	...	...

SIZE	CLASS 300 $\ddagger$												
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	FACE DIA.	OAL W/ FACE	DRILLING		FILLET RAD. (Min.)	(RTJ FACE)			
							B.C. DIA.	QTY. & SIZE		HEIGHT	r1	(E)	(K)
26	971.6	79.2	84.1	720.9	749.4	184.2	876.3	28	44.5	9.7	12.7	809.8	26
28	1035.1	85.9	90.4	774.7	800.1	196.9	939.8	28	44.5	11.2	12.7	860.6	28
30	1092.2	91.9	95.3	827.0	857.3	209.6	997.0	28	47.8	11.2	12.7	917.4	30
32	1149.4	98.6	100.1	881.1	914.4	222.3	1054.1	28	50.8	11.2	14.3	984.3	32
34	1206.5	101.6	104.6	936.8	965.2	231.6	1104.9	28	50.8	12.7	14.3	1035.1	34
36	1270.0	104.6	111.3	990.6	1022.4	241.3	1168.4	32	53.8	12.7	14.3	1092.2	36
38	1168.4	108.0	108.0	993.6	1028.7	180.8	1092.2	32	41.1	12.7	...	...	38
40	1238.3	114.3	114.3	1047.8	1085.9	193.5	1155.7	32	44.5	12.7	...	...	40
42	1289.1	119.1	119.1	1098.6	1136.7	200.2	1206.5	32	44.5	12.7	...	...	42
44	1352.6	124.0	124.0	1149.4	1193.8	206.2	1263.7	32	47.8	12.7	...	...	44
46	1416.1	128.5	128.5	1203.5	1244.6	215.9	1320.8	28	50.8	12.7	...	...	46
48	1466.9	133.4	133.4	1254.3	1301.8	223.8	1371.6	32	50.8	12.7	...	...	48
50	1530.4	139.7	139.7	1305.1	1358.9	231.6	1428.8	32	53.8	12.7	...	...	50
52	1581.2	144.5	144.5	1355.9	1409.7	238.3	1479.6	32	53.8	12.7	...	...	52
54	1657.4	152.4	152.4	1409.7	1466.9	252.5	1549.4	28	60.5	12.7	...	...	54
56	1708.2	153.9	153.9	1463.5	1517.7	260.4	1600.2	28	60.5	12.7	...	...	56
58	1759.0	158.8	158.8	1514.3	1574.8	266.7	1651.0	32	60.5	12.7	...	...	58
60	1809.8	163.6	163.6	1565.1	1625.6	273.1	1701.8	32	60.5	12.7	...	...	60

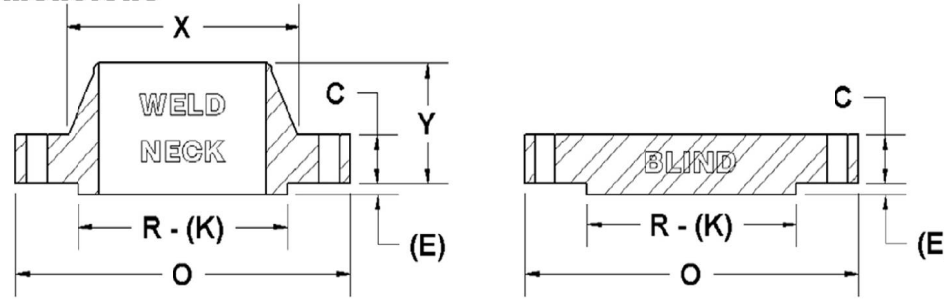
SIZE	CLASS 400 $\blacktriangle$												
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	FACE DIA.	OAL W/ FACE	DRILLING		FILLET RAD. (Min.)	(RTJ FACE)			
							B.C. DIA.	QTY. & SIZE		HEIGHT	r1	(E)	(K)
26	971.6	88.9	98.6	726.9	749.3	193.5	876.3	28	47.8	11.2	12.7	809.8	26
28	1035.1	95.3	104.6	782.6	800.1	206.2	939.8	28	50.8	12.7	12.7	860.6	28
30	1092.2	101.6	111.3	836.7	857.3	218.9	997.0	28	53.8	12.7	12.7	917.4	30
32	1149.4	108.0	115.8	889.0	914.4	231.6	1054.1	28	53.8	12.7	14.3	984.3	32
34	1206.5	111.3	122.2	944.6	965.2	241.3	1104.9	28	53.8	14.2	14.3	1035.1	34
36	1270.0	114.3	125.5	1000.3	1022.4	251.0	1168.4	32	53.8	14.2	14.3	1092.2	36
38	1206.5	124.0	124.0	1003.3	1035.1	206.2	1117.6	32	47.8	14.2	...	...	38
40	1270.0	130.0	130.0	1054.1	1092.2	215.9	1174.8	32	50.8	14.2	...	...	40
42	1320.8	133.4	135.4	1107.9	1143.0	223.8	1225.6	32	50.8	14.2	...	...	42
44	1384.3	139.7	135.7	1158.7	1200.2	233.2	1282.7	32	53.8	14.2	...	...	44
46	1441.5	146.1	146.1	1212.9	1257.3	244.3	1339.9	36	53.8	14.2	...	...	46
48	1511.3	152.4	152.4	1267.0	1308.1	257.0	1403.4	28	60.5	14.2	...	...	48
50	1568.5	157.2	156.8	1320.8	1361.9	268.2	1460.5	32	60.5	14.2	...	...	50
52	1619.3	162.1	163.6	1371.6	1412.7	276.4	1511.3	32	60.5	14.2	...	...	52
54	1701.8	169.9	171.5	1425.4	1470.2	289.1	1581.2	28	66.5	14.2	...	...	54
56	1752.6	174.8	176.3	1479.6	1527.0	298.5	1632.0	32	66.5	14.2	...	...	56
58	1803.4	177.8	180.8	1530.4	1577.8	306.3	1682.8	32	66.5	14.2	...	...	58
60	1886.0	185.7	185.0	1584.5	1635.3	319.0	1752.6	32	73.2	14.2	...	...	60

SIZE	CLASS 600 $\blacktriangle$												
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	FACE DIA.	OAL W/ FACE	DRILLING		FILLET RAD. (Min.)	(RTJ FACE)			
							B.C. DIA.	QTY. & SIZE		HEIGHT	r1	(E)	(K)
26	1016.0	108.0	125.5	747.8	749.3	222.3	914.4	28	50.8	12.7	12.7	809.3	26
28	1073.2	111.3	131.8	803.1	800.1	235.0	965.2	28	53.8	12.7	12.7	860.6	28
30	1130.3	114.3	139.7	862.1	857.3	247.7	1022.4	28	53.8	12.7	12.7	917.4	30
32	1193.8	117.3	147.6	917.4	914.4	260.4	1079.5	28	60.5	12.7	14.3	984.3	32
34	1244.6	120.7	153.9	973.1	965.2	269.7	1130.3	28	60.5	14.2	14.3	1035.1	34
36	1314.5	124.0	162.1	1031.7	1022.4	282.4	1193.8	28	66.5	14.2	14.3	1092.2	36
38	1270.0	152.4	155.4	1022.4	1054.1	254.0	1162.1	28	60.5	14.2	...	...	38
40	1320.8	158.8	162.1	1073.2	1111.3	263.7	1212.9	32	60.5	14.2	...	...	40
42	1403.4	168.1	171.5	1127.3	1168.4	279.4	1282.7	28	66.5	14.2	...	...	42
44	1454.2	173.0	177.8	1181.1	1225.6	289.1	1335.3	32	66.5	14.2	...	...	44
46	1511.3	179.3	185.7	1234.9	1276.4	300.0	1390.7	32	66.5	14.2	...	...	46
48	1593.9	189.0	195.3	1289.1	1333.5	316.0	1460.5	32	73.2	14.2	...	...	48
50	1670.1	196.9	203.2	1343.2	1384.3	328.7	1524.0	28	79.2	14.2	...	...	50
52	1720.9	203.2	209.6	1394.0	1435.1	336.6	1574.8	32	79.2	14.2	...	...	52
54	1778.0	209.6	217.4	1447.8	1492.3	349.3	1632.0	32	79.2	14.2	...	...	54
56	1854.2	217.4	225.6	1501.6	1543.1	362.0	1695.5	32	85.9	15.7	...	...	56
58	1905.0	222.3	231.6	1552.4	1600.2	369.8	1746.3	32	85.9	15.7	...	...	58
60	1993.9	233.4	242.8	1609.9	1657.4	388.9	1822.5	28	91.9	17.5	...	...	60

SIZE	CLASS 900 $\blacktriangle$												
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	FACE DIA.	OAL W/ FACE	DRILLING		FILLET RAD. (Min.)	(RTJ FACE)			
							B.C. DIA.	QTY. & SIZE		HEIGHT	r1	(E)	(K)
26	1085.9	139.7	160.3	774.7	749.3	285.8	952.5	20	73.2	11.2	17.5	831.9	26
28	1168.4	142.7	171.5	831.9	800.1	298.5	1022.4	20	79.2	12.7	17.5	889.0	28
30	1231.9	149.4	182.4	889.0	857.3	311.2	1085.9	20	79.2	12.7	17.5	946.2	30
32	1314.5	158.8	193.5	946.2	914.4	330.2	1155.7	20	85.9	12.7	17.5	1003.3	32
34	1397.0	165.1	204.7	1006.3	965.2	349.3	1225.6	20	91.9	14.2	20.6	1066.8	34
36	1460.5	171.5	214.4	1063.8	1022.4	362.0	1289.1	20	91.9	14.2	20.6	1124.1	36
38	1460.5	190.5	215.9	1073.2	1098.6	352.6	1289.1	20	91.9	19.1	...	...	38
40	1511.3	196.9	223.8	1127.3	1162.1	363.5	1339.9	24	91.9	20.6	...	...	40
42	1562.1	206.2	231.6	1176.3	1212.9	371.3	1390.7	24	91.9	20.6	...	...	42
44	1648.0	214.4	242.8	1234.9	1270.0	390.7	1463.5	24	98.6	22.4	...	...	44
46	1733.6	225.6	255.5	1292.4	1333.5	411.0							

# CARBON STEEL FLANGES • Dimensions

# ANSI B16.47 SERIE.B



SIZE	CLASS 75‡											SIZE
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	POINT OF WELD	FACE DIA.	OAL W/ FACE	DRILLING			FILLET RAD. (Min.)	
	O	C	C	X	A	R	Y	B.C. DIA.	QTY. & SIZE	r1		
26	762.0	33.3	33.3	676.1	661.9	704.9	58.7	723.9	36	19.1	7.9	26
28	812.8	33.3	33.3	726.9	712.7	755.7	62.0	774.7	40	19.1	7.9	28
30	863.6	33.3	33.3	777.7	763.5	806.5	65.0	825.5	44	19.1	7.9	30
32	914.4	35.1	36.6	828.5	814.3	857.3	69.9	876.3	48	19.1	7.9	32
34	965.2	35.1	38.1	879.3	865.1	908.1	73.2	927.1	52	19.1	7.9	34
36	1033.5	36.6	42.9	935.0	915.9	965.2	85.9	992.1	40	22.4	9.7	36
38	1084.3	38.1	44.5	985.8	966.7	1016.0	88.9	1042.9	40	22.4	9.7	38
40	1135.1	38.1	44.5	1036.6	1017.5	1066.8	91.9	1093.7	44	22.4	9.7	40
42	1185.9	39.6	47.8	1087.4	1068.3	1117.6	95.3	1144.5	48	22.4	9.7	42
44	1251.0	42.9	49.3	1140.0	1119.1	1174.8	104.6	1203.5	36	25.4	9.7	44
46	1301.8	44.5	50.8	1190.8	1169.9	1225.6	108.0	1254.3	40	25.4	9.7	46
48	1352.6	46.0	53.8	1241.6	1220.7	1276.4	111.3	1305.1	44	25.4	9.7	48
50	1403.4	47.8	55.4	1293.9	1271.5	1327.2	115.8	1355.9	44	25.4	9.7	50
52	1457.5	47.8	57.2	1344.7	1322.3	1378.0	120.7	1409.7	48	25.4	9.7	52
54	1508.3	49.3	60.5	1397.0	1373.1	1428.8	125.5	1460.5	48	25.4	9.7	54
56	1574.8	50.8	62.0	1450.8	1423.9	1485.9	134.9	1521.0	40	28.4	11.2	56
58	1625.6	52.3	63.5	1501.6	1474.7	1536.7	138.2	1571.8	44	28.4	11.2	58
60	1676.4	55.6	66.5	1552.4	1525.5	1587.5	144.5	1622.6	44	28.4	11.2	60

SIZE	CLASS 300‡											SIZE
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	POINT OF WELD	FACE DIA.	OAL W/ FACE	DRILLING			FILLET RAD. (Min.)	
	O	C	C	X	A	R	Y	B.C. DIA.	QTY. & SIZE	r1		
26	866.6	88.9	88.9	701.5	665.2	736.6	144.5	803.1	32	35.1	14.2	26
28	920.8	88.9	88.9	755.7	716.0	787.4	149.4	857.3	36	35.1	14.2	28
30	990.6	93.7	93.7	812.8	768.4	844.6	158.0	920.8	36	38.1	14.2	30
32	1054.1	103.1	103.1	863.6	819.2	901.7	168.1	977.9	32	41.1	15.7	32
34	1107.9	103.1	103.1	917.4	870.0	952.5	173.0	1031.7	36	41.1	15.7	34
36	1171.4	103.1	103.1	965.2	920.8	1005.7	180.8	1089.2	32	44.5	15.7	36
38	1222.2	111.3	111.3	1016.0	971.6	1066.5	192.0	1140.0	36	44.5	15.7	38
40	1273.0	115.8	115.8	1066.8	1022.4	1114.6	198.4	1190.8	40	44.5	15.7	40
42	1333.5	119.1	119.1	1117.6	1074.7	1168.4	204.7	1244.6	36	47.8	15.7	42
44	1384.3	127.0	127.0	1173.2	1125.5	1216.2	214.4	1295.4	40	47.8	15.7	44
46	1460.5	128.5	130.0	1228.9	1176.3	1270.0	222.3	1365.3	36	50.8	15.7	46
48	1511.3	128.5	134.9	1277.9	1227.1	1327.2	223.8	1416.1	40	50.8	15.7	48
50	1562.1	138.2	139.7	1330.5	1277.9	1378.0	235.0	1466.9	44	50.8	15.7	50
52	1612.9	142.7	144.3	1382.8	1328.7	1428.8	242.8	1517.7	48	50.8	15.7	52
54	1673.4	136.7	149.4	1435.1	1379.5	1479.6	239.8	1577.8	48	50.8	15.7	54
56	1765.3	153.9	157.0	1493.8	1430.3	1536.7	268.2	1651.0	36	60.5	17.5	56
58	1827.3	153.9	162.1	1547.9	1481.1	1593.9	274.6	1713.0	40	60.5	17.5	58
60	1878.1	150.9	166.6	1598.7	1531.9	1651.0	271.5	1763.8	40	60.5	17.5	60

SIZE	CLASS 150‡											SIZE
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	POINT OF WELD	FACE DIA.	OAL W/ FACE	DRILLING			FILLET RAD. (Min.)	
	O	C	C	X	A	R	Y	B.C. DIA.	QTY. & SIZE	r1		
26	785.9	41.1	44.5	684.3	661.9	711.2	88.9	744.5	36	22.4	9.7	26
28	836.7	44.5	47.8	735.1	712.7	762.0	95.3	795.3	40	22.4	9.7	28
30	941.3	44.5	50.8	787.4	763.5	812.8	100.1	846.1	44	22.4	9.7	30
32	941.3	46.0	53.8	839.7	814.3	863.6	108.0	900.2	48	22.4	9.7	32
34	1004.8	49.3	57.2	892.0	865.1	920.8	110.2	957.3	40	25.4	9.7	34
36	1057.1	52.3	58.7	944.6	915.9	971.6	117.3	1009.7	44	25.4	9.7	36
38	1124.0	53.8	63.5	997.0	968.2	1022.4	124.0	1069.8	40	28.4	9.7	38
40	1174.8	55.6	66.5	1049.3	1019.0	1079.5	128.5	1120.6	44	28.4	9.7	40
42	1225.6	58.7	68.3	1101.9	1069.8	1130.3	133.4	1171.4	48	28.4	11.2	42
44	1276.4	60.5	71.4	1152.7	1120.6	1181.1	136.7	1222.2	52	28.4	11.2	44
46	1341.4	62.0	74.7	1205.0	1171.4	1234.9	144.5	1284.2	40	31.8	11.2	46
48	1392.2	65.0	77.7	1257.3	1222.2	1289.1	149.4	1335.0	44	31.8	11.2	48
50	1443.0	68.3	80.8	1308.1	1273.0	1339.9	153.9	1385.8	48	31.8	11.2	50
52	1493.8	69.9	84.1	1360.4	1323.8	1390.7	157.2	1436.6	52	31.8	11.2	52
54	1549.4	71.4	87.4	1412.7	1374.6	1441.5	162.1	1492.3	56	31.8	11.2	54
56	1600.2	73.2	90.4	1465.3	1425.4	1492.3	166.6	1543.1	60	31.8	14.2	56
58	1674.9	74.7	93.5	1516.1	1476.2	1543.1	174.8	1611.4	48	35.1	14.2	58
60	1725.7	76.2	96.8	1570.0	1527.0	1600.2	179.3	1662.2	52	35.1	14.2	60

SIZE	CLASS 400▲											SIZE
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	POINT OF WELD	FACE DIA.	OAL W/ FACE	DRILLING			FILLET RAD. (Min.)	
	O	C	C	X	A	R	Y	B.C. DIA.	QTY. & SIZE	r1		
26	850.9	88.9	88.9	688.8	660.4	711.2	149.4	781.1	28	38.1	11.2	26
28	914.4	95.3	95.3	739.6	711.2	762.0	158.8	838.2	24	41.1	12.7	28
30	971.6	101.6	101.6	793.8	762.0	819.2	169.9	895.4	28	41.1	12.7	30
32	1035.1	108.0	108.0	844.6	812.8	873.3	179.3	952.5	28	44.5	12.7	32
34	1085.9	111.3	111.3	898.7	863.6	927.1	187.5	1003.3	32	44.5	14.2	34
36	1155.7	119.1	119.1	952.5	914.4	980.9	200.2	1066.8	28	47.8	14.2	36

SIZE	CLASS 600▲											SIZE
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	POINT OF WELD	FACE DIA.	OAL W/ FACE	DRILLING			FILLET RAD. (Min.)	
	O	C	C	X	A	R	Y	B.C. DIA.	QTY. & SIZE	r1		
26	889.0	111.3	111.3	698.5	660.4	726.9	180.8	806.5	28	44.5	12.7	26
28	952.5	115.8	115.8	752.3	711.2	784.4	190.5	863.6	28	47.8	12.7	28
30	1022.4	125.5	127.0	806.5	762.0	841.2	204.7	927.1	28	50.8	12.7	30
32	1085.9	130.0	134.9	860.6	812.8	895.4	215.9	984.3	28	53.8	12.7	32
34	1162.1	141.2	144.3	914.4	863.6	952.5	233.4	1054.1	24	60.5	14.2	34
36	1212.9	146.1	150.9	968.2	914.4	1005.7	242.8	1104.9	28	60.5	14.2	36

SIZE	CLASS 900▲											SIZE
	O.D.	THK (Min.) WN	THK (Min.) BLD	DIA. OF HUB	POINT OF WELD	FACE DIA.	OAL W/ FACE	DRILLING			FILLET RAD. (Min.)	
	O	C	C	X	A	R	Y	B.C. DIA.	QTY. & SIZE	r1		
26	1022.4	134.9	153.9	743.0	660.4	762.0	258.8	901.7	20	66.5	11.2	26
28	1104.9	147.6	166.6	797.1	711.2	819.2	276.4	971.6	20	73.2	12.7	28
30	1181.1	155.4	176.0	850.9	762.0	876.3	289.1	1035.1	20	79.2	12.7	30
32	1238.3	160.3	185.7	908.1	812.8	927.1	303.3	1092.2	20	79.2	12.7	32
34	1314.5	171.5	195.1	962.2	863.6	990.6	319.0	1155.7	20	85.9	14.2	34
36	1346.2	173.0	201.7	1016.0	914.4	1028.7	325.4	1200.2	24	79.2	14.2	36

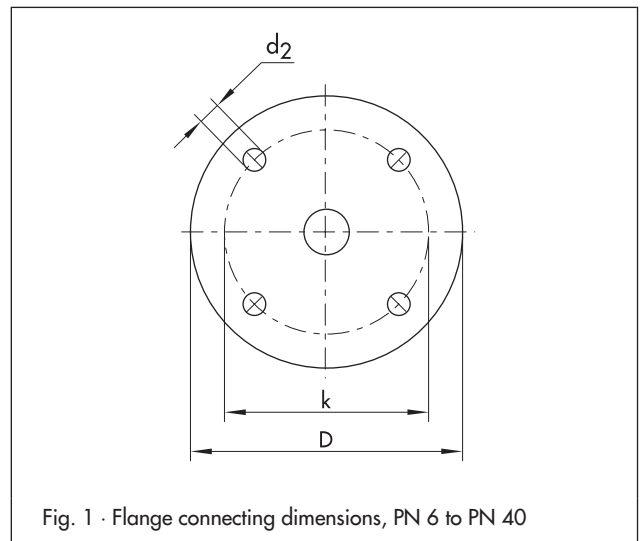
‡ RAISED FACE FLANGES ARE FURNISHED WITH 1.6mm FACE HEIGHT. ("C" AND "Y" DIMENSIONS INCLUDE FACE HEIGHT)

▲ RAISED FACE FLANGES ARE FURNISHED WITH 6.4mm FACE HEIGHT. ("C" AND "Y" DIMENSIONS DO NOT INCLUDE FACE HEIGHT)

# Flange connecting dimensions for PN 6, PN 10, PN 16, PN 25 and PN 40

## Connecting dimensions according to DIN EN 1092-1 and DIN 2501-1<sup>1)</sup>

Fig. 1 shows the schematic arrangement of the bolt holes, not their exact number.  
For the exact number of bores, refer to Table 1, column "No. n".



<sup>1)</sup> Flange connecting dimensions for PN 160, PN 250 and PN 320 correspond to the specifications in DIN 2501-1

Fig. 1 · Flange connecting dimensions, PN 6 to PN 40

**Table 1** · Connecting dimensions for PN 6, PN 10, PN 16, PN 25 and PN 40

Dimensions in mm

Nominal size	PN 6				PN 10				PN 16				PN 25				PN 40			
	Outside Ø	Bolt circle Ø	Bolt holes No.	Ø	Outside Ø	Bolt circle Ø	Bolt holes No.	Ø	Outside Ø	Bolt circle Ø	Bolt holes No.	Ø	Outside Ø	Bolt circle Ø	Bolt holes No.	Ø	Outside Ø	Bolt circle Ø	Bolt holes No.	Ø
	D	k	n	d <sub>2</sub>	D	k	n	d <sub>2</sub>	D	k	n	d <sub>2</sub>	D	k	n	d <sub>2</sub>	D	k	n	d <sub>2</sub>
15	80	55	4	11	95	65	4	14	95	65	4	14	95	65	4	14	95	65	4	14
20	90	65	4	11	105	75	4	14	105	75	4	14	105	75	4	14	105	75	4	14
25	100	75	4	11	115	85	4	14	115	85	4	14	115	85	4	14	115	85	4	14
32	120	90	4	14	140	100	4	18	140	100	4	18	140	100	4	18	140	100	4	18
40	130	100	4	14	150	110	4	18	150	110	4	18	150	110	4	18	150	110	4	18
50	140	110	4	14	165	125	4	18	165	125	4	18	165	125	4	18	165	125	4	18
65	160	130	4	14	185	145	8	18	185	145	8 <sup>1)</sup>	18	185	145	8	18	185	145	8	18
80	190	150	4	18	200	160	8	18	200	160	8	18	200	160	8	18	200	160	8	18
100	210	170	4	18	220	180	8	18	220	180	8	18	235	190	8	22	235	190	8	22
125	240	200	8	18	250	210	8	18	250	210	8	18	270	220	8	26	270	220	8	26
150	265	225	8	18	285	240	8	22	285	240	8	22	300	250	8	26	300	250	8	26
200	320	280	8	18	340	295	8	22	340	295	12	22	360	310	12	26	375	320	12	30
250	375	335	12	18	395	350	12	22	405	355	12	26	425	370	12	30	450	385	12	33
300	440	395	12	22	445	400	12	22	460	410	12	26	485	430	16	30	515	450	16	33
350	490	445	12	22	505	460	16	22	520	470	16	26	555	490	16	33	580	510	16	36
400	540	495	16	22	565	515	16	26	580	525	16	30	620	550	16	36	660	585	16	39

<sup>1)</sup> According to EN 1092-2 (cast iron flanges) and EN 1092-3 (copper alloy flanges), flanges in this PN and DN may be delivered with four bolt holes. If steel flanges with four holes are required, they may be delivered after prior consultation between manufacturer and customer.

# Flange connecting dimensions for PN 63, PN 100, PN 160, PN 250 and PN 320

Flange connecting dimensions for **PN 160, PN 250** and **PN 320** correspond to the specifications in **DIN 2501-1**.

Fig. 2 shows the schematic arrangement of the bolt holes, not their exact number.

For the exact number of bores, refer to Table 2, column "No. n".

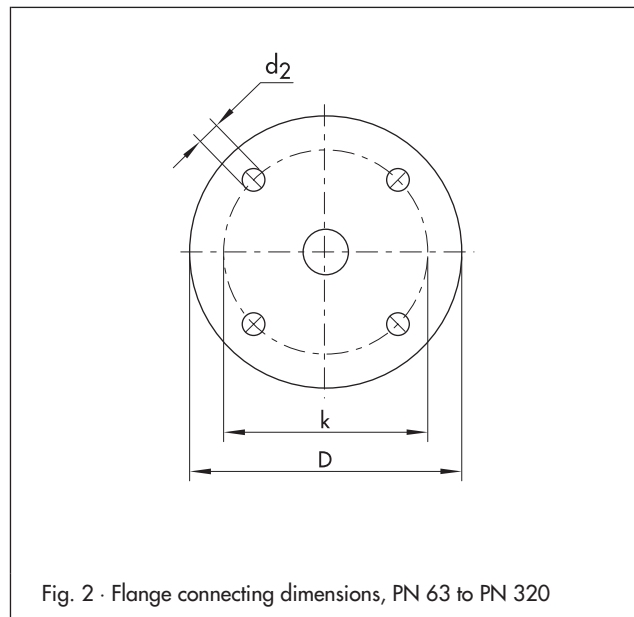


Fig. 2 · Flange connecting dimensions, PN 63 to PN 320

**Table 2** · Connecting dimensions, PN 63, PN 100, PN 160, PN 250 and PN 320

Dimensions in mm

Nominal size	PN 63				PN 100				PN 160				PN 250				PN 320			
	Outside Ø	Bolt circle Ø	Bolt holes No.	Bolt holes Ø	Outside Ø	Bolt circle Ø	Bolt holes No.	Bolt holes Ø	Outside Ø	Bolt circle Ø	Bolt holes No.	Bolt holes Ø	Outside Ø	Bolt circle Ø	Bolt holes No.	Bolt holes Ø	Outside Ø	Bolt circle Ø	Bolt holes No.	Bolt holes Ø
	D	k	n	d <sub>2</sub>	D	k	n	d <sub>2</sub>	D	k	n	d <sub>2</sub>	D	k	n	d <sub>2</sub>	D	k	n	d <sub>2</sub>
<b>15</b>	105	75	4	14	105	75	4	14	105	75	4	14	130	90	4	18	130	90	4	18
<b>20</b>	130	90	4	18																
<b>25</b>	140	100	4	18	140	100	4	18	140	100	4	18	150	105	4	22	160	115	4	22
<b>32</b>	155	110	4	22	155	110	4	22	–	–	–	–	–	–	–	–	–	–	–	–
<b>40</b>	170	125	4	22	170	125	4	22	170	125	4	22	185	135	4	26	195	145	4	26
<b>50</b>	180	135	4	22	195	145	4	26	195	145	4	26	200	150	8	26	210	160	8	26
<b>65</b>	205	160	8	22	220	170	8	26	220	170	8	26	230	180	8	26	255	200	8	30
<b>80</b>	215	170	8	22	230	180	8	26	230	180	8	26	255	200	8	30	275	220	8	30
<b>100</b>	250	200	8	26	265	210	8	30	265	210	8	30	300	235	8	33	335	265	8	36
<b>125</b>	295	240	8	30	315	250	8	33	315	250	8	33	340	275	12	33	380	310	12	36
<b>150</b>	345	280	8	33	355	290	12	33	355	290	12	33	390	320	12	36	425	350	12	39
<b>200</b>	415	345	12	36	430	360	12	36	430	360	12	36	485	400	12	42	525	440	16	42
<b>250</b>	470	400	12	36	505	430	12	39	515	430	12	42	585	490	16	48	640	540	16	52
<b>300</b>	530	460	16	36	585	500	16	42	585	500	16	42	690	590	16	52	–	–	–	–
<b>350</b>	600	525	16	39	655	560	16	48	–	–	–	–	–	–	–	–	–	–	–	–
<b>400</b>	670	585	16	42	715	620	16	48	–	–	–	–	–	–	–	–	–	–	–	–



# ASME B16.20 SPIRAL WOUND GASKET DIMENSIONS

## STYLE CG & CGI\* TO ASME B16.20 TO SUIT ASME B16.5 FLANGES

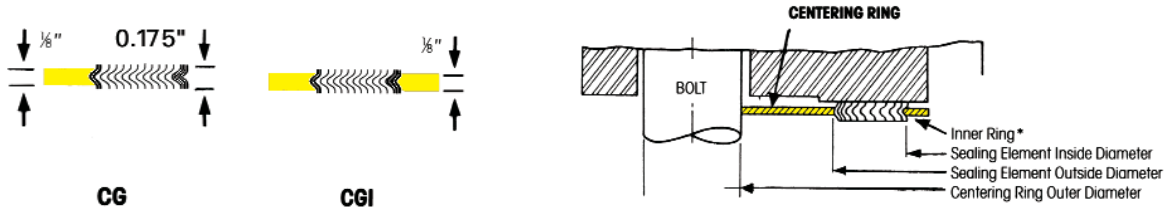


TABLE  
1

NOM PIPE SIZE	OUTSIDE DIAMETER OF SEALING ELEMENT		INNER DIAMETER OF SEALING ELEMENT							OUTER DIAMETER OF CENTERING RING						
	CLASS 150, 300, 400, 600	CLASS 900, 1500, 2500	CLASS 150	CLASS 300	CLASS 400	CLASS 600	CLASS 900	CLASS 1500	CLASS 2500	CLASS 150	CLASS 300	CLASS 400	CLASS 600	CLASS 900	CLASS 1500	CLASS 2500
1/4	7/8	-	1/2	1/2	1/2	1/2	-	-	-	1-3/4	1-3/4	1-3/4	1-3/4	-	-	-
1/2	1-1/4	1-1/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1-7/8	2-1/8	2-1/8	2-1/8	2-1/2	2-1/2	2-3/4
3/4	1-9/16	1-9/16	1	1	1	1	1	1	1	2-1/4	2-5/8	2-5/8	2-5/8	2-3/4	2-3/4	3
1	1-7/8	1-7/8	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	2-5/8	2-7/8	2-7/8	2-7/8	3-1/8	3-1/8	3-3/8
1-1/4	2-3/8	2-3/8	1-7/8	1-7/8	1-7/8	1-7/8	1-9/16	1-9/16	1-9/16	3	3-1/4	3-1/4	3-1/4	3-1/2	3-1/2	4-1/8
1-1/2	2-3/4	2-3/4	2-1/8	2-1/8	2-1/8	2-1/8	1-7/8	1-7/8	1-7/8	3-3/8	3-3/4	3-3/4	3-3/4	3-7/8	3-7/8	4-5/8
2	3-3/8	3-3/8	2-3/4	2-3/4	2-3/4	2-3/4	2-5/16	2-5/16	2-5/16	4-1/8	4-3/8	4-3/8	4-3/8	5-5/8	5-5/8	5-3/4
2-1/2	3-7/8	3-7/8	3-1/4	3-1/4	3-1/4	3-1/4	2-3/4	2-3/4	2-3/4	4-7/8	5-1/8	5-1/8	5-1/8	6-1/2	6-1/2	6-5/8
3	4-3/4	4-3/4	4	4	4	4	3-3/4	3-5/8	3-5/8	5-3/8	5-7/8	5-7/8	5-7/8	6-5/8	6-7/8	7-3/4
3-1/2	5-1/4	5-1/4	4-1/2	4-1/2	4-1/8	4-1/8	4-1/8	4-1/8	-	6-3/8	6-1/2	6-3/8	6-3/8	7-1/2	7-3/8	-
4	5-7/8	5-7/8	5	5	4-3/4	4-3/4	4-3/4	4-5/8	4-5/8	6-7/8	7-1/8	7	7-5/8	8-1/8	8-1/4	9-1/4
4-1/2	6-1/2	6-1/2	5-1/2	5-1/2	5-5/16	5-5/16	5-5/16	5-5/16	-	7	7-3/4	7-5/8	8-1/4	9-3/8	9-1/8	-
5	7	7	6-1/8	6-1/8	5-13/16	5-13/16	5-13/16	5-5/8	5-5/8	7-3/4	8-1/2	8-3/8	9-1/2	9-3/4	10	11
6	8-1/4	8-1/4	7-3/16	7-3/16	6-7/8	6-7/8	6-7/8	6-3/4	6-3/4	8-3/4	9-7/8	9-3/4	10-1/2	11-3/8	11-1/8	12-1/2
8	10-3/8	10-1/8	9-3/16	9-3/16	8-7/8	8-7/8	8-3/4	8-1/2	8-1/2	11	12-1/8	12	12-5/8	14-1/8	13-7/8	15-1/4
10	12-1/2	12-1/4	11-5/16	11-5/16	10-13/16	10-13/16	10-7/8	10-1/2	10-5/8	13-3/8	14-1/4	14-1/8	15-3/4	17-1/8	17-1/8	18-3/4
12	14-3/4	14-1/2	13-3/8	13-3/8	12-7/8	12-7/8	12-3/4	12-3/4	12-1/2	16-1/8	16-5/8	16-1/2	18	19-5/8	20-1/2	21-5/8
14	16	15-3/4	14-5/8	14-5/8	14-1/4	14-1/4	14	14-1/4	-	17-3/4	19-1/8	19	19-3/8	20-1/2	22-3/4	-
16	18-1/4	18	16-5/8	16-5/8	16-1/4	16-1/4	16-1/4	16	-	20-1/4	21-1/4	21-1/8	22-1/4	22-5/8	25-1/4	-
18	20-3/4	20-1/2	18-11/16	18-11/16	18-1/2	18-1/2	18-1/4	18-1/4	-	21-5/8	23-1/2	23-3/8	24-1/8	25-1/8	27-3/4	-
20	22-3/4	22-1/2	20-11/16	20-11/16	20-1/2	20-1/2	20-1/2	20-1/4	-	23-7/8	25-3/4	25-1/2	26-7/8	27-1/2	29-3/4	-
24	27	26 3/4	24-3/4	24-3/4	24-3/4	24-3/4	24-3/4	24-1/4	-	28-1/4	30-1/2	30-1/4	31-1/8	33	35-1/2	-

DIMENSIONS IN INCHES.

\*For Style CGI - see Table 3 for Inner Ring dimensions

Gasket sizes 1/4" to 3" Class 300, 400 & 600 as well as sizes 1/2" to 2-1/2" Class 900 & 1500 are identical within their respective nominal pipe sizes, therefore inventories need not be duplicated.

In accordance with ASME B16.20, Inner Rings are mandatory for the following flange designations (see Table 3).

Class 900 - NPS 24 to 48

Class 1500 - NPS 12 to NPS 24

Class 2500 - NPS 4 to NPS 12

All PTFE filled gaskets

All flexible graphite gaskets unless otherwise requested by the customer

ASME B16.20 does not include dimensions for NPS 1/4, 3-1/2, or 4-1/2, or Class 400 Flanges up to NPS 3 and Class 900 Flanges up to NPS 2-1/2.

# ASME B16.20 SPIRAL WOUND GASKET DIMENSIONS

## STYLE CG & CGI\* TO ASME B16.20 TO SUIT ASME B16.5 FLANGES

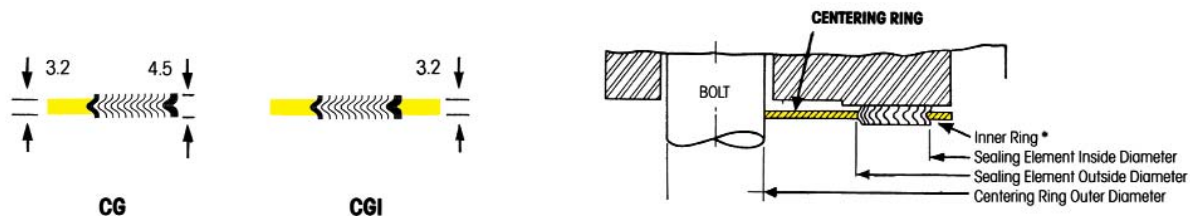


TABLE  
2

NOM PIPE SIZE	OUTSIDE DIAMETER OF SEALING ELEMENT		INNER DIAMETER OF SEALING ELEMENT							OUTER DIAMETER OF CENTERING RING						
	CLASS 150, 300, 400, 600	CLASS 900, 1500, 2500	CLASS 150	CLASS 300	CLASS 400	CLASS 600	CLASS 900	CLASS 1500	CLASS 2500	CLASS 150	CLASS 300	CLASS 400	CLASS 600	CLASS 900	CLASS 1500	CLASS 2500
1/4	22.2	-	12.7	12.7	12.7	12.7	-	-	-	44.5	44.5	44.5	44.5	-	-	-
1/2	31.8	31.8	19.1	19.1	19.1	19.1	19.1	19.1	19.1	47.8	54.1	54.1	54.1	63.5	63.5	69.9
3/4	39.6	39.6	25.4	25.4	25.4	25.4	25.4	25.4	25.4	57.2	66.8	66.8	66.8	69.9	69.9	76.2
1	47.8	47.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	66.8	73.2	73.2	73.2	79.5	79.5	85.9
1-1/4	60.5	60.5	47.8	47.8	47.8	47.8	39.6	39.6	39.6	76.2	82.6	82.6	82.6	88.9	88.9	104.9
1-1/2	69.9	69.9	54.1	54.1	54.1	54.1	47.8	47.8	47.8	85.9	95.3	95.3	95.3	98.6	98.6	117.6
2	85.9	85.9	69.9	69.9	69.9	69.9	58.7	58.7	58.7	104.9	111.3	111.3	111.3	143.0	143.0	146.1
2-1/2	98.6	98.6	82.6	82.6	82.6	82.6	69.9	69.9	69.9	124.0	130.3	130.3	130.3	165.1	165.1	168.4
3	120.7	120.7	101.6	101.6	101.6	101.6	95.3	92.2	92.2	136.7	149.4	149.4	149.4	168.4	174.8	196.9
3-1/2	133.4	133.4	114.3	114.3	104.8	104.8	104.8	104.8	-	161.9	165.1	161.9	161.9	190.5	187.3	-
4	149.4	149.4	127.0	127.0	120.7	120.7	120.7	117.6	117.6	174.8	181.1	177.8	193.8	206.5	209.6	235.0
4-1/2	165.1	165.1	139.7	139.7	134.9	134.9	134.9	134.9	-	177.8	196.9	193.7	209.6	238.1	231.8	-
5	177.8	177.8	155.7	155.7	147.6	147.6	147.6	143.0	143.0	196.9	215.9	212.9	241.3	247.7	254.0	279.4
6	209.6	209.6	182.6	182.6	174.8	174.8	174.8	171.5	171.5	222.3	251.0	247.7	266.7	289.1	282.7	317.5
8	263.7	257.3	233.4	233.4	225.6	225.6	222.3	215.9	215.9	279.4	308.1	304.8	320.8	358.9	352.6	387.4
10	317.5	311.2	287.3	287.3	274.6	274.6	276.4	266.7	270.0	339.9	362.0	358.9	400.1	435.1	435.1	476.3
12	374.7	368.3	339.9	339.9	327.2	327.2	323.9	323.9	317.5	409.7	422.4	419.1	457.2	498.6	520.7	549.4
14	406.4	400.1	371.6	371.6	362.0	362.0	355.6	362.0	-	450.9	485.9	482.6	492.3	520.7	577.9	-
16	463.6	457.2	422.4	422.4	412.8	412.8	412.8	406.4	-	514.4	539.8	536.7	565.2	574.8	641.4	-
18	527.1	520.7	474.7	474.7	469.9	469.9	463.6	463.6	-	549.4	596.9	593.9	612.9	638.3	704.9	-
20	577.9	571.5	525.5	525.5	520.7	520.7	520.7	514.4	-	606.6	654.1	647.7	682.8	698.5	755.7	-
24	685.8	679.5	628.7	628.7	628.7	628.7	628.7	616.0	-	717.6	774.7	768.4	790.7	838.2	901.7	-

DIMENSIONS IN MILLIMETERS.

\*For Style CGI - see Table 3 for Inner Ring dimensions.

Gasket sizes 1/4" to 3" Class 300, 400 & 600 as well as sizes 1/2" to 2-1/2" Class 900 & 1500 are identical within their respective nominal pipe sizes, therefore inventories need not be duplicated.

In accordance with ASME B16.20, Inner Rings are mandatory for the following flange designations (see Table 3).

- Class 900 - NPS 24 to 48
- Class 1500 - NPS 12 to NPS 24
- Class 2500 - NPS 4 to NPS 12
- All PTFE filled gaskets

All flexible graphite gaskets unless otherwise requested by the customer

ASME B16.20 does not include dimensions for NPS 1/4, 3-1/2, or 4-1/2, or Class 400 Flanges up to NPS 3 and Class 900 Flanges up to NPS 2-1/2.

# ASME B16.20 SPIRAL WOUND GASKET DIMENSIONS

## STANDARD INSIDE DIAMETERS OF INNER RINGS FOR STYLE CGI GASKETS TO ASME B16.20 TO SUIT ASME B16.5 FLANGES

See Table 4 for small diameter screwed and slip-on flanges.

TABLE 3

NON PIPE SIZE	PRESSURE CLASS													
	150		300		400		600		900		1500		2500	
1/2	0.56	14.22	0.56	14.22	0.56	14.22	0.56	14.22	0.56	14.22	0.56	14.22	0.56	14.22
3/4	0.81	20.57	0.81	20.57	0.81	20.57	0.81	20.57	0.81	20.57	0.81	20.57	0.81	20.57
1	1.06	26.92	1.06	26.92	1.06	26.92	1.06	26.92	1.06	26.92	1.06	26.92	1.06	26.92
1-1/4	1.50	38.10	1.50	38.10	1.50	38.10	1.50	38.10	1.31	33.27	1.31	33.27	1.31	33.27
1-1/2	1.75	44.45	1.75	44.45	1.75	44.45	1.75	44.45	1.63	41.40	1.63	41.40	1.63	41.40
2	2.19	55.63	2.19	55.63	2.19	55.63	2.19	55.63	2.06	52.32	2.06	52.32	2.06	52.52
2-1/2	2.62	66.55	2.62	66.55	2.62	66.55	2.62	66.55	2.50	63.60	2.50	63.50	2.50	63.50
3	3.19	81.03	3.19	81.03	3.19	81.03	3.19	81.03	3.10	78.74	3.10	78.74	3.10	78.74
4	4.19	106.43	4.19	106.43	4.04	102.62	4.04	102.62	4.04	102.62	3.85	97.79	3.85	97.79
5	5.19	131.83	5.19	131.63	5.05	128.27	5.05	128.27	5.05	128.27	4.90	124.46	4.90	124.46
6	6.19	157.23	6.19	157.23	6.10	154.64	6.10	154.94	6.10	154.95	5.80	147.32	5.80	147.32
8	8.50	215.90	8.50	215.90	8.10	205.74	8.10	205.74	7.75	196.85	7.75	196.85	7.75	196.85
10	10.56	288.22	10.56	268.22	10.05	255.27	10.05	255.27	9.69	246.13	9.69	246.13	9.69	246.13
12	12.50	317.50	12.50	317.50	12.10	307.34	12.10	307.34	11.50	292.10	11.50	292.10	11.50	292.10
14	13.75	349.28	13.75	349.25	13.50	342.80	13.50	342.90	12.63	320.80	12.63	320.80	-	-
16	15.75	400.05	15.75	400.05	15.35	389.89	15.35	389.89	14.75	374.65	14.50	388.30	-	-
18	17.69	449.33	17.69	449.33	17.25	438.15	17.25	438.15	16.75	425.45	16.75	425.45	-	-
20	19.69	500.13	19.69	500.13	19.25	488.95	19.25	488.95	19.00	482.60	18.75	476.25	-	-
24	23.75	603.25	23.75	603.25	23.25	590.55	23.25	590.65	23.25	590.55	22.75	577.85	-	-

DIMENSIONS IN INCHES & MILLIMETERS.

In accordance with ASME B16.20, Inner Rings are mandatory for the following flange designations (see Table 3).

Class 900 - NPS 24 to 48

Class 1500 - NPS 12 to NPS 24

Class 2500 - NPS 4 to NPS 12

All PTFE filled gaskets

All flexible graphite gaskets unless otherwise requested by the customer

ASME B16.20 does not include dimensions for NPS 1/4, 3-1/2, or 4-1/2, or Class 400 Flanges up to NPS 3 and Class 900 Flanges up to NPS 2-1/2.

## STYLE CG & CGI TO SUIT ASME B16.5 & BS 1560 SMALL DIAMETER SCREWED OR SLIP-ON FLANGES

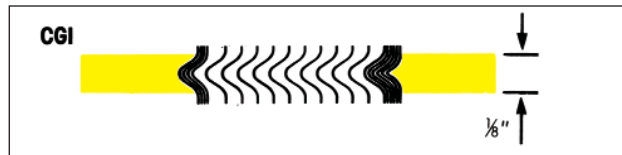
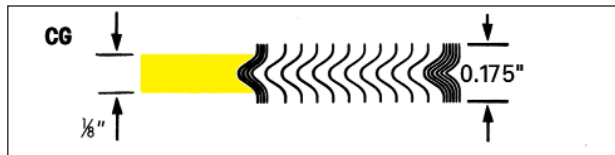


TABLE 4

Nom. Pipe Size	Inner Ring Inside Dia.		Sealing Element				Guide Ring Outside Diameter											
			Inside Dia.		Outside Dia.		Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500	
1/4	-	-	9/16	14.3	7/8	22.2	1-3/4	44.5	1-3/4	44.5	1-3/4	44.5	1-3/4	44.5	-	-	-	-
1/2	9/16	14.3	15/16	23.8	1-1/4	31.8	1-7/8	47.6	2-1/8	54.0	2-1/8	54.0	2-1/8	54.0	2-1/2	63.5	2-1/2	63.5
3/4	13/16	20.6	1-3/16	30.2	1-9/16	39.7	2-1/4	57.2	2-5/8	66.7	2-5/8	66.7	2-5/8	66.7	2-3/4	69.9	2-3/4	69.9
1	1-1/16	27.0	1-7/16	36.5	1-7/8	47.6	2-5/8	66.7	2-7/8	73.0	2-7/8	73.0	2-7/8	73.0	3-1/8	79.4	3-1/8	79.4
1-1/4	1-3/8	34.9	1-7/8	47.6	2-3/8	60.3	3	76.2	3-1/4	82.6	3-1/4	82.6	3-1/4	82.6	3-1/2	88.9	3-1/2	88.9
1-1/2	1-5/8	41.3	2-1/8	54.0	2-3/4	69.9	3-3/8	85.7	3-3/4	95.3	3-3/4	95.3	3-3/4	95.3	3-7/8	98.4	3-7/8	98.4

DIMENSIONS IN INCHES & MILLIMETERS.

NOTE: The above style CG & CGI spiral wound gaskets are dimensioned to suit existing screwed or slip-on flanges for NPS 1/4 to 1-1/2 ASME B16.5 & BS 1560 flanges.

# SOFT-CUT GASKET DIMENSIONS

## Dimensions to suit ANSI Standard Flanges ASME B16.21 Class 150

Nominal Bore (inches)	I.B.C. Gasket	Full Face gasket			
	OD x ID (mm)	OD x ID (mm)	Number of Bolt Holes	Hole Diameter (mm)	Bolt P.C.D. (mm)
1/2	48 x 21	89 x 21	4	16	60
3/4	57 x 27	95 x 27	4	16	70
1	67 x 33	108 x 33	4	16	79
1 1/4	76 x 42	117 x 42	4	16	89
1 1/2	86 x 48	127 x 48	4	16	98
2	105 x 60	152 x 60	4	19	121
2 1/2	124 x 73	178 x 73	4	19	140
3	137 x 89	191 x 89	4	19	152
3 1/2	162 x 102	216 x 102	8	19	178
4	175 x 114	229 x 114	8	19	191
5	197 x 141	254 x 141	8	22	216
6	222 x 168	279 x 168	8	22	241
8	279 x 219	343 x 219	8	22	298
10	340 x 273	406 x 273	12	25	362
12	410 x 324	483 x 324	12	25	432
14	451 x 356	533 x 356	12	29	476
16	514 x 406	597 x 406	16	29	540
18	549 x 457	635 x 457	16	32	578
20	606 x 508	699 x 508	20	32	635
24	718 x 610	813 x 610	20	35	749

## ASME B16.21 Class 300

Nominal Bore (inches)	I.B.C. Gasket	Full Face gasket			
	OD x ID (mm)	OD x ID (mm)	Number of Bolt Holes	Hole Diameter (mm)	Bolt P.C.D. (mm)
1/2	54 x 21	95 x 21	4	16	67
3/4	67 x 27	117 x 27	4	19	83
1	73 x 33	124 x 33	4	19	89
1 1/4	83 x 42	133 x 42	4	19	98
1 1/2	95 x 48	156 x 48	4	22	114
2	111 x 60	165 x 60	8	19	127
2 1/2	130 x 73	191 x 73	8	22	149
3	149 x 89	210 x 89	8	22	168
3 1/2	165 x 102	229 x 102	8	22	184
4	181 x 114	254 x 114	8	22	200
5	216 x 141	279 x 141	8	22	235
6	251 x 168	318 x 168	12	22	270
8	308 x 219	381 x 219	12	25	330
10	362 x 273	445 x 273	16	29	387
12	422 x 324	521 x 324	16	32	451
14	486 x 356	584 x 356	20	32	514
16	540 x 406	648 x 406	20	35	572
18	597 x 457	711 x 457	24	35	629
20	654 x 508	775 x 508	24	35	686
24	775 x 610	914 x 610	24	41	813

## PN16

Nominal Bore	IBC Gasket	Full Face gasket			
	OD x ID (mm)	OD x ID (mm)	Number of Bolt Holes	Hole Diameter (mm)	Bolt P.C.D. (mm)
10	45 x 18	90 x 18	4	14	60
15	50 x 22	95 x 22	4	14	65
20	60 x 28	105 x 28	4	14	75
25	70 x 35	115 x 35	4	14	85
32	82 x 43	140 x 43	4	18	100
40	92 x 49	150 x 49	4	18	110
50	107 x 61	165 x 61	4	18	125
65	127 x 77	185 x 77	8*	18	145
80	142 x 90	200 x 90	8	18	160
100	162 x 115	220 x 115	8	18	180
125	192 x 141	250 x 141	8	18	210
150	218 x 169	285 x 169	8	22	240
200	273 x 220	340 x 220	12	22	295
250	329 x 274	405 x 274	12	26	355
300	384 x 325	460 x 325	12	26	410
350	444 x 356	520 x 356	16	26	470
400	495 x 407	580 x 407	16	30	525
450	555 x 458	640 x 458	20	30	585
500	617 x 508	715 x 508	20	33	650
600	734 x 610	840 x 610	20	36	770
700	804 x 712	910 x 712	24	36	840
800	911 x 813	1025 x 813	24	39	950
900	1011 x 915	1125 x 915	28	39	1050
1000	1128 x 1016	1255 x 1016	28	42	1170
1100	1228 x 1120	1355 x 1120	32	42	1270
1200	1342 x 1220	1485 x 1220	32	48	1390
1400	1542 x 1420	1685 x 1420	36	48	1590
1500	1654 x 1520	1820 x 1520	36	56	1710
1600	1764 x 1620	1930 x 1620	40	56	1820
1800	1964 x 1820	2130 x 1820	44	56	2020
2000	2168 x 2020	2345 x 2020	48	62	2230

\* Gaskets for cast iron and copper alloy flanges may have 4 bolt holes

## PN25

Nominal Bore	IBC Gasket	Full Face gasket			
	OD x ID (mm)	OD x ID (mm)	Number of Bolt Holes	Hole Diameter (mm)	Bolt P.C.D. (mm)
10	45 x 18	90 x 18	4	14	60
15	50 x 22	95 x 22	4	14	65
20	60 x 28	105 x 28	4	14	75
25	70 x 35	115 x 35	4	14	85
32	82 x 43	140 x 43	4	18	100
40	92 x 49	150 x 49	4	18	110
50	107 x 61	165 x 61	4	18	125
65	127 x 77	185 x 77	8	18	145
80	142 x 90	200 x 90	8	18	160

# ASME B16.11 FORGED FITTINGS DIMENSIONS

## FORGED STEEL HIGH PRESSURE FITTINGS 3000 lb & 6000 lb

### SCREWED & SOCKET WELD

These Fittings are designed for use with American Standard Linepipe.

3000lb Fittings are for use with SCH 80 Pipe.

6000lb Fittings are for use with XXS Linepipe (Threaded) or SCH 160 for Socketweld.

These fittings must be used within the Pressure / Temperature limitations of the associated Pipe.

### SPECIFICATIONS

#### DIMENSIONS

Fittings – ASME B16.11 OR BS 3799

Unions – MSS-SP-83-1995

#### MATERIAL

Forgings ASTM A105N

Equivalent Bar Stock

#### FINISH

Phosphate or self coloured

#### THREADS

Stocked in NPT – BSP available if required

### WORKING PRESSURES

#### Possible Temperature Limitations

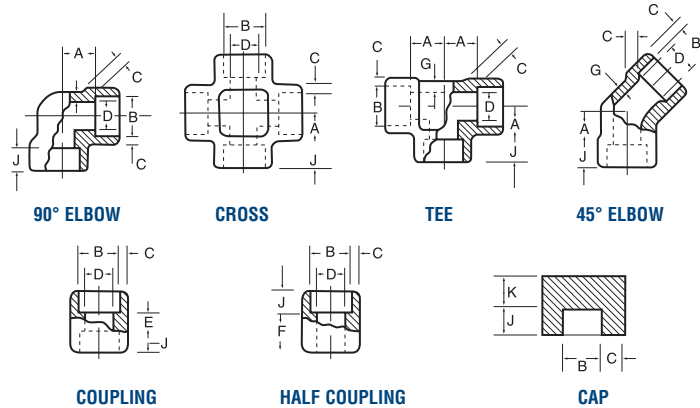
Nominal Pressure Ratings	TEMPERATURE°																		
	38	66	93	121	149	177	204	232	260	288	316	343	371	399	427	427+	482+	510*	538*
2000lb	13780	13573	13366	13194	13056	12918	12746	12470	11954	11299	10610	9852	8991	8130	6993	5718	4237	2928	1619
3000lb	20670	20359	20084	19808	19602	19360	19119	18706	17948	16949	15915	14813	13504	12229	10507	8612	6373	4409	2445
6000lb	41340	40754	40168	39617	39232	38756	38239	37412	37412	33933	31831	29627	27008	24459	21014	17225	12780	8853	4926

Non-shock Working Pressures tabulated in kPa

+ These pressures are in accordance with ANSI Code for Pressure Piping (ASME B31.1)

\* Suggest Alloy Steel above 482°C.

### SOCKET WELD

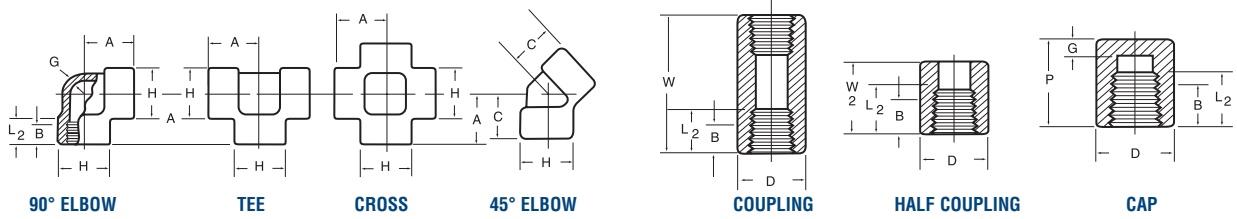


### SOCKET WELD FITTINGS Dimensions in mm

SIZE	BORE B	BORE D MAX/MIN CLASS		SOCKET WALL C MIN CLASS		BODY WALL G MIN CLASS		SOCKET DEPTH J MIN	CENTER TO BOTTOM OF SOCKET A				LAYING LENGTH		END WALL THICKNESS K MIN CLASS	
		3000	6000	3000	6000	3000	6000		90 ELBOWS, TEES, CROSSES CLASS		45 ELBOWS CLASS		COUPLING E	HALF COUP F	3000	6000
									3000	6000	3000	6000				
6	11.2/10.8	7.6/6.1	4.8/3.2	3.18	3.43	2.41	3.15	9.5	11.00	11.00	8.00	8.00	6.5	16.0	4.8	6.4
8	14.6/14.2	10.0/8.5	7.1/5.6	3.30	4.01	3.02	2.68	9.5	11.00	13.50	8.00	8.00	6.5	16.0	4.8	6.4
10	18.0/17.6	13.3/11.8	9.9/8.4	3.50	4.37	3.20	4.01	9.5	13.50	15.50	8.00	11.00	6.5	17.5	4.8	6.4
15	22.2/21.8	16.6/15.0	12.5/11.0	4.09	5.18	3.73	4.78	9.5	15.50	19.00	11.00	12.50	9.5	22.5	6.4	7.9
20	27.6/27.2	21.7/20.2	16.3/14.8	4.27	6.04	3.91	5.56	12.5	19.00	22.50	13.00	14.00	9.5	24.0	6.4	7.9
25	34.3/33.9	27.4/25.9	21.5/19.9	4.98	6.93	4.55	6.35	12.5	22.50	27.00	14.00	17.00	12.5	28.5	9.6	11.2
32	43.1/42.7	35.8/34.3	30.2/28.7	5.28	6.93	4.85	6.35	12.5	27.00	32.00	17.50	20.50	12.5	30.0	9.6	11.2
40	49.2/48.8	41.6/40.1	34.7/33.2	5.54	7.80	5.08	7.14	12.5	23.00	38.00	20.50	25.50	12.5	32.0	11.2	12.7
50	61.7/61.2	53.3/51.7	43.6/42.1	6.04	9.50	5.54	8.74	16.0	38.00	41.00	25.50	28.50	19.0	41.0	12.7	15.7
65	74.4/73.9	64.2/61.2		7.67		7.01		16.0	41.00		28.50		19.0	43.0	15.7	19.0
80	90.3/89.8	79.4/76.4		8.30		7.62		16.0	57.00		32.00		19.0	44.5	19.0	22.4
100	115.7/115.2	103.8/100.7		9.35		8.56		19.0	66.50		41.00		19.0	48.0	22.4	28.4

# ASME B16.11 FORGED FITTINGS DIMENSIONS

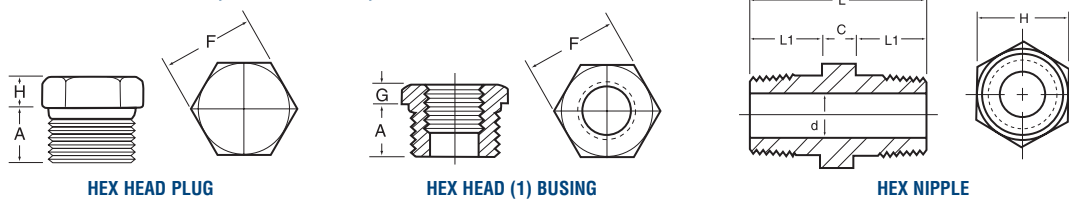
## SCREWED ELBOWS, TEES, CROSSES, CAPS & COUPLINGS



## SCREWED NPT ELBOWS TEES CROSS CAP & COUPLING FITTINGS Dimensions in mm

SIZE	CENTRE TO END A 90 ELBOW, TEE & CROSS CLASS		CENTRE TO END C 45 ELBOW CLASS		OD OF BAND H CLASS		MIN WALL THICKNESS G CLASS		THREAD LENGTH MIN		END TO END W	END TO END P CAPS CLASS		OUTSIDE DIAMETER D COUPLING, CAP*		END THICKNESS G MIN CAP CLASS		
	3000	6000	3000	6000	3000	6000	3000	6000	B	L2	3000 & 60000	3000	6000	3000	6000	3000	6000	
	6	21	25	17	19	22	25	3.18	6.35	6.4	6.7	32	19	19	16	22	4.8	
	8	25	28	19	22	25	33	3.30	6.60	8.1	10.2	35	25	27	19	25	4.8	6.4
10	28	33	22	25	33	38	3.51	6.98	9.1	10.4	38	25	27	22	32	4.8	6.4	
15	33	38	25	28	38	46	4.09	8.15	10.9	13.6	48	32	33	28	38	6.4	7.9	
20	38	44	28	33	46	56	4.32	8.53	12.7	13.9	51	37	38	35	44	6.4	7.9	
25	44	51	33	35	56	62	4.98	9.93	14.7	17.3	60	41	43	44	57	9.7	11.2	
32	51	60	35	43	62	75	5.28	10.59	17.0	18.0	67	44	46	57	64	9.7	11.2	
40	60	64	43	44	75	84	5.56	11.07	17.8	18.4	79	44	48	64	76	11.2	12.7	
50	64	83	44	52	84	102	7.14	12.09	19.0	19.2	86	48	51	76	92	12.7	15.7	
65	83	95	52	64	102	121	7.65	15.29	23.6	28.9	92	60	64	92	108	15.7	19.0	
80	95	106	64	79	121	146	8.84	16.64	25.9	30.5	108	65	68	108	127	19.0	22.4	
100	114	114	79	79	152	152	11.18	18.67	27.7	33.0	121	68	75	140	159	22.4	28.4	

## SCREWED FITTINGS, HEX PLUGS, BUSHES & NIPPLES



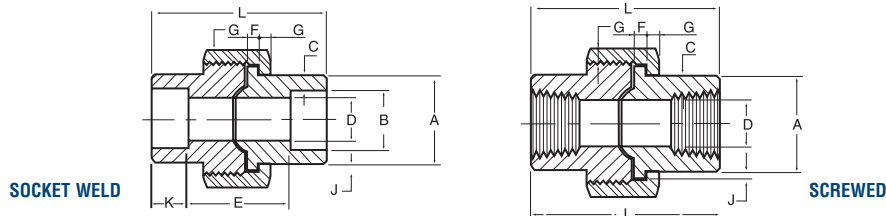
## SCREWED NPT HEX PLUGS, BUSHES & NIPPLES Dimensions mm

SIZE	MIN LENGTH A	PLUGS & BUSHES			HEX NIPPLES					
		WIDTH FLATS		HEX HEIGHT	C	L1	L	d	H	
		F	G	BUSH						PLUG
6	10	11	6	6	6.0	10	26	4.0	12.0	
8	11	16	3	6	8.0	14	36	6.7	17.0	
10	13	18	4	8	8.0	14	36	8.9	19.0	
15	14	22	5	8	9.0	19	47	11.9	24.0	
20	16	27	6	10	10.0	19	48	16.0	30.0	
25	19	36	6	10	11.0	24	59	20.1	35.0	
32	21	46	7	14	12.0	24	60	27.9	46.0	
40	21	50	8	16	14.0	24	62	32.0	50.0	
50	22	65	9	18	16.0	26	68	39.9	65.0	
65	27	75	10	19	18.0	38	94	55.1	80.0	
80	28	90	10	21	20.0	40	100	65.0	95.0	
100	32	115	13	25	24.5	40	105	85.0	125.5	

## APPROXIMATE WEIGHT 3000 LB FITTINGS Kg

SIZE	BUSH	PLUG ELBOW	90 ELBOW	45	TEE	UNION NIPPLE	HEX	COUPLING
6		0.01	0.10	0.13	0.13	0.28	0.03	0.05
8	0.01	0.03	0.14	0.12	0.20	0.28	0.04	0.04
10	0.01	0.05	0.29	0.24	0.38	0.24	0.05	0.06
15	0.03	0.07	0.43	0.34	0.56	0.34	0.09	0.13
20	0.05	0.14	0.69	0.56	0.92	0.48	0.15	0.19
25	0.09	0.22	1.14	0.94	1.49	0.77	0.27	0.45
32	0.25	0.44	1.42	1.03	1.76	1.03	0.45	0.81
40	0.34	0.59	2.63	2.05	3.27	1.63	0.62	1.07
50	0.45	1.03	2.92	2.23	3.53	2.43	1.03	1.40
65	0.60	1.80	5.99	3.71	6.99	3.63	1.51	2.29
80	1.16	2.60	8.88	5.97	10.19	5.27	2.22	3.38
100	3.20	5.20	14.85	8.96	19.13	12.00	4.00	6.28

# MSS-SP-83 FORGED UNIONS DIMENSIONS



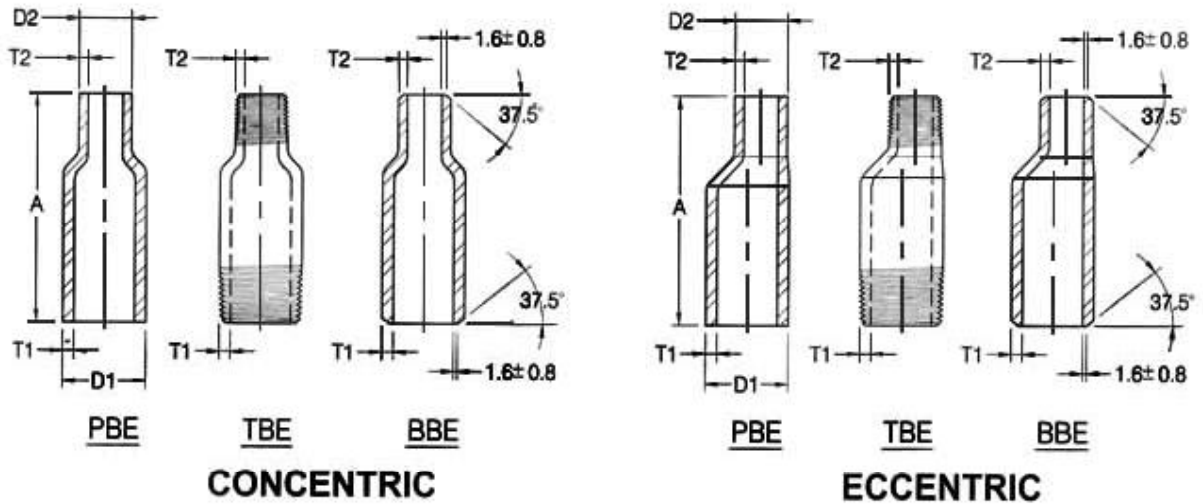
## UNIONS TO TO MSS-SP-83 1995 Dimensions min

SIZE	COMMON DIMENSIONS						SOCKET WELD DIMENSIONS				SCRD DIMENSIONS	
	BORE D		MALE FLANGE F	NUT G	BEARING J	LENGTH L	END A	BORE C	WALL E	LAY LEN K	SOCKET END A	WALL C
	MAX/MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MAX	MIN	MIN	MIN
6	6.83 / 6.43	3.17	3.17	1.24	41.40	21.80	10.92	3.17	22.40	9.60	14.70	2.41
8	9.85 / 9.45	3.17	3.17	1.24	41.40	21.80	14.22	3.30	22.40	9.60	19.00	3.02
10	13.92 / 13.51	3.43	3.43	1.37	46.00	25.90	17.78	3.48	26.90	9.60	22.90	3.20
15	17.47 / 17.07	3.68	3.68	1.50	49.00	31.20	21.84	4.06	26.90	9.60	27.70	3.73
20	21.79 / 21.39	4.06	4.06	1.68	56.90	37.10	27.18	4.27	31.80	12.70	33.50	3.91
25	28.14 / 27.74	4.57	4.44	1.85	62.00	45.50	34.04	4.95	34.30	12.70	41.40	4.55
32	35.76 / 35.36	5.33	5.21	2.13	71.10	54.90	42.67	5.28	40.60	12.70	50.50	4.85
40	41.61 / 41.20	5.84	5.59	2.31	76.50	61.50	48.77	5.54	42.20	12.70	57.20	5.08
50	52.53 / 52.12	6.6	6.35	2.69	86.10	75.20	61.47	6.05	45.50	15.80	70.10	5.54
65	64.72 / 64.31	7.49	7.11	3.07	102.40	91.70	74.17	7.65	61.70	15.80	85.30	7.01
80	77.67 / 77.27	8.25	8.00	3.53	109.00	109.20	90.17	8.31	63.80	15.80	102.40	7.62

# MSS-SP95 NIPPLES DIMENSIONS

## Swaged Nipples

MSS-SP-95-2006



Nominal Pipe Size NPS	Outside Diameter		End To End "A"	Wall Thickness							
	Large End D1	Small End D2		T1				T2			
				Sch40 STD	Sch80 XS	Sch160	XXS	Sch40 STD	Sch80 XS	Sch160	XXS
1/4"x1/8"	13.7	10.3	57	2.2	3.0	3.7	6.1	1.7	2.4		
3/8"x1/8"	17.1	10.3	64	2.3	3.2	4.0	6.4	1.7	2.4		
3/8"x1/4"	17.1	13.7	64	2.3	3.2	4.0	6.4	2.2	3.0		
1/2"x1/8"	21.3	10.3	70	2.8	3.7	4.8	7.5	1.7	2.4		
1/2"x1/4"	21.3	13.7	70	2.8	3.7	4.8	7.5	2.2	3.0		
1/2"x3/8"	21.3	17.1	70	2.8	3.7	4.8	7.5	2.3	3.2		
3/4"x1/8"	26.7	10.3	76	2.9	3.9	5.6	7.8	1.7	2.4		
3/4"x1/4"	26.7	13.7	76	2.9	3.9	5.6	7.8	2.2	3.0		
3/4"x3/8"	26.7	17.1	76	2.9	3.9	5.6	7.8	2.3	3.2		
3/4"x1/2"	26.7	21.3	76	2.9	3.9	5.6	7.8	2.8	3.7	4.8	7.5
1"x1/8"	33.4	10.3	89	3.4	4.5	6.4	9.1	1.7	2.4		
1"x1/4"	33.4	13.7	89	3.4	4.5	6.4	9.1	2.2	3.0		
1"x3/8"	33.4	17.1	89	3.4	4.5	6.4	9.1	2.3	3.2		
1"x1/2"	33.4	21.3	89	3.4	4.5	6.4	9.1	2.8	3.7	4.8	7.5
1"x3/4"	33.4	26.7	89	3.4	4.5	6.4	9.1	2.9	3.9	5.6	7.8
1-1/4"x1/8"	42.2	10.3	102	3.6	4.9	6.4	9.7	1.7	2.4		
1-1/4"x1/4"	42.2	13.7	102	3.6	4.9	6.4	9.7	2.2	3.0		
1-1/4"x3/8"	42.2	17.1	102	3.6	4.9	6.4	9.7	2.3	3.2		
1-1/4"x1/2"	42.2	21.3	102	3.6	4.9	6.4	9.7	2.8	3.7	4.8	7.5
1-1/4"x3/4"	42.2	26.7	102	3.6	4.9	6.4	9.7	2.9	3.9	5.6	7.8
1-1/4"x1"	42.2	33.4	102	3.6	4.9	6.4	9.7	3.4	4.5	6.4	9.1
1-1/2"x1/8"	48.3	10.3	114	3.7	5.1	7.1	10.2	1.7	2.4		
1-1/2"x1/4"	48.3	13.7	114	3.7	5.1	7.1	10.2	2.2	3.0		
1-1/2"x3/8"	48.3	17.1	114	3.7	5.1	7.1	10.2	2.3	3.2		
1-1/2"x1/2"	48.3	21.3	114	3.7	5.1	7.1	10.2	2.8	3.7	4.8	7.5
1-1/2"x3/4"	48.3	26.7	114	3.7	5.1	7.1	10.2	2.9	3.9	5.6	7.8
1-1/2"x1"	48.3	33.4	114	3.7	5.1	7.1	10.2	3.4	4.5	6.4	9.1
1-1/2"x1-1/4"	48.3	42.2	114	3.7	5.1	7.1	10.2	3.6	4.9	6.4	9.7
2"x1/8"	60.3	10.3	165	3.9	5.5	8.7	11.1	1.7	2.4		
2"x1/4"	60.3	13.7	165	3.9	5.5	8.7	11.1	2.2	3.0		
2"x3/8"	60.3	17.1	165	3.9	5.5	8.7	11.1	2.3	3.2		
2"x1/2"	60.3	21.3	165	3.9	5.5	8.7	11.1	2.8	3.7	4.8	7.5

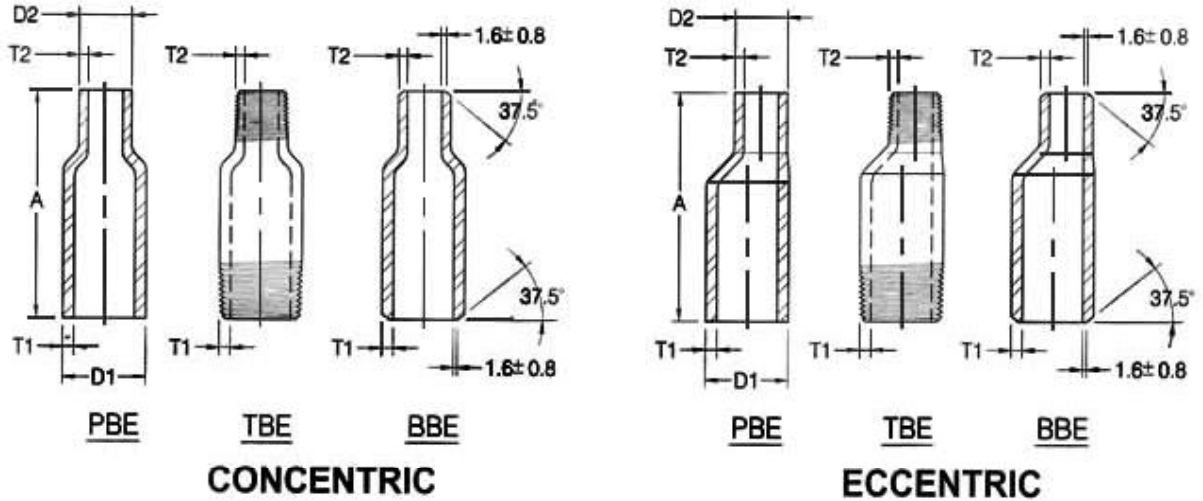
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# MSS-SP95 NIPPLES DIMENSIONS

## Swaged Nipples

MSS-SP-95-2006



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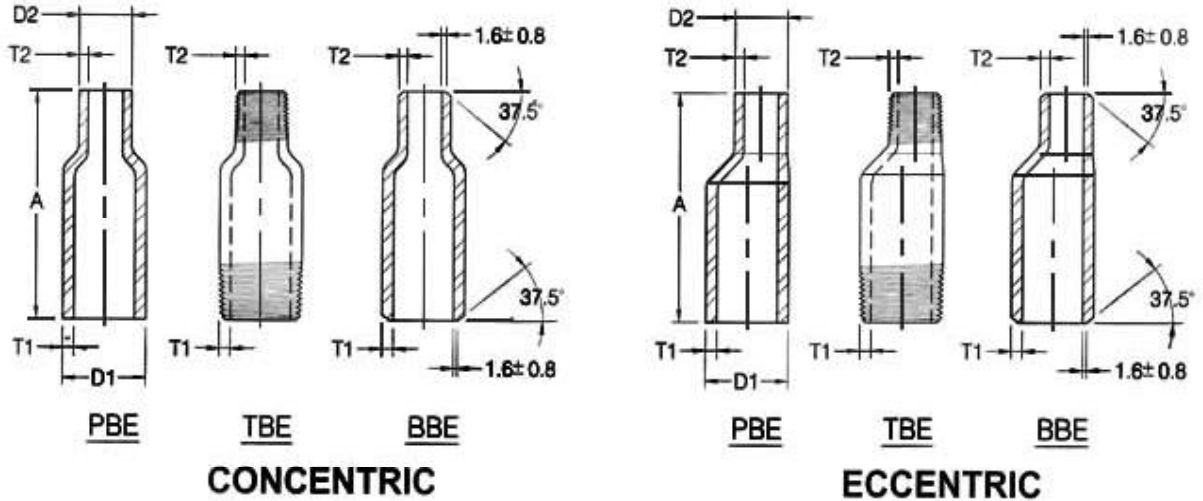
Nominal Pipe Size NPS	Outside Diameter		End To End "A"	Wall Thickness							
	Large End D1	Small End D2		T1				T2			
				Sch40 STD	Sch80 XS	Sch160	XXS	Sch40 STD	Sch80 XS	Sch160	XXS
2"x3/4"	60.3	26.7	165	3.9	5.5	8.7	11.1	2.9	3.9	5.6	7.8
2"x1"	60.3	33.4	165	3.9	5.5	8.7	11.1	3.4	4.5	6.4	9.1
2"x1-1/4"	60.3	42.2	165	3.9	5.5	8.7	11.1	3.6	4.9	6.4	9.7
2"x1-1/2"	60.3	48.3	165	3.9	5.5	8.7	11.1	3.7	5.1	7.1	10.2
2-1/2"x1/8"	73.0	10.3	178	5.2	7.0	9.5	14.0	1.7	2.4		
2-1/2"x1/4"	73.0	13.7	178	5.2	7.0	9.5	14.0	2.2	3.0		
2-1/2"x3/8"	73.0	17.1	178	5.2	7.0	9.5	14.0	2.3	3.2		
2-1/2"x1/2"	73.0	21.3	178	5.2	7.0	9.5	14.0	2.8	3.7	4.8	7.5
2-1/2"x3/4"	73.0	26.7	178	5.2	7.0	9.5	14.0	2.9	3.9	5.6	7.8
2-1/2"x1"	73.0	33.4	178	5.2	7.0	9.5	14.0	3.4	4.5	6.4	9.1
2-1/2"x1-1/4"	73.0	42.2	178	5.2	7.0	9.5	14.0	3.6	4.9	6.4	9.7
2-1/2"x1-1/2"	73.0	48.3	178	5.2	7.0	9.5	14.0	3.7	5.1	7.1	10.2
2-1/2"x2"	73.0	60.3	178	5.2	7.0	9.5	14.0	3.9	5.5	8.7	11.1
3"x1/8"	88.9	10.3	203	5.5	7.6	11.1	15.2	1.7	2.4	3.2	4.8
3"x1/4"	88.9	13.7	203	5.5	7.6	11.1	15.2	2.2	3.0	3.7	6.1
3"x3/8"	88.9	17.1	203	5.5	7.6	11.1	15.2	2.3	3.2	4.0	6.4
3"x1/2"	88.9	21.3	203	5.5	7.6	11.1	15.2	2.8	3.7	4.8	7.5
3"x3/4"	88.9	26.7	203	5.5	7.6	11.1	15.2	2.9	3.9	5.6	7.8
3"x1"	88.9	33.4	203	5.5	7.6	11.1	15.2	3.4	4.5	6.4	9.1
3"x1-1/4"	88.9	42.2	203	5.5	7.6	11.1	15.2	3.6	4.9	6.4	9.7
3"x1-1/2"	88.9	48.3	203	5.5	7.6	11.1	15.2	3.7	5.1	7.1	10.2
3"x2"	88.9	60.3	203	5.5	7.6	11.1	15.2	3.9	5.5	8.7	11.1
3"x2-1/2"	88.9	73.0	203	5.5	7.6	11.1	15.2	5.2	7.0	9.5	14.0
3-1/2"x1/8"	101.6	10.3	203	5.7	8.1			1.7	2.4		
3-1/2"x1/4"	101.6	13.7	203	5.7	8.1			2.2	3.0		
3-1/2"x3/8"	101.6	17.1	203	5.7	8.1			2.3	3.2		
3-1/2"x1/2"	101.6	21.3	203	5.7	8.1			2.8	3.7	4.8	7.5
3-1/2"x3/4"	101.6	26.7	203	5.7	8.1			2.9	3.9	5.6	7.8
3-1/2"x1"	101.6	33.4	203	5.7	8.1			3.4	4.5	6.4	9.1
3-1/2"x1-1/4"	101.6	42.2	203	5.7	8.1			3.6	4.9	6.4	9.7

Continued

# MSS-SP95 NIPPLES DIMENSIONS

## Swaged Nipples

MSS-SP-95-2006



Continued

Nominal Pipe Size NPS	Outside Diameter		End To End "A"	Wall Thickness							
	Large End D1	Small End D2		T1				T2			
				Sch40 STD	Sch80 XS	Sch160	XXS	Sch40 STD	Sch80 XS	Sch160	XXS
3-1/2"x1-1/2"	101.6	48.3	203	5.7	8.1			3.7	5.1	7.1	10.2
3-1/2"x2"	101.6	60.3	203	5.7	8.1			3.9	5.5	8.7	11.1
3-1/2"x2-1/2"	101.6	73.0	203	5.7	8.1			5.2	7.0	9.5	14.0
3-1/2"x3"	101.6	88.9	203	5.7	8.1			5.5	7.6	11.1	15.2
4"x1/4"	114.3	13.7	229	6.0	8.6	13.5	17.1	2.2	3.0		
4"x3/8"	114.3	17.1	229	6.0	8.6	13.5	17.1	2.3	3.2		
4"x1/2"	114.3	21.3	229	6.0	8.6	13.5	17.1	2.8	3.7	4.8	7.5
4"x3/4"	114.3	26.7	229	6.0	8.6	13.5	17.1	2.9	3.9	5.6	7.8
4"x1"	114.3	33.4	229	6.0	8.6	13.5	17.1	3.4	4.5	6.4	9.1
4"x1-1/4"	114.3	42.2	229	6.0	8.6	13.5	17.1	3.6	4.9	6.4	9.7
4"x1-1/2"	114.3	48.3	229	6.0	8.6	13.5	17.1	3.7	5.1	7.1	10.2
4"x2"	114.3	60.3	229	6.0	8.6	13.5	17.1	3.9	5.5	8.7	11.1
4"x2-1/2"	114.3	73.0	229	6.0	8.6	13.5	17.1	5.2	7.0	9.5	14.0
4"x3"	114.3	88.9	229	6.0	8.6	13.5	17.1	5.5	7.6	11.1	15.2
4"x3-1/2"	114.3	101.6	229	6.0	8.6	13.5	17.1	5.7	8.1		

1 Dimensions in Millimeters.

2 Wall Thickness : T1 & T2 in accordance with ASME B36.10M

PBE : Plain Both Ends

BBE : Bevel Both Ends

TBE : Thread Both Ends

PSE : Plain Small End

BSE : Bevel Small End

TSE : Thread Small End

PLE : Plain Large End

BLE : Bevel Large End

TLE : Thread Large End

### Dimensional Tolerance of Swaged Nipple

Nominal Pipe Size inch	Overall Length mm	Outside diameter at end		Wall Thickness prior to threading or grooving
		Square Cut Ends mm	Other End Connection mm	
1/8" to 3/8"	± 1.5	+ 0.40 - 0.80	± 0.80	Not less than 87.5% of nominal wall thickness
1/2" to 1-1/2"	± 1.5	+ 0.40 - 0.80	+ 1.50 - 0.80	
2" to 2-1/2"	± 3.0	± 0.80	+ 1.50 - 0.80	
3" to 4"	± 3.0	± 0.80	± 1.50	

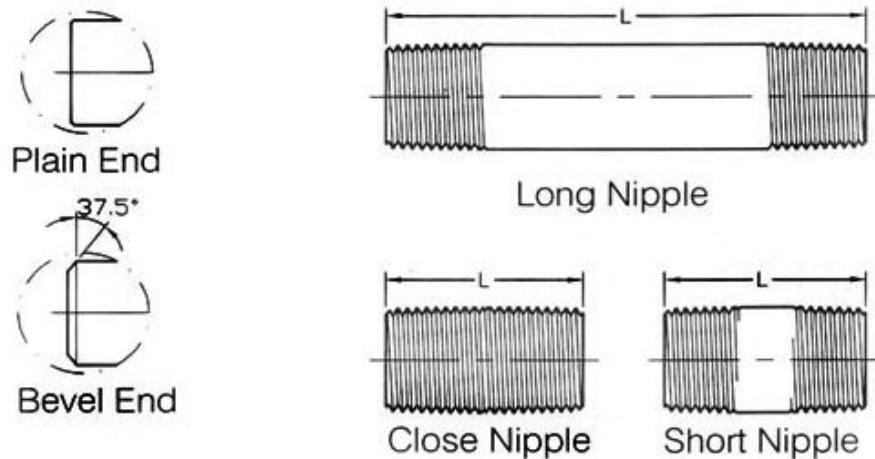
1 Dimensions in Millimeters.

2 Prior to threading or grooving

# MSS-SP95 NIPPLES DIMENSIONS

## Pipe Nipples Threaded

ASME A773-03



Nom. Pipe Size	L			Plain End Weight (kg/m)			
	Close Nipple	Short Nipple	Long Nipple	Sch40/STD	Sch80/XS	Sch160	XXS
1/8"	3/4	1-1/2	2~12	0.37	0.47		
1/4"	7/8	1-1/2	2~12	0.63	0.80		
3/8"	1	1-1/2	2~12	0.84	1.10		
1/2"	1-1/8	1-1/2	2~12	1.27	1.62	1.95	2.55
3/4"	1-3/8	2	2-1/2~12	1.69	2.20	2.90	3.64
1"	1-1/2	2	2-1/2~12	2.50	3.24	4.24	5.45
1-1/4"	1-5/8	2-1/2	3~12	3.39	4.47	5.61	7.77
1-1/2"	1-3/4	2-1/2	3~12	4.05	5.41	7.25	9.55
2"	2	2-1/2	3~12	5.44	7.48	11.11	13.44
2-1/2"	2-1/2	3	3-1/2~12	8.63	11.41	14.92	20.39
3"	2-5/8	3	3-1/2~12	11.29	15.27	21.35	27.68
3-1/2"	2-3/4	4	4-1/2~12	13.57	18.64		
4"	2-7/8	4	4-1/2~12	16.08	22.32	33.54	41.03
5"	3	4-1/2	5~12	21.77	30.97	49.12	57.43
6"	3-1/8	4-1/2	5~12	28.26	42.56	67.57	79.22

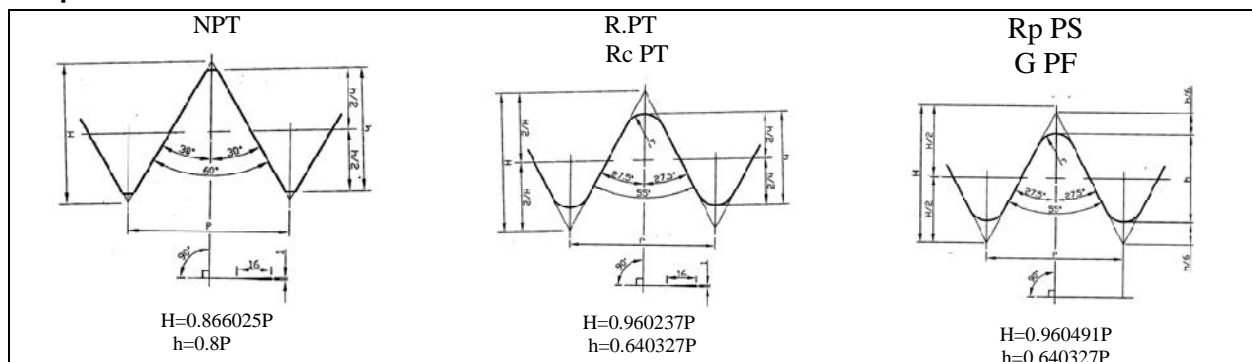
1 Dimensions in Millimeters.

2 Thickness in accordance with ASME B1.20.1

3 Weld bevel in accordance with ASME B16.25

4 Weight in accordance with ASME B36.10M Table 1.

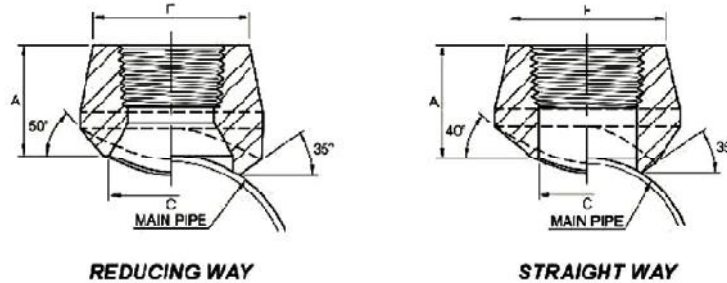
### Shape of Thread



# MSS-SP97 THERDOLET DIMENSIONS

## Branch Outlet Threaded

Reducing Sizes MSS-SP-97-2006



Out-Let Pipe NPS (in)	Reducing Way					
	A		C		F	
	3000lb Sch80	6000lb Sch160	3000lb Sch80	6000lb Sch160	3000lb Sch80	6000lb Sch160
1/8"	19.0		13.7		17.3	
1/4"	19.0		13.7		22.0	
3/8"	21.0		17.1		25.8	
1/2"	25.0	32.0	21.3	16.6	31.3	33.9
3/4"	27.0	37.0	26.7	21.2	37.1	41.2
1"	33.0	40.0	33.4	27.0	45.5	49.9
1-1/4"	33.0	41.0	42.2	35.8	57.0	58.6
1-1/2"	35.0	43.0	48.3	41.2	64.0	66.7
2"	38.0	52.0	60.3	51.6	76.0	83.2
2-1/2"	46.0		73.0		92.0	
3"	51.0		88.9		109.2	
4"	57.0		114.3		140.0	

Out-Let Pipe NPS (in)	Straight Way		
	A	C	F
	3000lb		
1/8"			
1/4"	19.0	11.5	22.0
3/8"	21.0	14.5	25.9
1/2"	25.0	16.5	31.4
3/4"	27.0	21.5	37.1
1"	33.0	27.2	45.5
1-1/4"	33.0	36.0	57.0
1-1/2"	35.0	42.0	64.0
2"	38.0	53.0	76.0
2-1/2"	46.0	65.0	92.0
3"	51.0	80.0	109.2
4"	57.0	104.0	140.0

1 Dimensions in Millimeters.

2 Thread in accordance with ASME B1.20.1

3 3000LBS outlet size 4 and less fit a number of run pipe sizes and the fitting are marked accordingly.

### Dimensional Tolerance of MSS SP-97-2006

Item	1/8" to 3/4"	1" to 4"
Face of fitting to crotch (A)	± 0.76	± 1.52

### Conventional Run Size Combinations

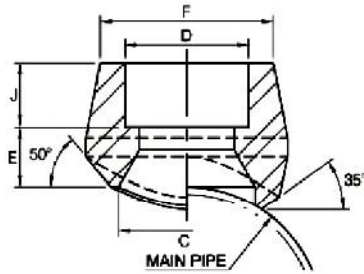
		OUTLET SIZE										
		1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
RUN SIZE (Main Pipe)	Reducing way	3/8"~3/4" 1"~36"	1/2" 3/4"~1-1/4" 1-1/2"~36"	3/4" 1" 1-1/4" 1-1/2"~3" 3-1/2"~36"	1" 1-1/4" 1-1/2" 2"~3" 3-1/2"~6" 8"~36"	1-1/4" 1-1/2" 2" 3" 3-1/2"~4" 5"~10" 12~36"	1-1/2" 2" 2-1/2" 3" 3-1/2"~5" 6"~8" 10"~36"	2" 2-1/2" 3" 3-1/2" 4"~5" 6"~10" 12"~36"	2-1/2" 3" 3-1/2" 4" 5"~6" 8"~10" 12"~18" 20"~36"	3" 3-1/2" 4" 5" 6" 8" 10"~14" 16"~36"	3-1/2" 4" 5" 6" 8" 10" 12"~16" 18"~36"	4" 5" 6" 8" 10" 12"~16" 20"~24" 26"~36"
	Straight way	3/8"~36"	1/2"~36"	3/4"~36"	1"~36"	1-1/4"~1-1/2" 2"~36"	1-1/2" 2"~3" 3-1/2"~36"	2" 2-1/2"~4" 5"~36"	2-1/2" 3" 3-1/2" 4"~6" 8"~36"	3" 3-1/2"~4" 5"~8" 10"~36"	3-1/2" 4" 5" 6" 8"~12" 14"~36"	4" 5" 6" 8" 10" 12"~16" 18"~36"

Each charted outlet size is designed to fit a number of run pipe size.

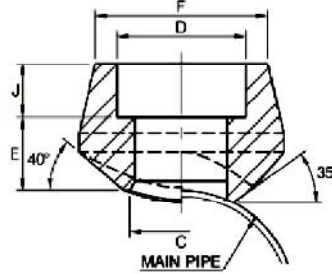
# MSS-SP97 SOCKOLET DIMENSIONS

## Branch Outlet Socket Weld

Reducing Sizes MSS-SP-97-2006



**REDUCING WAY**



**STRAIGHT WAY**

Out-Let Pipe NPS	Reducing Way									
	C		D		F		J Min		E Min	
	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000
1/8"	13.7		10.8		22.0		9.7		10.4	
1/4"	13.7		14.2		22.0		9.7		10.4	
3/8"	19.1		17.6		25.9		9.7		12.7	
1/2"	21.3	16.6	21.8	21.8	31.4	38.0	9.7	9.7	16.0	23.9
3/4"	26.7	21.2	27.2	27.2	37.1	44.0	12.7	12.7	16.0	25.4
1"	33.4	27.0	33.9	33.9	45.5	57.0	12.7	12.7	22.4	28.7
1-1/4"	42.2	35.8	42.7	42.7	57.0	64.0	12.7	12.7	22.4	30.2
1-1/2"	48.3	41.2	48.8	48.8	64.0	76.0	12.7	12.7	23.9	31.8
2"	60.3	51.6	61.2	61.2	76.0	92.0	15.8	15.8	23.9	36.6
2-1/2"	73.2		73.9		92.0		15.8		25.4	
3"	88.9		89.8		109.2		15.8		30.2	
4"	114.3		115.2		140.0		19.1		30.2	

Out-Let Pipe NPS	Straight Way				
	C	D	F	J Min	E Min
	3000				
1/8"					
1/4"	11.5	14.2	22.0	9.7	10.4
3/8"	14.5	17.6	25.9	9.7	12.7
1/2"	16.5	21.8	31.4	9.7	16.0
3/4"	21.5	27.2	37.1	12.7	16.0
1"	27.2	33.9	45.5	12.7	22.4
1-1/4"	36.0	42.7	57.0	12.7	22.4
1-1/2"	42.0	48.8	64.0	12.7	23.9
2"	53.0	61.2	76.0	15.8	23.9
2-1/2"	65.0	73.9	92.0	15.8	25.4
3"	80.0	89.8	109.2	15.8	30.2
4"	104.0	115.2	140.0	19.1	30.2

1 Dimensions in Millimeters.

2 Socket in accordance with ASME B16.11

3 3000LBS outlet size 4 and less fit a number of run pipe sizes and the fitting are marked accordingly.

## Conventional Run Size Combinations

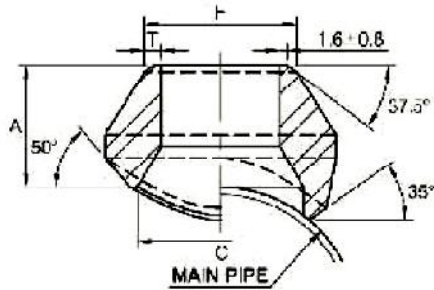
		OUTLET SIZE										
		1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
RUN SIZE (Main Pipe)	Reducing way	3/8"~3/4" 1"~36"	1/2" 3/4"~1-1/4" 1-1/2"~36"	3/4" 1" 1-1/4" 1-1/2"~3" 3-1/2"~36"	1" 1-1/4" 1-1/2" 2"~3" 3-1/2"~6" 8"~36"	1-1/4" 1-1/2" 2" 2-1/2" 3" 3-1/2"~4" 5"~10" 12~36"	1-1/2" 2" 2-1/2" 3" 3-1/2"~5" 6"~8" 10"~36"	2" 2-1/2" 3" 3-1/2" 4"~5" 6"~10" 12"~36"	2-1/2" 3" 3-1/2" 4" 5"~6" 8"~10" 12"~18" 20"~36"	3" 3-1/2" 4" 5" 6" 8" 10"~14" 16"~36"	3-1/2" 4" 5" 6" 8" 10" 12"~14" 18"~36"	5" 6" 8" 10" 12"~14" 16"~18" 20"~24" 26"~36"
	Straight way	3/8"~36"	1/2"~36"	3/4"~36"	1"~36"	1-1/4"~1-1/2" 2"~36"	1-1/2" 2"~3" 3-1/2"~36"	2" 2-1/2"~4" 5"~36"	2-1/2" 3"~3-1/2" 4"~6" 8"~36"	3" 3-1/2"~4" 5"~8" 10"~36"	3-1/2" 4" 5" 6" 8"~12" 14"~36"	5" 6" 8" 10" 12"~16" 18"~36"

Each charted outlet size is designed to fit a number of run pipe size.

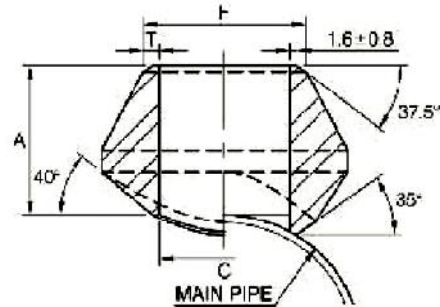
# MSS-SP97 WELDOLET DIMENSIONS

## Branch Outlet Butt Weld

Reducing Sizes MSS-SP-97-2006



**REDUCING WAY**



**STRAIGHT WAY**

### Standard Weight and Extra Strong

Out-Let Pipe NPS	Reducing Way				
	A	C	F	T	
				Standard Weight	Extra Strong
1/8"	16.0	13.7	10.3	1.73	2.41
1/4"	16.0	13.7	13.7	2.24	3.02
3/8"	19.0	17.1	17.1	2.31	3.20
1/2"	19.0	21.3	21.3	2.77	3.73
3/4"	22.0	26.7	26.7	2.87	3.91
1"	27.0	33.4	33.4	3.38	4.55
1-1/4"	32.0	42.2	42.2	3.56	4.85
1-1/2"	33.0	48.3	48.3	3.68	5.08
2"	38.0	60.3	60.3	3.91	5.54
2-1/2"	41.0	73.0	73.0	5.16	7.01
3"	44.0	88.9	88.9	5.49	7.62
3-1/2"	48.0	101.6	101.6	5.74	8.56
4"	51.0	114.3	114.3	6.02	8.56
5"	57.0	141.3	141.3	6.55	9.53
6"	78.0	168.3	168.3	7.11	10.97
8"	99.0	219.3	219.3	8.11	12.70
10"	94.0	273.1	273.1	9.27	12.70
12"	103.0	323.9	323.9	9.53	12.70
14"	100.0	355.6	355.6	9.53	12.70
16"	106.0	406.4	406.4	9.53	12.70
18"	111.0	457.2	457.2	9.53	12.70
20"	119.0	508.0	508.0	9.53	12.70
24"	140.0	609.6	609.6	9.53	12.70

Out-Let Pipe NPS	Straight Way				
	A	C	F	T	
				Standard Weight	Extra Strong
1/8"					
1/4"	16.0	11.5	13.7	2.24	3.02
3/8"	19.0	14.5	17.1	2.31	3.20
1/2"	19.0	16.5	21.3	2.77	3.73
3/4"	22.0	21.5	26.7	2.87	3.91
1"	27.0	27.2	33.4	3.38	4.55
1-1/4"	32.0	36.0	42.2	3.56	4.85
1-1/2"	33.0	42.0	48.3	3.68	5.08
2"	38.0	53.0	60.3	3.91	5.54
2-1/2"	41.0	65.0	73.0	5.16	7.01
3"	44.0	80.0	88.9	5.49	7.62
3-1/2"					
4"	51.0	104.0	114.3	6.02	8.56

1 Dimensions in Millimeters.

2 Weld Bevel in accordance with ASME B16.25

3 Outside size 4 and less fit a number of run pipe sizes and the fitting are marked accordingly.

4 Outside size 5 and up order to specific size combination

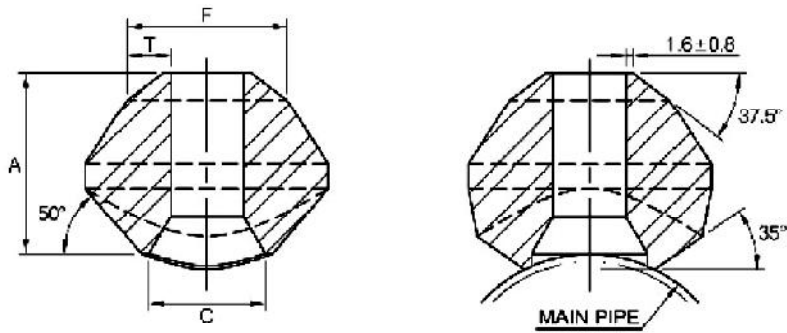
### Dimensional Tolerance of MSS SP-97-2006

Item	1/8" to 3/4"	1" to 4"	5" to 12"	14" to 24"
Face of fitting to crotch (A)	± 0.76	± 1.52	± 3.05	± 4.83

# MSS-SP97 WELDOLET DIMENSIONS

## Branch Outlet Butt Weld

Reducing Sizes MSS-SP-97-2006



### Schedule 160 and Double Extra Strong

Out-Let Pipe	A	C	F	T	
				Sch.160	XXS
1/2"	28.0	13.8	21.3	4.78	7.47
3/4"	32.0	18.9	26.7	5.56	7.82
1"	38.0	24.3	33.4	6.35	9.09
1-1/4"	44.0	32.5	42.2	6.35	9.70
1-1/2"	51.0	38.1	48.3	7.14	10.15
2"	55.0	49.2	60.3	8.74	11.07
2-1/2"	62.0	59.0	73.0	9.53	14.02
3"	73.0	73.7	88.9	11.13	15.24
4"	84.0	97.2	114.3	13.49	17.12
5"	94.0	122.2	141.3	15.88	19.05
6"	105.0	146.4	168.3	18.26	21.95

- 1) Dimensions in Millimeters.
- 2) Weld Bevel in accordance with ASME B16.25
- 3) Outlet size by order to specific size combination.

### Conventional Run Size Combinations

		OUTLET SIZE											
		1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	
RUN SIZE (Main Pipe)	Reducing way	3/8"~3/4" 1"~36"	1/2" 3/4"~1-1/4" 1-1/2"~36"	3/4" 1" 1-1/4" 1-1/2"~3" 3-1/2"~36"	1" 1-1/4" 1-1/2" 2"~3" 3-1/2"~6" 8"~36"	1-1/4" 1-1/2" 2" 2-1/2" 3" 3-1/2"~4" 5"~10" 12~36"	1-1/2" 2" 2-1/2" 3" 3-1/2"~5" 6"~8" 6"~10" 10" ~ 36"	1-1/2" 2" 2-1/2" 3" 3-1/2" 4"~5" 6"~10" 12"~36"	2" 2-1/2" 3" 3-1/2" 4" 4"~5" 6"~10" 12"~36"	2-1/2" 3" 3-1/2" 4" 5"~6" 8"~10" 12"~18" 20"~36"	3" 3-1/2" 4" 5" 6" 8" 10" 10"~14" 16"~36"	3-1/2" 4" 5" 6" 8" 10" 12"~16" 18"~36"	4" 6" 8" 10" 12"~16" 18"~36"
	Straight way	3/8"~36"	1/2"~36"	3/4"~36"	1"~36"	1-1/4"~1-1/2" 2"~36"	1-1/2" 2"~3" 3-1/2"~36"	2" 2-1/2"~4" 5"~36"	2-1/2" 3" 3-1/2" 4"~6" 8"~36"	3" 3-1/2"~4" 5"~8" 10"~36"	3-1/2" 4" 5" 6" 8"~12" 14"~36"	4" 6" 8" 10" 12"~16" 18"~36"	5" 6" 8" 10" 12"~16" 18"~36"

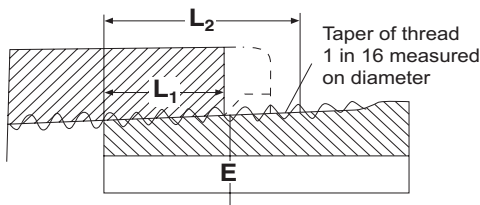
Each charted outlet size is designed to fit a number of run pipe size.

# ANSI/ASME B1.20.1 (NPT/API)

## PIPE THREADS

**BASIC DIMENSIONS OF AMERICAN NATIONAL STANDARD TAPER THREADS, NPT (ANSI/ASME B1.20.1)**

NPS	Number of threads per inch	Pitch of thread		Depth of thread		Truncation, max."		Pitch diameter at plane of hand-tight engagement		Length from end of pipe to plane of hand-tight engagement		Length of useful thread		Length of vanish (or washout) thread	
		P		h		l		E		L1		L2		L2	
		in	mm	in	mm	in	mm	in	mm	in	Threads	in	Threads	in	Threads
1/8"	27	0.03704	0.941	0.02963	0.753	0.00360	0.091	0.37360	9.489	0.162	4.36	0.2639	7.12	0.1285	3.47
1/4"	18	0.05556	1.411	0.04444	1.129	0.00490	0.124	0.49163	12.487	0.228	4.10	0.4018	7.23	0.1928	3.47
3/8"	18	0.05556	1.411	0.04444	1.129	0.00490	0.124	0.62701	15.926	0.240	4.32	0.0478	7.34	0.1928	3.47
1/2"	14	0.07143	1.814	0.05714	1.451	0.00560	0.142	0.77843	19.772	0.320	4.48	0.5337	7.47	0.2478	3.47
3/4"	14	0.07143	1.814	0.05714	1.451	0.00560	0.142	0.98887	25.117	0.339	4.75	0.5457	7.64	0.2478	3.47
1"	11.5	0.08696	2.209	0.06957	1.767	0.00630	0.160	1.23863	31.461	0.400	4.60	0.6828	7.85	0.3017	3.47
1-1/4"	11.5	0.08696	2.209	0.06957	1.767	0.00630	0.160	1.58338	40.218	0.420	4.83	0.7068	8.13	0.3017	3.47
1-1/2"	11.5	0.08696	2.209	0.06957	1.767	0.00630	0.160	1.82234	46.287	0.402	4.83	0.7235	8.32	0.3017	3.47
2"	11.5	0.08696	2.209	0.06957	1.767	0.00630	0.160	2.29627	58.325	0.436	5.01	0.7565	8.70	0.3017	3.47
2-1/2"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	2.76215	70.159	0.682	5.46	1.1375	9.10	0.4337	3.47
3"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	3.38850	86.068	0.766	6.13	1.2000	9.60	0.4337	3.47
3-1/2"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	3.88881	98.776	0.821	6.57	1.2500	10.00	0.4337	3.47
4"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	4.38712	111.433	0.844	6.75	1.3000	10.40	0.4337	3.47
5"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	5.44929	138.412	0.937	7.50	1.4063	11.25	0.4337	3.47
6"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	6.50597	165.252	0.958	7.66	1.5125	12.10	0.4337	3.47
8"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	8.50003	215.901	1.630	8.50	1.7125	13.70	0.4337	3.47
10"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	10.62094	296.772	1.210	9.58	1.9250	15.40	0.4337	3.47
12"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	12.61781	320.493	1.360	10.88	2.1250	17.00	0.4337	3.47
14"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	13.87262	352.365	1.562	12.50	2.2500	18.00	0.4337	3.47
16"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	15.87575	403.244	1.812	14.50	2.4500	19.60	0.4337	3.47
18"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	17.87500	454.025	2.000	16.00	2.6500	21.20	0.4337	3.47
20"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	19.87031	504.706	2.125	17.00	2.8500	22.80	0.4337	3.47
24"	8	0.12500	3.175	0.10000	2.540	0.00780	0.198	23.68094	606.066	2.375	19.00	3.2500	26.00	0.4337	3.47



**E** = Pitch diameter at hand-tight plane. This is also the pitch diameter at the gauge plane.

**L<sub>1</sub>** = Length of normal hand-tight engagement. This is also the L1 gauge length. (Longer thread engagement may be used in special applications, such as flanges for high pressure use. In such cases the pitch diameter, E, remains as specified and the diameter at the end of the pipe is proportionally smaller.)

**L<sub>2</sub>** = Effective length of thread

= Truncation from point of thread triangle to flat (not shown in diagram). Minimum = 0.033P for all pitches. See table for maximum.

**Example designation:**

3/8 – 18 NPT

where

3/8 = nominal pipe size

18 = number of threads per inch

NPT = symbol for the thread series and form (i.e., National (American) Standard Pipe, Taper)

**Tolerances**

When using L1 gauges to check threads, the thread is within permissible tolerance if the ring gauge face, or plug gauge notch, is +/- 1 turn from being flush with the end of the thread.

**Note** – Basic dimensions are given to four or five decimal places to eliminate errors when calculating gauge dimensions, they do not imply a greater degree of precisions than is normally obtainable.

– Metric dimensions, where shown, are calculated from the inch values and rounded.



# ASTM STANDARDS . CHEMICAL REQUIREMENT

ASTM	Nuance Grade	Designation UNS	Composition chimique %							
			C	Mn	P maxi	S maxi	Si	Ni	Cr	
<b>A 53 - 96</b>	Types A		0,25 maxi	0,95 maxi	0,050	0,045			0,40 maxi	0,40 maxi
	S.E. B		0,30 maxi	1,20 maxi	0,050	0,045			0,40 maxi	0,40 maxi
<b>A 105 / A 105 M-96</b>			0,35 maxi	0,60 - 1,05	0,035	0,040	0,10 - 0,35		0,40 maxi	0,30 maxi
<b>A 106 - 95</b>	A		0,25 maxi	0,27 - 0,93	0,035	0,035	0,10 mini		0,40 maxi	0,40 maxi
	B		0,30 maxi	0,29 - 1,06	0,035	0,035	0,10 mini		0,40 maxi	0,40 maxi
	C		0,35 maxi	0,29 - 1,06	0,035	0,035	0,10 mini		0,40 maxi	0,40 maxi
<b>A 182 / A 182 M-96</b>	F1	K 12822	0,28 maxi	0,60 - 0,90	0,045	0,045	0,15 - 0,35			
	F2	K 12122	0,05 - 0,21	0,30 - 0,80	0,040	0,040	0,10 - 0,60			0,50 - 0,81
	F5	K 41545	0,15 maxi	0,30 - 0,60	0,030	0,030	0,50 maxi	0,50 maxi		4,0 - 6,0
	F5a	K 42544	0,25 maxi	0,60 maxi	0,040	0,030	0,50 maxi	0,50 maxi		4,0 - 6,0
	F9	K 90941	0,15 maxi	0,30 - 0,60	0,030	0,030	0,50 - 1,00			8,0 - 10,0
	F11-Cl 2	K 11572	0,10 - 0,20	0,30 - 0,80	0,040	0,040	0,50 - 1,00			1,0 - 1,5
	F12-Cl 2	K 11564	0,10 - 0,20	0,30 - 0,80	0,040	0,040	0,10 - 0,60			0,80 - 1,25
	F21	K 31545	0,05 - 0,15	0,30 - 0,60	0,040	0,040	0,50 maxi			2,7 - 3,3
	F22-Cl 3	K 21590	0,05 - 0,15	0,30 - 0,60	0,040	0,040	0,50 maxi			2,0 - 2,5
	F304	S 30400	0,08 maxi	2,00 maxi	0,045	0,030	1,00 maxi	8,0 - 11,0		18,0 - 20,0
	F304 L	S 30403	0,035 maxi	2,00 maxi	0,045	0,030	1,00 maxi	8,0 - 13,0		18,0 - 20,0
	F310	S 31000	0,15 maxi	2,00 maxi	0,045	0,030	1,00 maxi	19,0 - 22,0		24,0 - 26,0
	F316	S 31600	0,08 maxi	2,00 maxi	0,045	0,030	1,00 maxi	10,0 - 14,0		16,0 - 18,0
	F316 L	S 31603	0,035 maxi	2,00 maxi	0,045	0,030	1,00 maxi	10,0 - 15,0		16,0 - 18,0
	F321	S 32100	0,08 maxi	2,00 maxi	0,045	0,030	1,00 maxi	9,0 - 12,0		17,0 mini
	F347	S 34700	0,08 maxi	2,00 maxi	0,045	0,030	1,00 maxi	9,0 - 13,0		17,0 - 20,0
	F348	S 34800	0,08 maxi	2,00 maxi	0,045	0,030	1,00 maxi	9,0 - 13,0		17,0 - 20,0
	F44	S 31254	0,02 maxi	1,00 maxi	0,030	0,010	0,80 maxi	17,5 - 18,5		19,5 - 20,5
	F51	S 31803	0,03 maxi	2,00 maxi	0,030	0,020	1,00 maxi	4,5 - 6,5		21,0 - 23,0
	F55	S 32760	0,03 maxi	1,00 maxi	0,030	0,010	1,00 maxi	6,0 - 8,0		24,0 - 26,0
<b>A 193 / A 193 M-96a</b>	B5		0,10 mini	1,00 maxi	0,040	0,030	1,00 maxi			4,0 - 6,0
	B6		0,15 maxi	1,00 maxi	0,040	0,030	1,00 maxi			11,5 - 13,5
	B7		0,37 - 0,49	0,65 - 1,10	0,035	0,040	0,15 - 0,35			0,75 - 1,20
	B8-Cl 1		0,08 maxi	2,00 maxi	0,045	0,030	1,00 maxi	8,0 - 10,5		18,0 - 20,0
	B16		0,36 - 0,47	0,45 - 0,70	0,035	0,040	0,15 - 0,35			0,80 - 1,15
<b>A 194 / A 194 M-96</b>	2H		0,40 mini	1,00 maxi	0,040	0,050	0,40 maxi			
	3		0,10 mini	1,00 maxi	0,040	0,030	1,00 maxi			4,0 - 6,0
	4		0,40 - 0,50	0,70 - 0,90	0,035	0,040	0,15 - 0,35			
	6		0,15 maxi	1,00 maxi	0,040	0,030	1,00 maxi			11,5 - 13,5
	7		0,37 - 0,49	0,65 - 1,10	0,040	0,040	0,15 - 0,35			0,75 - 1,20
<b>A 213 / A 213 M-95a</b>	8		0,08 maxi	2,00 maxi	0,045	0,030	1,00 maxi	8,0 - 10,5		18,0 - 20,0
	T2		0,10 - 0,20	0,30 - 0,61	0,025	0,025	0,10 - 0,30			0,50 - 0,81
	T5		0,15 maxi	0,30 - 0,60	0,025	0,025	0,50 maxi			4,00 - 6,00
	T9		0,15 maxi	0,30 - 0,60	0,025	0,025	0,25 - 1,00			8,00 - 10,0
	T11		0,05 - 0,15	0,30 - 0,60	0,025	0,025	0,50 - 1,00			1,00 - 1,50
	T12		0,05 - 0,15	0,30 - 0,61	0,025	0,025	0,50 maxi			0,80 - 1,25
	T21		0,05 - 0,15	0,30 - 0,60	0,025	0,025	0,50 maxi			2,65 - 3,35
	T22		0,05 - 0,15	0,30 - 0,60	0,025	0,025	0,50 maxi			1,90 - 2,60
	T91		0,08 - 0,12	0,30 - 0,60	0,020	0,010	0,20 - 0,50	0,40 maxi		8,00 - 9,50
	TP304	S 30400	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	8,0 - 11,0		18,0 - 20,0
	TP304 L	S 30403	0,035 maxi	2,00 maxi	0,040	0,030	0,75 maxi	8,0 - 13,0		18,0 - 20,0
	TP310 S	S 31008	0,08 maxi	2,00 maxi	0,045	0,030	0,75 maxi	19,0 - 22,0		24,0 - 26,0
	TP316	S 31600	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	11,0 - 14,0		16,0 - 18,0
	TP316 L	S 31603	0,035 maxi	2,00 maxi	0,040	0,030	0,75 maxi	10,0 - 15,0		16,0 - 18,0
	TP321	S 32100	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	9,0 - 13,0		17,0 - 20,0
	TP347	S 34700	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	9,0 - 13,0		17,0 - 20,0
	TP348	S 34800	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	9,0 - 13,0		17,0 - 20,0
<b>A 216 / A 216 M-93</b>	WCA		0,25 maxi	0,70 maxi	0,040	0,045	0,60 maxi	0,50 maxi		
	WCB		0,30 maxi	1,00 maxi	0,040	0,045	0,60 maxi	0,50 maxi		
	WCC		0,25 maxi	1,20 maxi	0,040	0,045	0,60 maxi	0,50 maxi		

Chemical requirements percent					Nuance Grade	ASTM
Mo	Cu	V	Nb / Cb	Autres / Others		
0,15 maxi	0,40 maxi	0,08 maxi	-		Types A	<b>A 53 - 96</b>
0,15 maxi	0,40 maxi	0,08 maxi	-		S.E. B	
0,12 maxi	0,40 maxi	0,05 maxi	0,02 maxi		A	<b>A 105 / A 105 M-96</b>
0,15 maxi	0,40 maxi	0,08 maxi			B	
0,15 maxi	0,40 maxi	0,08 maxi			B	<b>A 106 - 95</b>
0,15 maxi	0,40 maxi	0,08 maxi			C	
0,44 - 0,65					F1	<b>A 182 / A 182 M-96</b>
0,44 - 0,65					F2	
0,44 - 0,65					F5	
0,44 - 0,65					F5a	
0,90 - 1,10					F9	
0,44 - 0,65					F11-Cl 2	
0,44 - 0,65					F12-Cl 2	
0,80 - 1,06					F21	
0,87 - 1,13					F22-Cl 3	
				N ≤ 0,10 %	F304	
				N ≤ 0,10 %	F304 L	
					F310	
2,00 - 3,00				N ≤ 0,10 %	F316	
2,00 - 3,00				N ≤ 0,10 %	F316 L	
				5C ≤ Ti ≤ 0,70 %	F321	
				10C ≤ Cb + Ta ≤ 1,10 %	F347	
				10C ≤ Cb + Ta ≤ 1,10 % - Ta : 0,10 % maxi	F348	
6,00 - 6,50	0,50 - 1,00			N : 0,18 - 0,22 %	F44	
2,50 - 3,50				N : 0,08 - 0,20 %	F51	
3,00 - 4,00	0,50 - 1,00			N : 0,20 - 0,30 % - W : 0,50 - 1,00 % Cr + 3,3 Mo + 16 N ≥ 40	F55	
0,40 - 0,65					B5	<b>A 193 / A 193 M-96a</b>
					B6	
0,15 - 0,25					B7	
					B8-Cl 1	
0,50 - 0,65		0,25 - 0,35			B16	
0,40 - 0,65					2H	<b>A 194 / A 194 M-96</b>
0,20 - 0,30					3	
					4	
0,15 - 0,25					6	
					7	
					8	
0,44 - 0,65					T2	<b>A 213 / A 213 M-95a</b>
0,45 - 0,65					T5	
0,90 - 1,10					T9	
0,44 - 0,65					T11	
0,44 - 0,65					T12	
0,80 - 1,06					T21	
0,87 - 1,13					T22	
0,85 - 1,05		0,18 - 0,25	0,06 - 0,10	N : 0,03 - 0,07 % - Al 0,04 maxi	T91	
					TP304	
					TP304 L	
					TP310 S	
0,75 maxi					TP316	
2,00 - 3,00					TP316 L	
2,00 - 3,00					TP321	
				5C ≤ Ti ≤ 0,60 %	TP347	
				10C ≤ Cb + Ta ≤ 1,00 %	TP348	
				10C ≤ Cb + Ta ≤ 1,00 % - Ta : 0,10 % maxi	TP348	
0,20 maxi	0,30 maxi	0,03 maxi			WCA	<b>A 216 / A 216 M-93</b>
0,20 maxi	0,30 maxi	0,03 maxi		Total [Ni + Cr + Mo + Cu + V] ≤ 1 %	WCB	
0,20 maxi	0,30 maxi	0,03 maxi			WCC	

# ASTM STANDARDS . CHEMICAL REQUIREMENT

ASTM	Nuance Grade	Designation UNS	Composition chimique %							
			C	Mn	P maxi	S maxi	Si	Ni	Cr	
<b>A 234 / A 234 M-96a</b>	WPB		0,30 maxi	0,29 - 1,06	0,050	0,058	0,10 mini	0,40 maxi	0,40 maxi	
	WPC		0,35 maxi	0,29 - 1,06	0,050	0,058	0,10 mini	0,40 maxi	0,40 maxi	
	WP1		0,28 maxi	0,30 - 0,90	0,045	0,045	0,10 - 0,50			
	WP5		0,15 maxi	0,30 - 0,60	0,040	0,030	0,50 maxi		4,00 - 6,00	
	WP9		0,15 maxi	0,30 - 0,60	0,030	0,030	0,25 - 1,00		8,00 - 10,0	
	WP11-Cl1		0,05 - 0,15	0,30 - 0,60	0,030	0,030	0,50 - 1,00		1,00 - 1,50	
	WP12-Cl1		0,05 - 0,20	0,30 - 0,80	0,045	0,045	0,60 maxi		0,80 - 1,25	
	WP22-Cl1		0,05 - 0,15	0,30 - 0,60	0,040	0,040	0,50 maxi		1,90 - 2,60	
	WP91		0,08 - 0,12	0,30 - 0,60	0,020	0,010	0,20 - 0,50	0,40 maxi	8,00 - 9,50	
<b>A 312 / A 312 M-95a</b>	TP304	S 30400	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	8,0 - 11,0	18,0 - 20,0	
	TP304 L	S 30403	0,035 maxi	2,00 maxi	0,040	0,030	0,75 maxi	8,0 - 13,0	18,0 - 20,0	
	TP310 S	S 31008	0,08 maxi	2,00 maxi	0,045	0,030	0,75 maxi	19,0 - 22,0	24,0 - 26,0	
	TP316	S 31600	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	11,0 - 14,0	16,0 - 18,0	
	TP316 L	S 31603	0,035 maxi	2,00 maxi	0,040	0,030	0,75 maxi	10,0 - 15,0	16,0 - 18,0	
	TP321	S 32100	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	9,0 - 13,0	17,0 - 20,0	
	TP347	S 34700	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	9,0 - 13,0	17,0 - 20,0	
	TP348	S 34800	0,08 maxi	2,00 maxi	0,040	0,030	0,75 maxi	9,0 - 13,0	17,0 - 20,0	
	-	S 31254	0,20 maxi	1,00 maxi	0,030	0,010	0,80 maxi	17,5 - 18,5	19,5 - 20,5	
	-	N 08904	0,20 maxi	2,00 maxi	0,045	0,035	1,00 maxi	23,0 - 28,0	19,0 - 23,0	
	<b>A 333 / A 333 M-94</b>	1		0,30 maxi	0,40 - 1,06	0,025	0,025			
		3		0,19 maxi	0,31 - 0,64	0,025	0,025	0,18 - 0,37	3,18 - 3,82	
4			0,12 maxi	0,50 - 1,05	0,025	0,025	0,08 - 0,37	0,47 - 0,98	0,44 - 1,01	
6			0,30 maxi	0,29 - 1,06	0,025	0,025	0,10 mini			
7			0,19 maxi	0,90 maxi	0,025	0,025	0,13 - 0,32	2,03 - 2,57		
8			0,13 maxi	0,90 maxi	0,025	0,025	0,13 - 0,32	8,4 - 9,6		
9			0,20 maxi	0,40 - 1,06	0,025	0,025		1,60 - 2,24		
10			0,20 maxi	1,15 - 1,50	0,035	0,015	0,10 - 0,35	0,25 maxi	0,15 maxi	
11			0,10 maxi	0,60 maxi	0,025	0,025	0,35 maxi	35,0 - 37,0	0,50 maxi	
<b>A 335 / A 335 M-95a</b>		P1	K 11522	0,10 - 0,20	0,30 - 0,80	0,025	0,025	0,10 - 0,50		
		P2	K 11547	0,10 - 0,20	0,30 - 0,61	0,025	0,025	0,10 - 0,30		0,50 - 0,81
	P5	K 41545	0,15 maxi	0,30 - 0,60	0,025	0,025	0,50 maxi		4,00 - 6,00	
	P5b	K 51545	0,15 maxi	0,30 - 0,60	0,025	0,025	1,00 - 2,00		4,00 - 6,00	
	P5c	K 41245	0,12 maxi	0,30 - 0,60	0,025	0,025	0,50 maxi		4,00 - 6,00	
	P9	S 50400	0,15 maxi	0,30 - 0,60	0,025	0,025	0,25 - 1,00		8,00 - 10,0	
	P11	K 11597	0,05 - 0,15	0,30 - 0,60	0,025	0,025	0,50 - 1,00		1,00 - 1,50	
	P12	K 11562	0,05 - 0,15	0,30 - 0,61	0,025	0,025	0,50 maxi		0,80 - 1,25	
	P15	K 11578	0,05 - 0,15	0,30 - 0,60	0,025	0,025	1,15 - 1,65			
	P21	K 31545	0,05 - 0,15	0,30 - 0,60	0,025	0,025	0,50 maxi		2,65 - 3,35	
	P22	K 21590	0,05 - 0,15	0,30 - 0,60	0,025	0,025	0,50 maxi		1,90 - 2,60	
	P91	K 91560	0,08 - 0,12	0,30 - 0,60	0,020	0,010	0,20 - 0,50	0,40 maxi	8,00 - 9,50	
	P92	K 92460	0,07 - 0,13	0,30 - 0,60	0,020	0,010	0,50 maxi	0,40 maxi	8,50 - 9,50	
	<b>A 350 / A 350 M-96c</b>	LF1		0,35 maxi	0,60 - 1,35	0,035	0,040	0,15 - 0,30	0,40 maxi	0,30 maxi
LF2			0,35 maxi	0,60 - 1,35	0,035	0,040	0,15 - 0,30	0,40 maxi	0,30 maxi	
LF3			0,20 maxi	0,90 maxi	0,035	0,040	0,20 - 0,35	3,30 - 3,70	0,30 maxi	
LF9			0,20 maxi	0,40 - 1,06	0,035	0,040		1,60 - 2,24	0,30 maxi	
<b>A 515 / A 515 M-92</b>	60		0,27 maxi	0,90 maxi	0,035	0,035	0,15 - 0,40			
	65		0,31 maxi	0,90 maxi	0,035	0,035	0,15 - 0,40			
	70		0,33 maxi	1,20 maxi	0,035	0,035	0,15 - 0,40			
<b>A 516 / A 516 M-90</b>	55		0,20 maxi	0,60 - 1,20	0,035	0,035	0,15 - 0,40			
	60		0,23 maxi	0,85 - 1,20	0,035	0,035	0,15 - 0,40			
	65		0,26 maxi	0,85 - 1,20	0,035	0,035	0,15 - 0,40			
			0,28 maxi	0,85 - 1,20	0,035	0,035	0,15 - 0,40			

Chemical requirements percent					Nuance Grade	ASTM
Mo	Cu	V	Nb / Cb	Autres / Others		
0,15 maxi	0,40 maxi	0,08 maxi		Total (Ni + Cr + Mo + Cu) ≤ 1 %	WPB	<b>A 234 / A 234 M-96a</b>
0,15 maxi	0,40 maxi		0,02 maxi		WPC	
0,44 - 0,65					WP1	
0,44 - 0,65					WP5	
0,90 - 1,10					WP9	
0,44 - 0,65					WP11 Cl1	
0,44 - 0,65					WP12 Cl1	
0,87 - 1,13					WP22 Cl1	
0,85 - 1,05		0,18 - 0,25	0,06 - 0,10	N : 0,03 - 0,07 % - Al 0,04 maxi	WP91	
					TP304	<b>A 312 / A 312 M-95a</b>
					TP304 L	
					TP310 S	
0,75 maxi					TP316	
2,00 - 3,00					TP316 L	
2,00 - 3,00					TP321	
				5C ≤ Ti ≤ 0,70 %	TP347	
				10C ≤ Cb + Ta ≤ 1,00 %	TP348	
				10C ≤ Cb + Ta ≤ 1,00 % - Ta : 0,10 % maxi		
6,00 - 6,50	0,50 - 1,00			N : 0,18 - 0,22 %	-	
4,00 - 5,00	1,00 - 2,00			N : 0,10 % maxi	-	
					1	
					3	
-	0,40 - 0,75			Al : 0,04 - 0,30 %	4	
					6	
					7	
					8	
					9	
	0,75 - 1,25				10	
0,05 maxi	0,15 maxi	0,12 maxi	0,05 maxi	Al : 0,06 % maxi	11	
0,50 maxi	-	-	-	Co : 0,50 % maxi		
0,44 - 0,65					P1	<b>A 335 / A 335 M-95a</b>
0,44 - 0,65					P2	
0,45 - 0,65					P5	
0,45 - 0,65					P5b	
0,45 - 0,65				8C ≤ Cb ≤ 10C ou/or 4C ≤ Ti ≤ 0,70 %	P5c	
0,90 - 1,10					P9	
0,44 - 0,65					P11	
0,44 - 0,65					P12	
0,44 - 0,65					P15	
0,80 - 1,06					P21	
0,87 - 1,13					P22	
0,85 - 1,05		0,18 - 0,25	0,06 - 0,10	N : 0,03 - 0,07 % - Al : 0,04 % maxi	P91	
0,30 - 0,60		0,15 - 0,25	0,04 - 0,09	N : 0,03 - 0,07 % - Al : 0,04 % maxi W : 1,5 - 2,00 % - B : 0,001 - 0,006	P92	
0,12 maxi	0,40 maxi	0,05 maxi	0,02 maxi	Cu + Ni + Cr + V + Mo ≤ 1,00 %	LF1	
0,12 maxi	0,40 maxi	0,05 maxi	0,02 maxi	Cu + Ni + Cr + V + Mo ≤ 1,00 %	LF2	
0,12 maxi	0,40 maxi	0,03 maxi	0,02 maxi	Cr + Mo ≤ 0,32 %	LF3	
0,12 maxi	0,75 - 1,25	0,03 maxi	0,02 maxi	Cr + Mo ≤ 0,32 %	LF9	<b>A 515 / A 515 M-92</b>
					60	
					65	
					70	<b>A 516 / A 516 M-90</b>
					55	
					60	
					65	
					70	

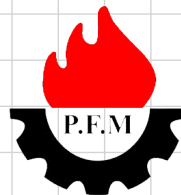
# ASTM STANDARDS . MECHANICAL REQUIREMENT

ASTM	Nuance Grade	Caractéristiques mécaniques				
		Résistance / Tensile strength		Limite élastique / Yield strength		Allong. / Elong. mini - %
		mini - MPa	mini - ksi	mini - MPa	mini - ksi	
<b>A 53 - 96</b>	Types A	330	48	205	30	36
	S.E. B	415	60	240	35	29,5
<b>A 105 / A 105 M-96</b>		485	70	250	36	30
<b>A 106 - 95</b>	A	330	48	205	30	L35 / T25
	B	415	60	240	35	L30 / T16,5
	C	485	70	275	40	L30 / T16,5
<b>A 182 / A 182 M-96</b>	F1	485	70	275	40	20
	F2	485	70	275	40	20
	F5	485	70	275	40	20
	F5a	620	90	450	65	22
	F9	585	85	380	55	20
	F11-Cl 2	485	70	275	40	20
	F12-Cl 2	485	70	275	40	20
	F21	515	75	310	45	20
	F22-Cl 3	515	75	310	45	20
	F304	515	75	205	30	30
	F304 L	485	70	170	25	30
	F310	515	75	205	30	30
	F316	515	75	205	30	30
	F316 L	485	70	170	25	30
	F321	515	75	205	30	30
	F347	515	75	205	30	30
	F348	515	75	205	30	30
	F44	650	94	300	44	35
	F51	620	90	450	65	25
	F55	750 - 895	109 - 130	550	80	25
<b>A 193 / A 193 M-96a</b>	B5	690	100	550	80	16
	B6	760	110	585	85	15
	B7	690 - 860	100 - 125	515 - 720	75 - 105	18 - 16
	B8-Cl 1	515	75	205	30	30
	B16	690 - 860	100 - 125	585 - 725	85 - 105	18 - 16
<b>A 194 / A 194 M-96</b>	2H					
	3					
	4					
	6					
	7					
	8					
<b>A 213 / A 213 M-95a</b>	T2	415	60/085	205	30	30
	T5	415	70/095	205	30	30
	T9	415	70/095	205	30	30
	T11	415	60	205	30	30
	T12	415	60	220	32	30
	T21	415	60	205	30	30
	T22	415	60	205	30	30
	T91	585	85	415	60	20
	TP304	515	75	205	30	35
	TP304 L	485	70	170	25	35
	TP310 S	515	75	205	30	35
	TP316	515	75	205	30	35
	TP316 L	485	70	170	25	35
	TP321	515	75	205	30	35
	TP347	515	75	205	30	35
	TP348	515	75	205	30	35
<b>A 216 / A 216 M-93</b>	WCA	415 - 585	60 - 85	205	30	24
	WCB	485 - 655	70 - 95	250	36	22
	WCC	485 - 655	70 - 95	275	40	22

Striction/Red. of area mini - %	Mechanical requirements		Essai de flexion par choc/Impact test		Nuance Grade	ASTM
	Dureté / Hardness		à °C			
	Brinell	Rockwell	at °F			
					Types A S.E. B	<b>A 53 - 96</b>
30	maxi 187HB				A B C	<b>A 105 / A 105 M-96</b>
					F1 F2 F5 F5a F9 F11-Cl 2 F12-Cl 2 F21 F22-Cl 3 F304 F304 L F310 F316 F316 L F321 F347 F348 F44 F51 F55	<b>A 182 / A 182 M-96</b>
					B5 B6 B7 B8-Cl 1 B16	<b>A 193 / A 193 M-96a</b>
					2H 3 4 6 7 8	<b>A 194 / A 194 M-96</b>
					T2 T5 T9 T11 T12 T21 T22 T91 TP304 TP304 L TP310 S TP316 TP316 L TP321 TP347 TP348	<b>A 213 / A 213 M-95a</b>
					WCA WCB WCC	<b>A 216 / A 216 M-93</b>



شرکت پخش فولاد  
ماهان تهران  
(سهامی خاص)



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# PIPING HANDBOOK



شرکت پخش فولاد  
ماهان تهران  
(سهامی خاص)

تلفن: ۸۸۷۲۷۵۶۹

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