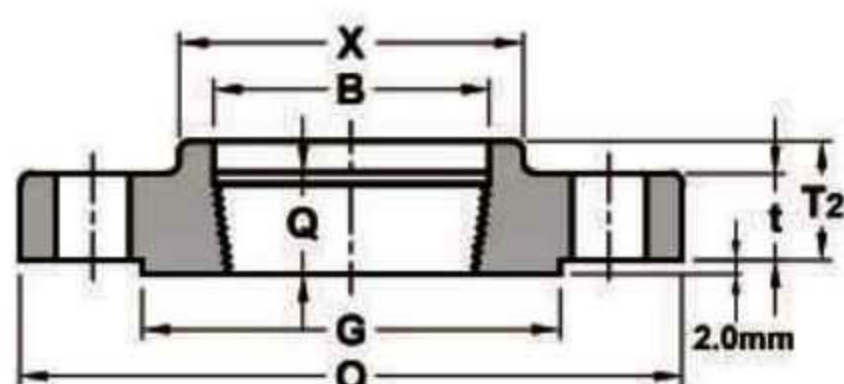


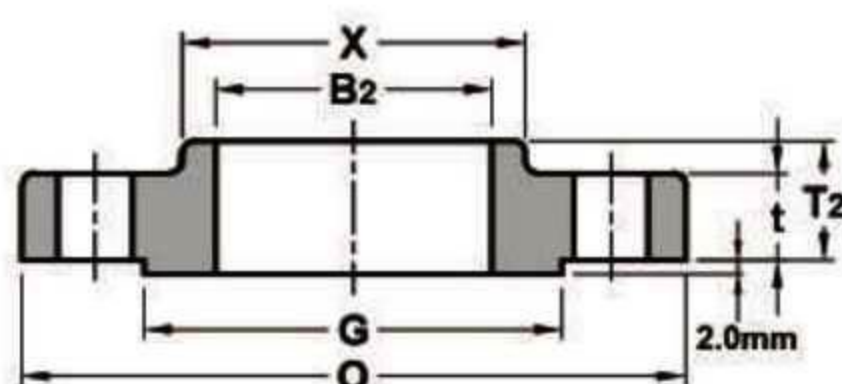
The background of the page is an abstract design. The top half is filled with a complex pattern of overlapping triangles in various shades of blue, from deep navy to bright cyan. A wide, white diagonal band cuts across the middle of the page, separating the blue geometric pattern from the bottom section. The bottom section is a solid white space, with a few more blue geometric shapes visible at the very bottom edge.

ANSI_ASME B16.5

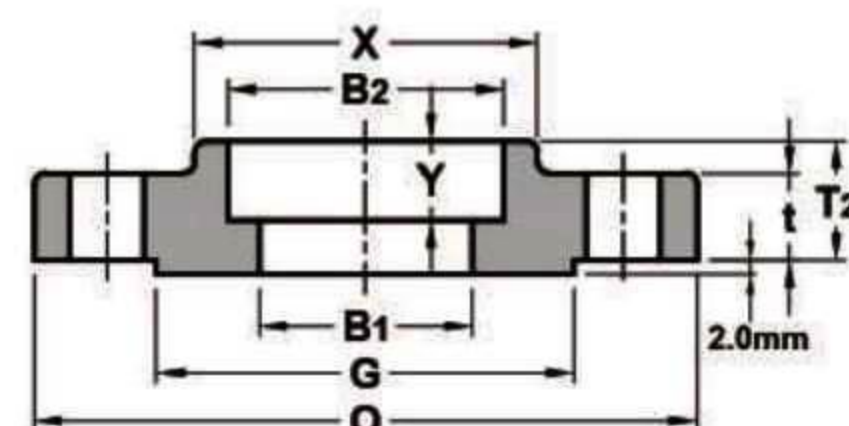
CLASS 150 FLANGES



THREADED



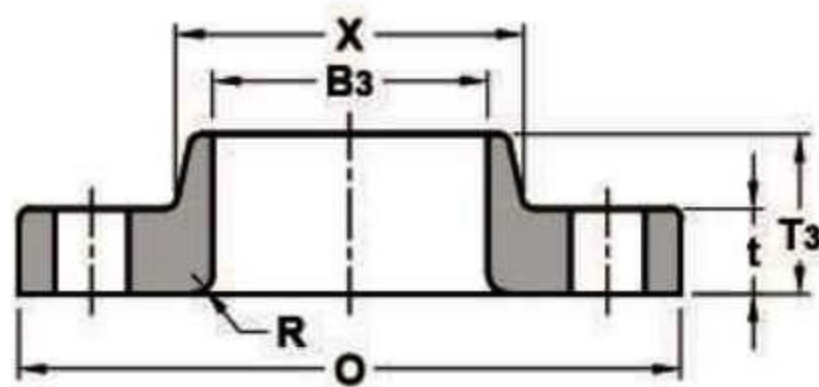
SLIP-ON



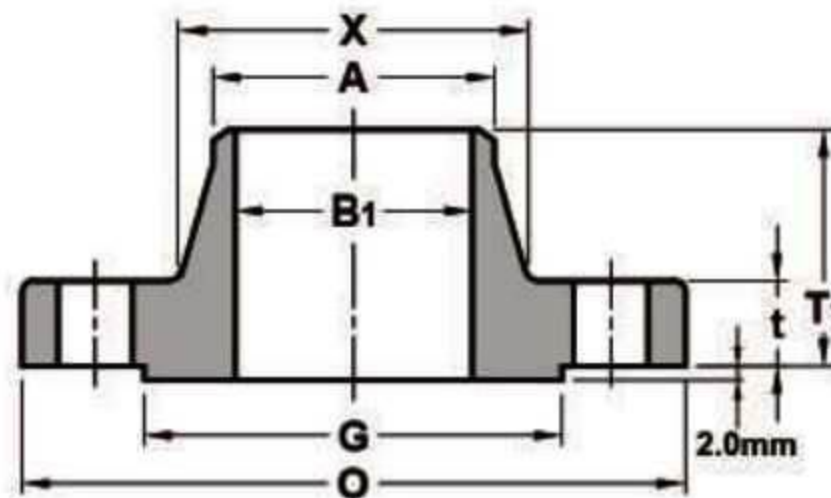
SOCKET WELDING

Unit : mm

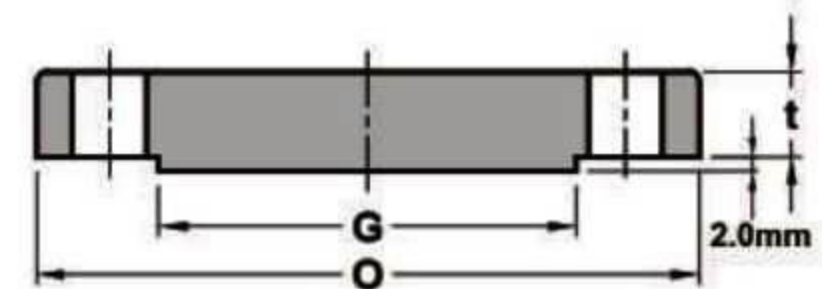
Nominal Pipe Size	Out-side Diam.	Min. Thickness	Min. Thickness Lap Joint	Diam. Of Hub	O.D of Raised Face	Diam. Of Hub at Bevel	Length Through Hub			Min. Thread Length	Bore		
							Welding Neck	Slip-on Threaded Socket Welding	Lap Joint		Welding Neck / Socket Welding	Slip-on / Socket Welding Min.	Min. Lap Joint
	O	t	t	X	G	A	T1	T2	T3	Q	B1	B2	B3
1/2	90	9.6	11.2	30	35.1	21.3	46	14	16	16	15.8	22.2	22.9
3/4	100	11.2	12.7	38	42.9	26.7	51	14	16	16	20.9	27.7	28.2
1	110	12.7	14.3	49	50.8	33.4	54	16	17	17	26.6	34.5	34.9
1 1/4	115	14.3	15.9	59	63.5	42.2	56	19	21	21	35.1	43.2	43.7
1 1/2	125	15.9	17.5	65	73.2	48.3	60	21	22	22	40.9	49.5	50
2	150	17.5	19.1	78	91.9	60.3	62	24	25	25	52.5	61.9	62.5
2 1/2	180	20.7	22.3	90	104.6	73	68	27	29	29	62.7	74.6	75.4
3	190	22.3	23.9	108	127	88.9	68	29	30	30	77.9	90.7	91.4
3 1/2	215	22.3	23.9	122	139.7	101.6	70	30	32	32	90.1	103.4	104.1
4	230	22.3	23.9	135	157.2	114.3	75	32	33	33	102.3	116.1	116.8
5	255	22.3	23.9	164	185.7	141.3	87	35	36	36	128.2	143.8	144.4
6	280	23.9	25.4	192	215.9	168.3	87	38	40	40	154.1	170.7	171.4
8	345	27	28.6	246	269.7	219.1	100	43	44	44	202.7	221.5	222.2
10	405	28.6	30.2	305	323.9	273	100	48	49	49	254.6	276.2	277.4
12	485	30.2	31.8	365	381	323.8	113	54	56	56	304.8	327	328.2
14	535	33.4	35	400	412.8	355.6	125	56	79	57	To be Specified by Purchaser	359.2	360.2
16	595	35	36.6	457	469.9	406.4	125	62	87	64		410.5	411.2
18	635	38.1	39.7	505	533.4	457	138	67	97	68		461.8	462.3
20	700	41.3	42.9	559	584.2	508	143	71	103	73		513.1	514.4
24	815	46.1	47.7	663	692.2	610	151	81	111	83		616	616



LAP JOINT



WELDING NECK

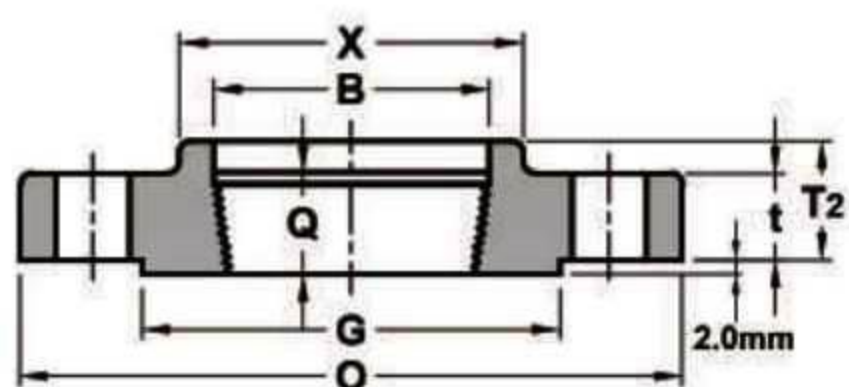


BLIND

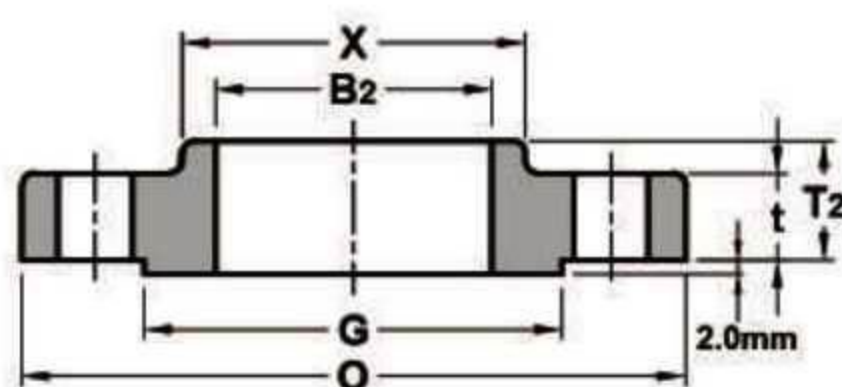
Unit : mm

Nominal Pipe Size	Radius of Lap-Joint	Depth of Socket	Drilling			Bolting				Approximate Weight(Kg)				
			Bolt Circle Diam.	Number of Holes	Diam. Of Holes	Diam. Of Bolt (inch)	Machine Bolt Length (Raised Face)	Stud Bolt Length		Welding Neck	Slip on / Threaded	Lap Joint	Blind	Socket Welding
	R	Y						2mm Raised Face	Ring Joint					
1/2	3	10	60.3	4	15.9	1/2	50	55	-	0.51	0.47	0.51	0.47	0.47
3/4	3	11	69.9	4	15.9	1/2	50	65	-	0.73	0.58	0.64	0.63	0.59
1	3	13	79.4	4	15.9	1/2	55	65	75	1.07	0.86	0.93	0.94	0.87
1 1/4	5	14	88.9	4	15.9	1/2	55	70	85	1.4	1.08	1.16	1.23	1.11
1 1/2	6	16	98.4	4	15.9	1/2	65	70	85	1.81	1.41	1.51	1.62	1.45
2	8	17	120.7	4	19.1	5/8	70	85	95	2.59	2.26	2.38	2.64	2.33
2 1/2	8	19	139.7	4	19.1	5/8	75	90	100	4.28	3.43	3.6	4.06	3.55
3	10	21	152.4	4	19.1	5/8	75	90	100	5.18	3.87	4.04	4.9	4.02
3 1/2	10	22.4	177.8	8	19.1	5/8	75	90	100	5.45	4.99	4.99	5.9	4.99
4	11	24.1	190.5	8	19.1	5/8	75	90	100	7.32	5.75	5.96	7.41	5.99
5	11	23.9	215.9	8	22.2	3/4	85	95	110	8.91	6.22	6.44	8.76	6.68
6	13	26.9	241.3	8	22.2	3/4	85	100	115	11.26	7.38	7.59	11.31	7.99
8	13	31.8	298.5	8	22.2	3/4	90	110	120	17.68	12.36	12.66	19.92	13.29
10	13	33.3	362	12	25.4	7/8	100	115	125	24.79	17.1	16.78	29.39	19.5
12	13	39.6	431.8	12	25.4	7/8	100	120	135	38.98	27.68	28.3	43.7	29.03
14	13	41.4	476.3	12	28.6	1	115	135	145	51.71	35.2	41.5	59.42	38.56
16	13	44.5	539.8	16	28.6	1	115	135	145	64.41	42.18	52.98	77.11	44.49
18	13	49.3	577.9	16	31.8	1 1/8	125	145	160	74.84	49.71	59	94.8	54.43
20	13	54.1	635	20	31.8	1 1/8	140	160	170	89.36	65.5	72.12	123.38	70.31
24	13	63.5	749.3	20	34.9	1 1/4	150	170	185	119.66	90.5	99.02	188.24	95.25

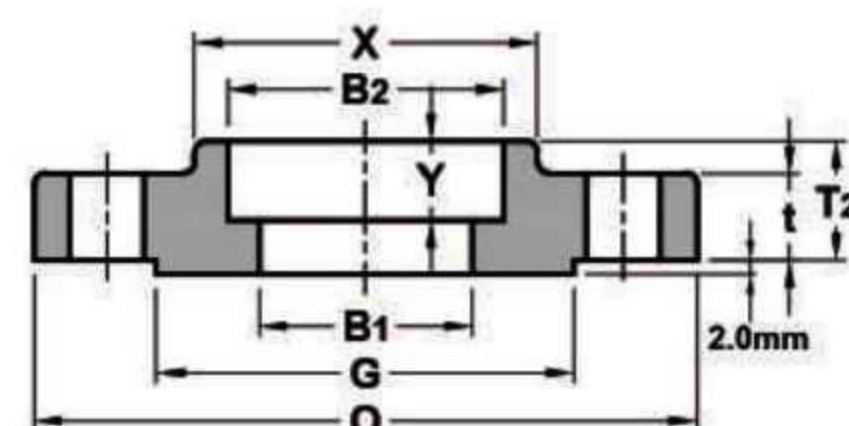
CLASS 300 FLANGES



THREADED



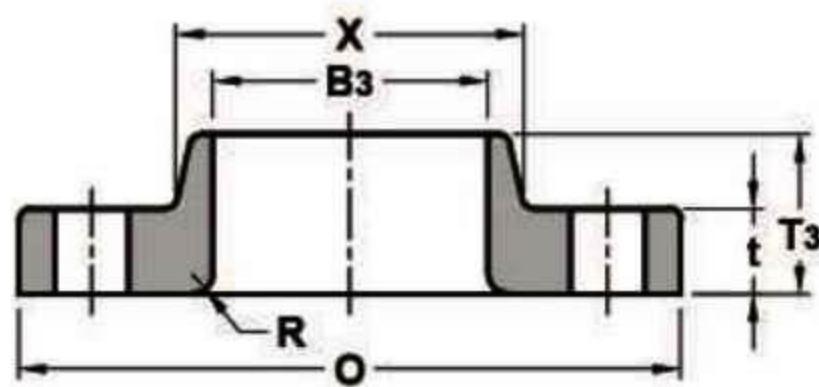
SLIP-ON



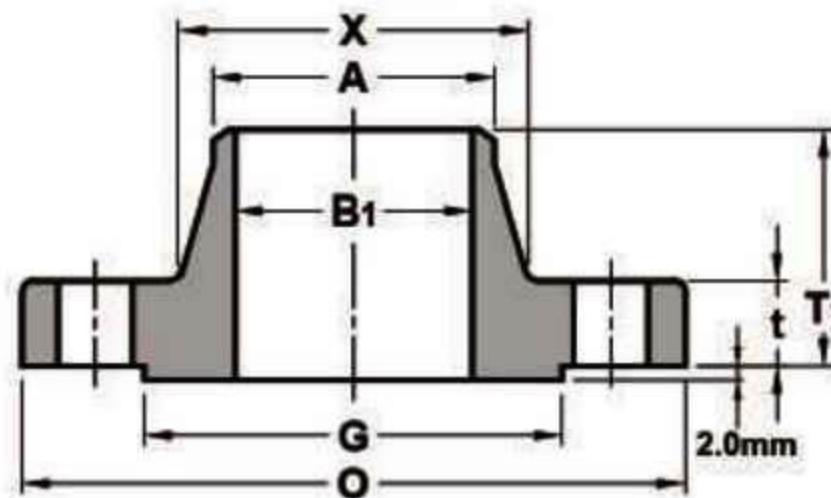
SOCKET WELDING

Unit : mm

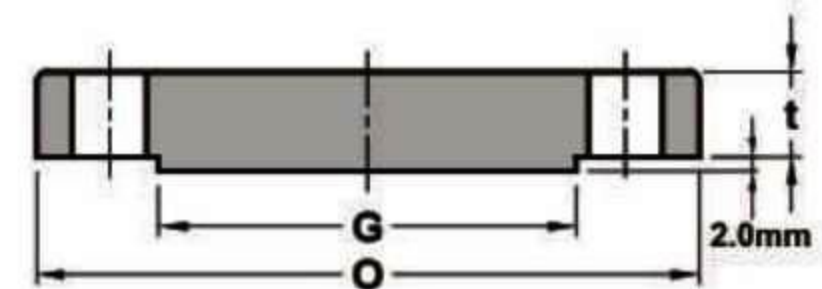
Nominal Pipe Size	Out-side Diam.	Min. Thickness	Min. Thickness of Lap Joint	Diam. of Hub	O.D of Rasied Face	Diam. of Hub at Bevel	Length Through Hub			Min. Thread Length	Bore			
							Welding Neck	Slip-on Threaded Socket Welding	Lap Joint		Welding Nect / Socket Welding	Min. Slip-on / Socket Welding	Min. Lap Joint	Counter Bore Min. Threaded
	O	t	t	X	G	A	T1	T2	T3	Q	B1	B2	B3	B
1/2	95	12.7	14.3	38	35.1	21.3	51	21	22	16	15.8	22.2	22.9	23.6
3/4	115	14.3	15.9	48	42.9	26.7	56	24	25	16	20.9	27.7	28.2	29
1	125	15.9	17.5	54	50.8	33.4	60	25	27	18	26.6	34.5	34.9	35.8
1 1/4	135	17.5	19.1	64	63.5	42.2	64	25	27	21	35.1	43.2	43.7	44.4
1 1/2	155	19.1	20.7	70	73.2	48.3	67	29	30	23	40.9	49.5	50	50.3
2	165	20.7	22.3	84	91.9	60.3	68	32	33	29	52.5	61.9	62.5	63.5
2 1/2	190	23.9	25.4	100	104.6	73	75	37	38	32	62.7	74.6	75.4	76.2
3	210	27	28.6	117	127	88.9	78	41	43	32	77.9	90.7	91.4	92.2
3 1/2	230	28.6	30.2	133	139.7	101.6	79	43	44	37	90.1	103.4	104.1	104.9
4	255	30.2	31.8	146	157.2	114.3	84	46	48	37	102.3	116.1	116.8	117.6
5	280	33.4	35	178	185.7	141.3	97	49	51	43	128.2	143.8	144.4	144.4
6	320	35	36.6	206	215.9	168.3	97	51	52	47	154.1	170.7	171.4	171.4
8	380	39.7	41.3	260	269.7	219.1	110	60	62	51	202.7	221.5	222.2	222.2
10	445	46.1	47.7	321	323.9	273	116	65	95	56	254.6	276.2	277.4	276.2
12	520	49.3	50.8	375	381	323.8	129	71	102	61	304.8	327	328.2	328.6
14	585	52.4	54	425	412.8	355.6	141	75	111	64	To be Specified by Purchaser	359.2	360.2	360.4
16	650	55.6	57.2	483	469.9	406.4	144	81	121	69		410.5	411.2	411.2
18	710	58.8	60.4	533	533.4	457	157	87	130	70		461.8	462.3	462
20	775	62	63.5	587	584.2	508	160	94	140	74		513.1	514.4	512.8
24	915	68.3	69.9	702	692.2	610	167	105	152	83		616	616	614.4



LAP JOINT



WELDING NECK

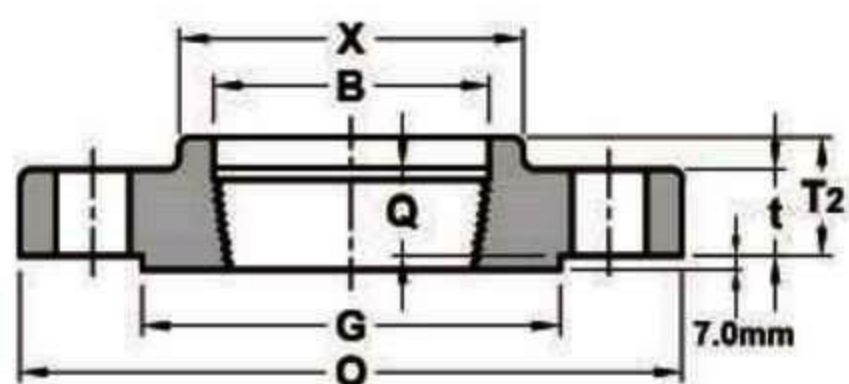


BLIND

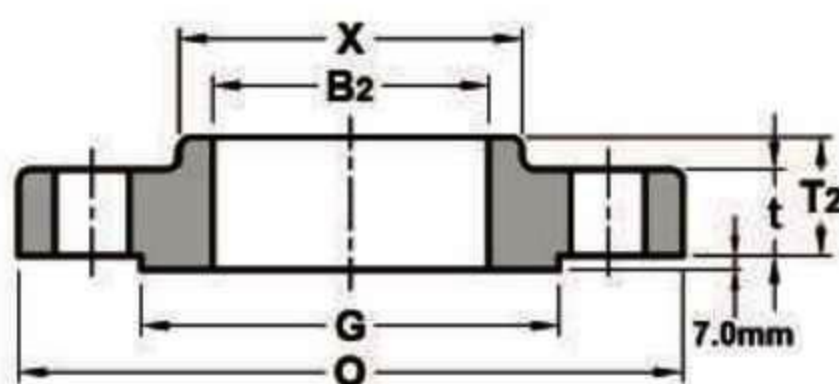
Unit : mm

Nominal Pipe Size	Radius of Lap-Joint	Depth of Socket	Drilling			Bolting				Approximate Weight(Kg)				
			Bolt Circle Diam.	Num. of Holes	Diam. of Holes	Diam. of Bolt (inch)	Machine Bolt Length (Raised Face)	Stud Bolt Length		Welding Neck	Slip-on / Threaded	Lap Joint	Blind	Socket Welding
	R	Y						2mm Raised Face	Ring Joint					
1/2	3	10	66.7	4	15.9	1/2	55	65	75	0.78	0.62	0.61	0.62	0.62
3/4	3	11	82.6	4	19.1	5/8	65	75	90	1.34	1.15	1.15	1.16	1.19
1	3	13	88.9	4	19.1	5/8	65	75	90	1.64	1.39	1.38	1.42	1.44
1 1/4	5	14	98.4	4	19.1	5/8	70	85	95	2.06	1.67	1.66	1.79	1.73
1 1/2	6	16	114.3	4	22.2	3/4	75	90	100	3.06	2.53	2.52	2.68	2.62
2	8	17	127	8	19.1	5/8	75	90	100	3.4	2.8	2.79	3.09	2.94
2 1/2	8	19	149.2	8	22.2	3/4	85	100	115	5.31	4.25	4.22	4.75	4.49
3	10	21	168.3	8	22.2	3/4	90	110	120	7.32	5.81	5.78	6.79	6.2
3 1/2	10	22.4	184.2	8	22.2	3/4	95	110	125	8.17	7.72	7.72	9.53	
4	11	23.9	200	8	22.2	3/4	95	115	125	11.3	10.13	10.07	12	
5	11	23.9	235	8	22.2	3/4	110	120	135	15.12	12.58	12.52	15.96	
6	13	26.9	269.9	12	22.2	3/4	110	120	140	19.68	16.04	15.95	21.2	
8	13	31.8	330.2	12	25.4	7/8	120	140	150	30.48	24.5	24.37	34.6	
10	13	33.3	387.4	16	28.6	1	140	160	170	43.74	34.16	39.92	55.34	
12	13	39.6	450.8	16	31.8	1 1/8	145	170	185	64.41	51.26	58.7	78.9	
14	13	41.4	514.4	20	31.8	1 1/8	160	180	190	88.3	72.12	83.46	107.05	
16	13	44.5	571.5	20	34.9	1 1/4	165	190	205	112.94	90.4	106.14	139.25	
18	13	49.3	628.6	24	34.9	1 1/4	170	195	210	138.34	109	133.95	176.9	
20	13	54.1	685.8	24	34.9	1 1/4	185	205	220	167.37	136	157.65	223.17	
24	13	63.5	812.8	24	41.3	1 1/2	205	230	255	235.41	204	240.4	342	

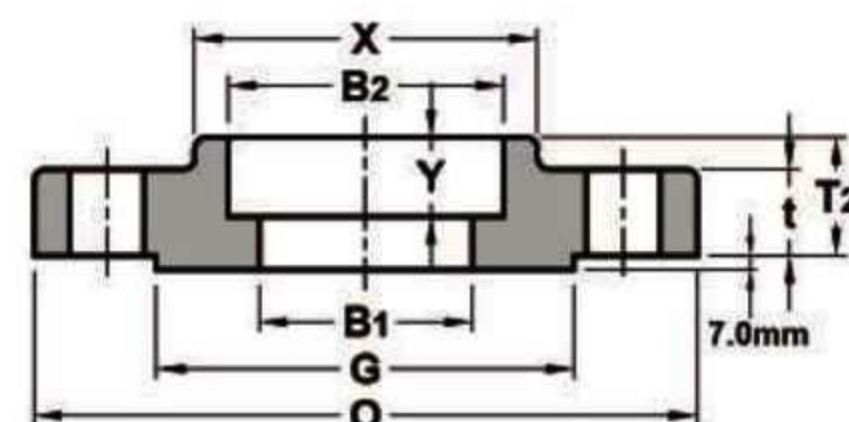
CLASS 600 FLANGES



THREADED



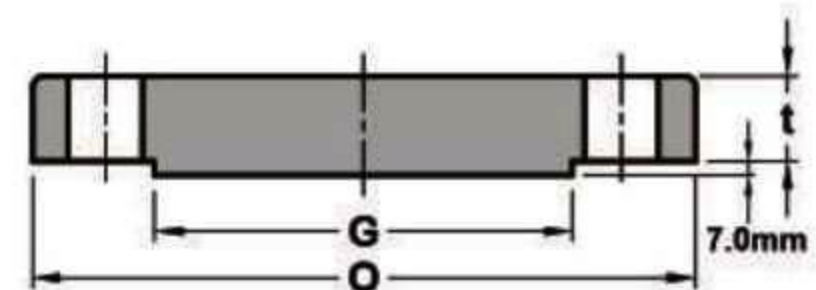
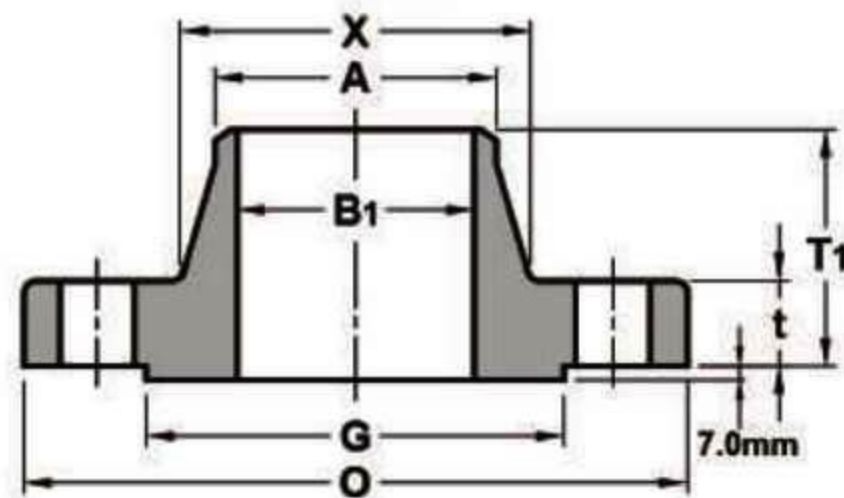
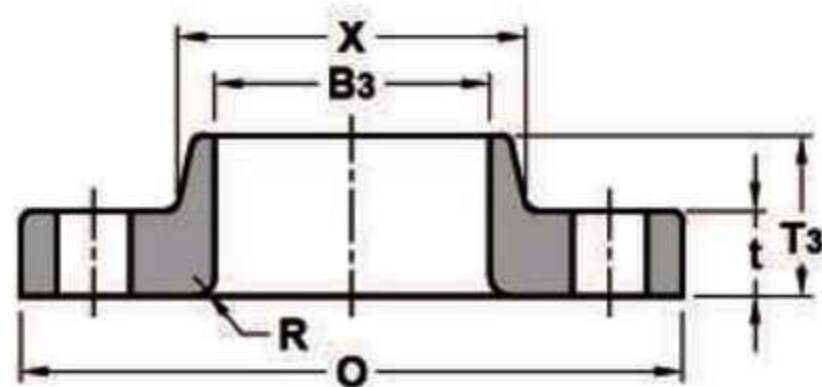
SLIP-ON



SOCKET WELDING

Unit : mm

Nominal Pipe Size	Out-side Diam.	Min. Thickness	Diam. of Hub	O.D of Rasied Face	Diam. of Hub at Bevel	Length Through Hub			Min. Thread Length	Bore			
						Welding Neck	Slip-on Threaded Socket Welding	Lap Joint		Welding Nect / Socket Welding	Min. Slip-on / Socket Welding	Min. Lap Joint	Counter Bore Min. Threaded
	O	t	X	G	A	T1	T2	T3	Q	B1	B2	B3	B
1/2	95	14.3	38	35.1	21.3	52	22	22	16	To be Specified by Purchaser	22.2	22.9	23.6
3/4	115	15.9	48	42.9	26.7	57	25	25	16		27.7	28.2	29
1	125	17.5	54	50.8	33.4	62	27	27	18		34.5	34.9	35.8
1 1/4	135	20.7	64	63.5	42.2	67	29	29	21		43.2	43.7	44.4
1 1/2	155	22.3	70	73.2	48.3	70	32	32	23		49.5	50	50.6
2	165	25.4	84	91.9	60.3	73	37	37	29		61.9	62.5	63.5
2 1/2	190	28.6	100	104.6	73	79	41	41	32		74.6	75.4	76.2
3	210	31.8	117	127	88.9	83	46	46	35		90.7	91.4	92.2
3 1/2	230	35	133	139.7	101.6	86	49	49	40		103.4	104.1	104.9
4	275	38.1	152	157.2	114.3	102	54	54	42		116.1	116.8	117.6
5	330	44.5	189	185.7	141.3	114	60	60	48		143.8	144.4	144.4
6	355	47.7	222	215.9	168.3	117	67	67	51		170.7	171.4	171.4
8	420	55.6	273	269.7	219.1	133	76	76	58		221.5	222.2	222.2
10	510	63.5	343	323.9	273	152	86	111	66		276.2	277.4	276.2
12	560	66.7	400	381	323.8	156	92	117	70		327	328.2	328.6
14	605	69.9	432	412.8	355.6	165	94	127	74		359.2	360.2	360.4
16	685	76.2	495	469.9	406.4	178	106	140	78		410.5	411.2	411.2
18	745	82.6	546	533.4	457	184	117	152	80		461.8	462.3	462
20	815	88.9	610	584.2	508	190	127	165	83		513.1	514.4	512.8
24	940	101.6	718	692.2	610	203	140	184	93		616	616	614.4



LAP JOINT

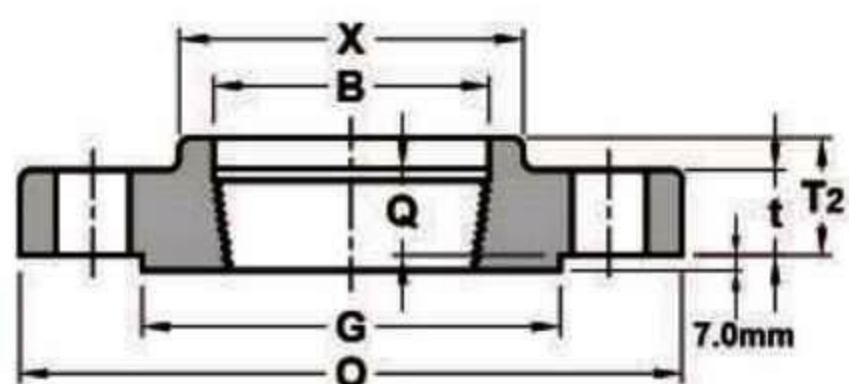
WELDING NECK

BLIND

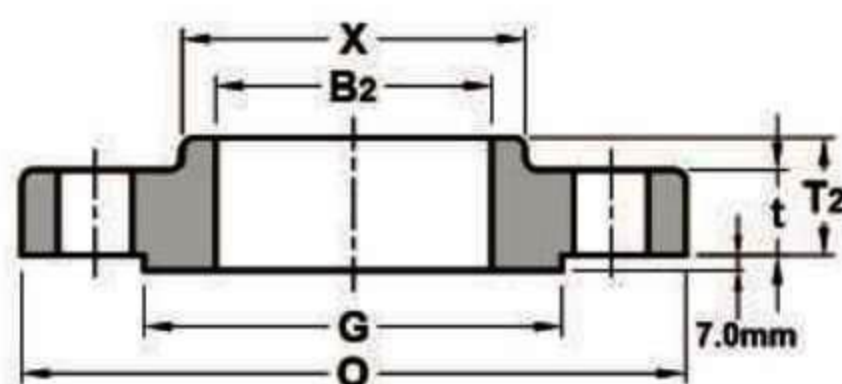
Unit : mm

Nominal Pipe Size	Radius of Lap-Joint	Depth of Socket	Drilling			Bolting				Approximate Weight(Kg)				
			Bolt Circle Diam.	Num. of Holes	Diam. of Holes	Diam. of Bolt (inch)	Male Female Tongue Groove	Stud Bolt Length		Welding Neck	Slip-on / Threaded	Lap Joint	Blind	Socket Welding
	R	Y						7mm Raised Face	Ring Joint					
1/2	3	10	66.7	4	15.9	1/2	70	75	75	0.9	0.91	0.8	0.91	0.91
3/4	3	11	82.6	4	19.1	5/8	85	90	90	1.59	1.4	1.36	1.4	1.36
1	3	13	88.9	4	19.1	5/8	85	90	90	1.9	1.7	1.59	1.81	1.81
1 1/4	5	14	98.4	4	19.1	5/8	90	95	95	2.49	2.27	2.04	2.4	2.6
1 1/2	6	16	114.3	4	22.2	3/4	100	110	110	3.63	3.1	2.95	3.4	3.18
2	8	17	127	8	19.1	5/8	100	110	110	4.54	3.63	3.63	4.4	3.9
2 1/2	8	19	149.2	8	22.2	3/4	115	120	120	6.35	5.44	4.99	6.8	5.9
3	10	21	168.3	8	22.2	3/4	120	125	125	8.16	7.26	6.35	8.9	7.4
3 1/2	10	22.4	184.2	8	25.4	7/8	135	140	140	11.8	9.53	9.08	13.17	
4	11	23.9	215.9	8	25.4	7/8	140	145	145	16.78	14.97	14.06	18.6	
5	11	23.9	266.7	8	28.6	1	160	165	165	30.87	28.5	27.5	30.84	
6	13	26.9	292.1	12	28.6	1	165	170	170	36.77	36.32	35.38	38	
8	13	31.8	349.2	12	31.8	1 1/8	185	190	195	50.8	44	50.8	62.2	
10	13	33.3	431.8	16	34.9	1 1/4	210	215	215	86.26	76.2	74	102	
12	13	39.6	489	20	34.9	1 1/4	215	220	220	102.51	97.52	108.86	132	
14	13	41.4	527	20	38.1	1 3/8	230	235	235	121.56	102	111	158	
16	13	44.5	603.2	20	41.3	1 1/2	250	255	255	177.06	149.82	165.71	224.73	
18	13	49.3	654	20	44.5	1 5/8	265	275	275	215.65	180.1	194	285	
20	13	54.1	723.9	24	44.5	1 5/8	280	285	290	267.86	231.54	258.78	365	
24	13	63.5	838.2	24	50.8	1 7/8	325	330	335	372	330	362	533.45	

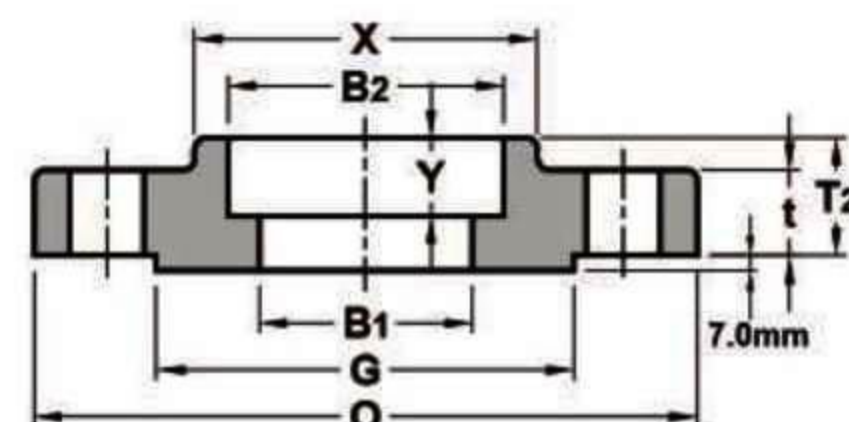
CLASS 900 FLANGES



THREADED



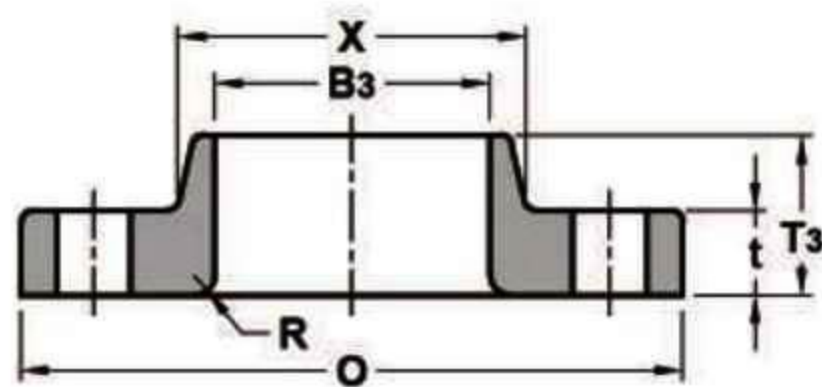
SLIP-ON



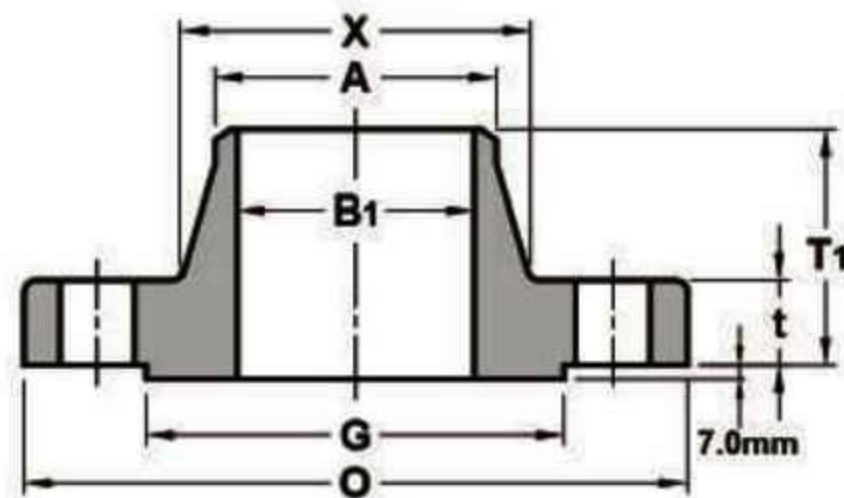
SOCKET WELDING

Unit : mm

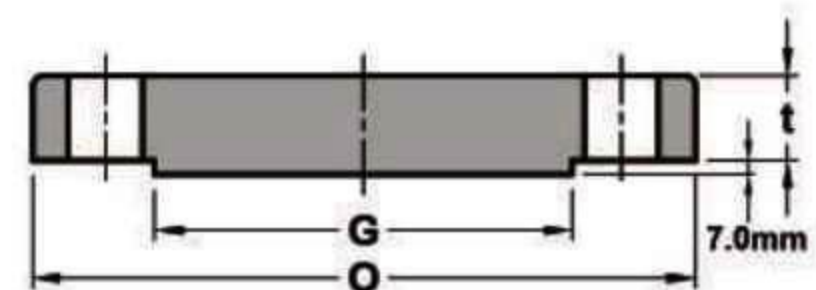
Nominal Pipe Size	Out-side Diam.	Min. Thickness	Diam. of Hub	O.D of Rasied Face	Diam. of Hub at Bevel	Length Through Hub			Min. Thread Length	Bore			
						Welding Neck	Slip-on Threaded Socket Welding	Lap Joint		Welding Nect / Socket Welding	Min. Slip-on / Socket Welding	Min. Lap Joint	Counter Bore Min. Threaded
	O	t	X	G	A	T1	T2	T3	Q	B1	B2	B3	B
1/2	120	22.3	38	35.1	21.3	60	32	32	23	To be Specified by Purchaser	22.2	22.9	23.6
3/4	130	25.4	44	42.9	26.7	70	35	35	26		27.7	28.2	29
1	150	28.6	52	50.8	33.4	73	41	41	29		34.5	34.9	35.8
1 1/4	160	28.6	64	63.5	42.2	73	41	41	31		43.2	43.7	44.4
1 1/2	180	31.8	70	73.2	48.3	83	44	44	32		49.5	50	50.6
2	215	38.1	105	91.9	60.3	102	57	57	39		61.9	62.5	63.5
2 1/2	245	41.3	124	104.6	73	105	64	64	48		74.6	75.4	76.2
3	240	38.1	127	127	88.9	102	54	54	42		90.7	91.4	92.2
4	290	44.5	159	157.2	114.3	114	70	70	48		116.1	116.8	117.6
5	350	50.8	190	185.7	141.3	127	79	79	54		143.8	144.4	144.4
6	380	55.6	235	215.9	168.3	140	86	86	58		170.7	171.4	171.4
8	470	63.5	298	269.7	219.1	162	102	114	64		221.5	222.2	222.2
10	545	69.9	368	323.9	273	184	108	127	72		276.2	277.4	276.2
12	610	79.4	419	381	323.8	200	117	143	77		327	328.2	328.6
14	640	85.8	451	412.8	355.6	213	130	156	83		359.2	360.2	360.4
16	705	88.9	508	469.9	406.4	216	133	165	86		410.5	411.2	411.2
18	785	101.6	565	533.4	457	229	152	190	89		461.8	462.3	462
20	855	108	622	584.2	508	248	159	210	93		513.1	514.4	512.8
24	1040	139.7	749	692.2	610	292	203	267	102		616	616	614.4



LAP JOINT



WELDING NECK

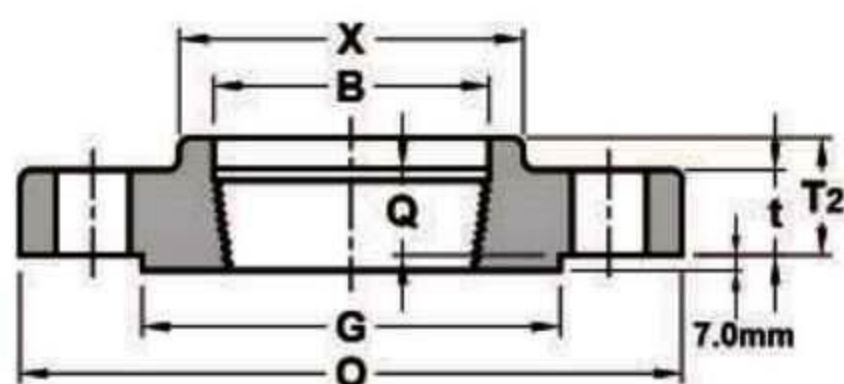


BLIND

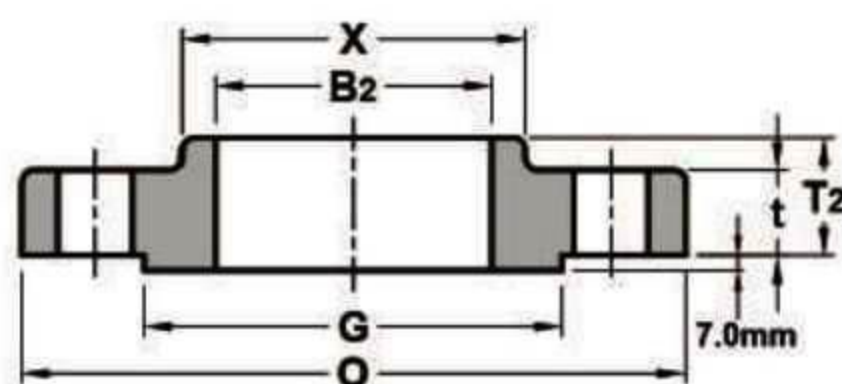
Unit : mm

Nominal Pipe Size	Radius of Lap-Joint	Drilling			Bolting			Approximate Weight(Kg)				
		Bolt Circle Diam.	Num. of Holes	Diam. of Holes	Diam. of Bolt (inch)	Male Female Tongue Groove	Stud Bolt Length		Welding Neck	Slip-on / Threaded	Lap Joint	Blind
	R						7mm Raised Face	Ring Joint				
1/2	3	82.6	4	22.2	3/4	100	110	110	2.1	1.81	1.81	1.9
3/4	3	88.9	4	22.2	3/4	110	115	115	2.72	2.4	2.3	2.7
1	3	101.6	4	25.4	7/8	120	125	125	3.86	3.41	3.4	4.09
1 1/4	5	111.1	4	25.4	7/8	120	125	125	4.54	4.1	4.09	4.54
1 1/2	6	123.8	4	28.6	1	135	140	140	5.9	5.45	5.4	5.9
2	8	165.1	8	25.4	7/8	140	145	145	10.89	9.98	9.53	11.34
2 1/2	8	190.5	8	28.6	1	150	160	160	16.33	15.8	13.15	16
3	10	190.5	8	25.4	7/8	140	145	145	15	11.8	11.34	13.17
4	11	235	8	31.8	1 1/8	165	170	170	23.13	23.2	22.6	24.5
5	11	279.4	8	34.9	1 1/4	185	190	190	38.5	37.65	36.74	39.46
6	13	317.5	12	31.8	1 1/8	185	190	195	49.89	48.3	47.5	51.5
8	13	393.7	12	38.1	1 3/8	215	220	220	79.45	75	86	89
10	13	469.9	16	38.1	1 3/8	230	235	235	118.04	111.13	125.64	131.54
12	13	533.4	20	38.1	1 3/8	250	255	255	157	146	167	187
14	13	558.8	20	41.3	1 1/2	265	275	280	181.6	172.36	180.07	224.07
16	13	616	20	44.5	1 5/8	280	285	290	224.73	192.95	211.11	272.4
18	13	685.8	20	50.8	1 7/8	320	325	335	308.72	272.4	295.1	385.9
20	13	749.3	20	54	2	345	350	360	376.82	331.42	367.74	488
24	13	901.7	20	66.7	2 1/2	430	440	455	685	632	700	905

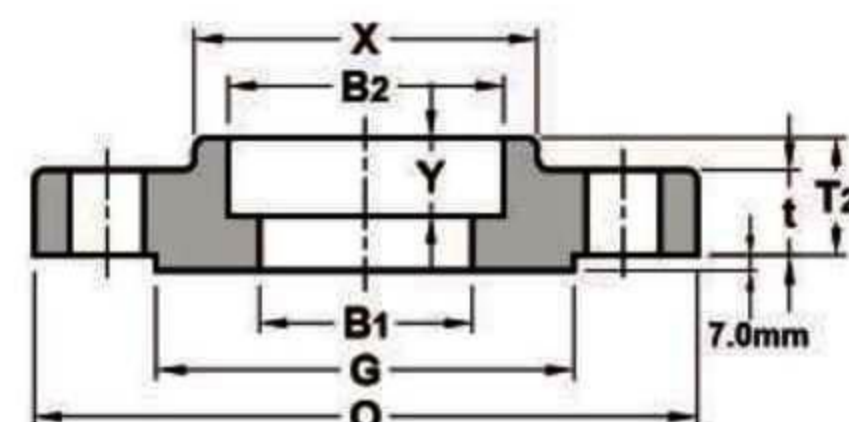
CLASS 1500 FLANGES



THREADED



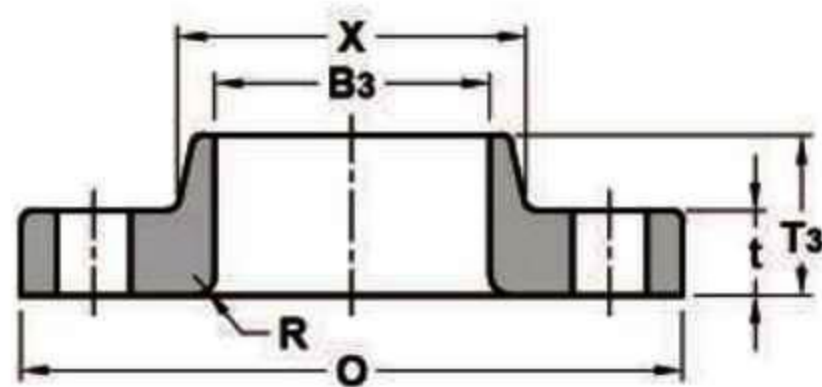
SLIP-ON



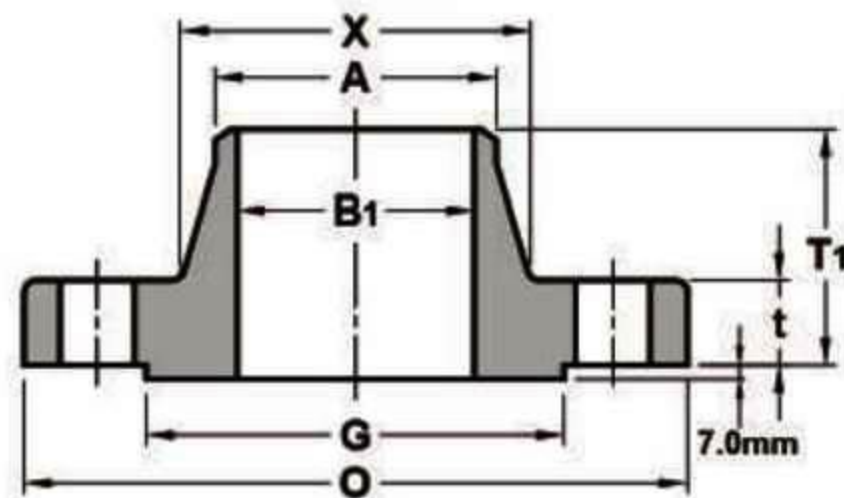
SOCKET WELDING

Unit : mm

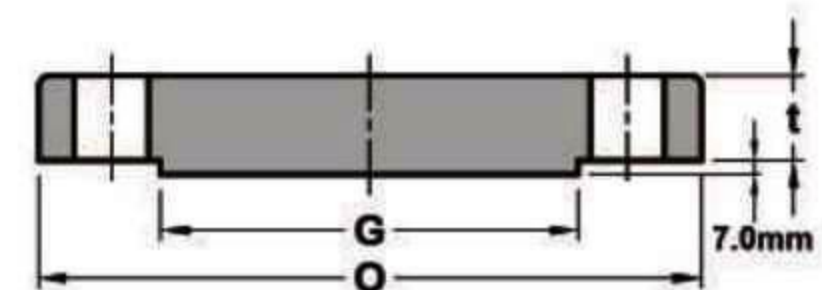
Nominal Pipe Size	Out-side Diam.	Min. Thickness	Diam. of Hub	O.D of Rasied Face	Diam. of Hub at Bevel	Length Through Hub			Min. Thread Length	Bore			
						Welding Neck	Slip-on Threaded Socket Welding	Lap Joint		Welding Nect / Socket Welding	Min. Slip-on / Socket Welding	Min. Lap Joint	Counter Bore Min. Threaded
	O	t	X	G	A	T1	T2	T3	Q	B1	B2	B3	B
1/2	120	22.3	38	35.1	21.3	60	32	32	23	To be Specified by Purchaser	22.2	22.9	23.6
3/4	130	25.4	44	42.9	26.7	70	35	35	26		27.7	28.2	29
1	150	28.6	52	50.8	33.4	73	41	41	29		34.5	34.9	35.8
1 1/4	160	28.6	64	63.5	42.2	73	41	41	31		43.2	43.7	44.4
1 1/2	180	31.8	70	73.2	48.3	85	44	44	32		49.5	50	50.6
2	215	38.1	105	91.9	60.3	102	57	57	39		61.9	62.5	63.5
2 1/2	245	41.3	124	104.6	73	105	64	64	48		74.6	75.4	76.2
3	265	47.7	133	127	88.9	117	73.2	73	50.8		90.7	91.4	92.2
4	310	54	162	157.2	114.3	124	90.4	90	57.2		116.1	116.8	117.6
5	375	73.1	197	185.7	141.3	156	104.6	105	57.2		143.8	144.4	144.5
6	395	82.6	229	215.9	168.3	171	119.1	119	69.9		170.7	171.4	171.5
8	485	92.1	292	269.7	219.1	213	142.7	143	76.2		221.5	222.2	222.3
10	585	108	368	323.9	273	254	158.8	178	84.1		276.4	277.4	276.4
12	675	123.9	451	381	323.8	283	180.8	219	91.9		327.2	328.2	328.7
14	750	133.4	495	412.8	355.6	298		241			359.2	360.2	360.4
16	825	146.1	552	469.9	406.4	311		260			410.5	411.2	411.2
18	915	162	597	533.4	457	327		276			461.8	462.3	462
20	985	177.8	641	584.2	508	356		292			513.1	514.4	512.8
24	1170	203.2	762	692.2	610	406		330			616	616	614.4



LAP JOINT



WELDING NECK

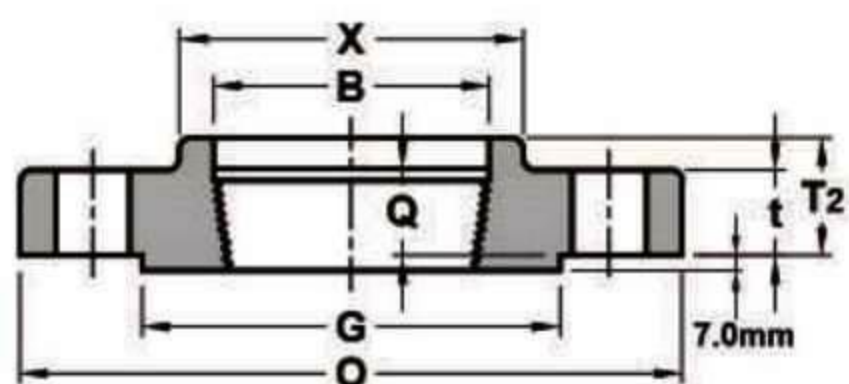


BLIND

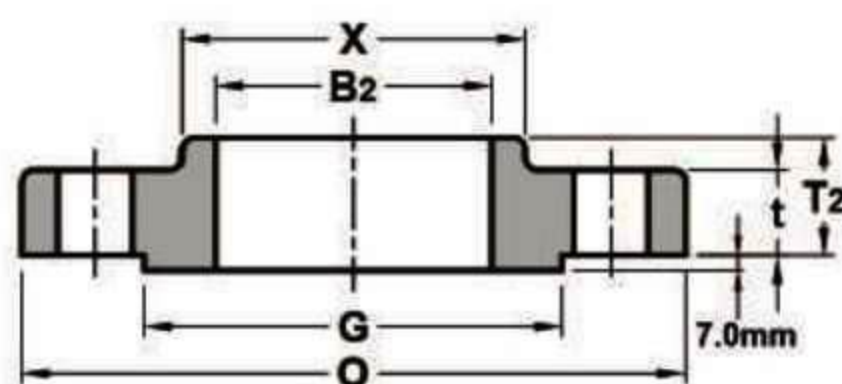
Unit : mm

Nominal Pipe Size	Radius of Lap-Joint	Depth of Socket	Drilling			Bolting				Approximate Weight(Kg)				
			Bolt Circle Diam.	Num. of Holes	Diam. of Holes	Diam. of Bolt (inch)	Male Female Tongue Groove	Stud Bolt Length		Welding Neck	Slip-on / Threaded	Lap Joint	Blind	Socket Welding
	R	Y						7mm Raised Face	Ring Joint					
1/2	3	10	82.6	4	22.2	3/4	100	110	110	2.1	1.8	1.8	1.9	1.81
3/4	3	11	88.9	4	22.2	3/4	110	115	115	2.72	2.27	2.27	2.72	2.81
1	3	13	101.6	4	25.4	7/8	120	125	125	3.86	3.4	3.4	4.08	3.61
1 1/4	5	14	111.1	4	25.4	7/8	120	125	125	4.54	4.1	4.09	4.3	4.99
1 1/2	6	16	123.8	4	28.6	1	135	140	140	5.9	5.45	5.4	5.9	6.76
2	8	17	165.1	8	25.4	7/8	140	145	145	10.89	10.5	9.53	11.3	10.89
2 1/2	8	19	190.5	8	28.6	1	150	160	160	16.34	15.8	13.15	16	16.34
3	10	20.6	203.2	8	31.8	1 1/8	170	180	180	21.79	21.77	17.24	21.79	
4	11	23.9	241.3	8	34.9	1 1/4	190	195	195	31.3	31	29	33.11	
5	11	23.9	292.1	8	41.3	1 1/2	240	250	250	59.02	58.8	54	60	
6	13	26.9	317.5	12	38.1	1 3/8	255	260	265	74.91	74	62	75	
8	13	31.8	393.7	12	44.5	1 5/8	285	290	325	123.83	117.73	129.73	136.98	
10	13	33.3	482.6	12	50.8	1 7/8	330	335	345	205.93	197.49	220.19	229.97	
12	13	39.6	571.5	16	54	2	370	375	385	306	264	286.02	316	
14	13	41.4	635	16	60.3	2 1/4	400	405	425	416		404.06	421	
16	13	44.5	704.8	16	66.7	2 1/2	440	445	470	567.5		522.1	559	
18	13	49.3	774.7	16	73	2 3/4	490	495	525	736		669.65	761	
20	13	54.1	831.8	16	79.4	3	535	540	565	929		805.85	967	
24	13	63.5	990.6	16	92.1	3 1/2	610	615	650	1504		1285.55	1568	

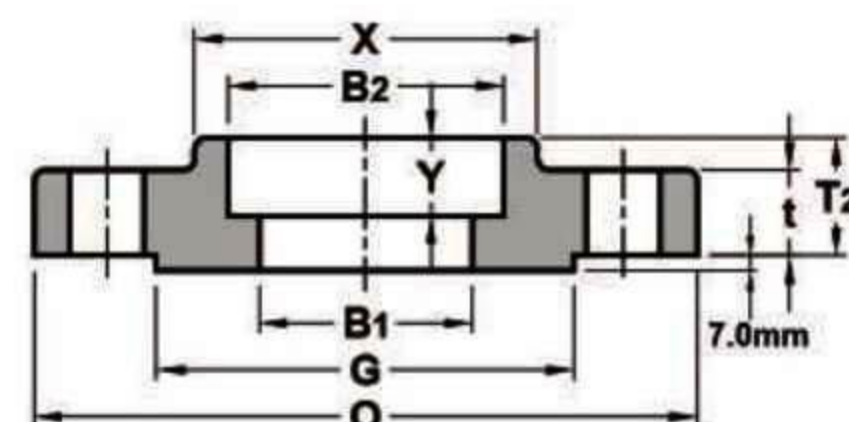
CLASS 2500 FLANGES



THREADED



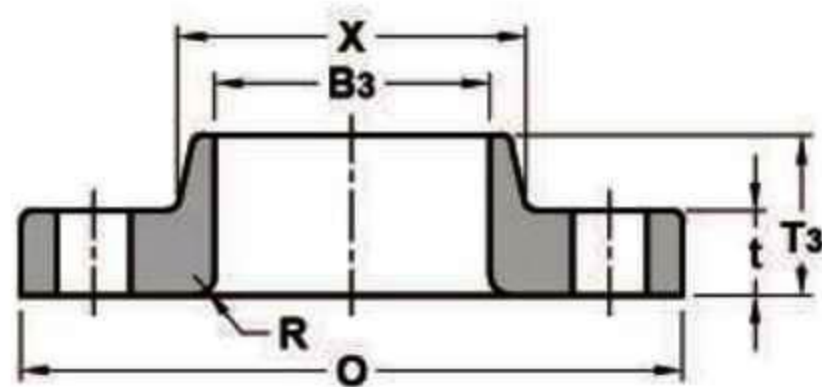
SLIP-ON



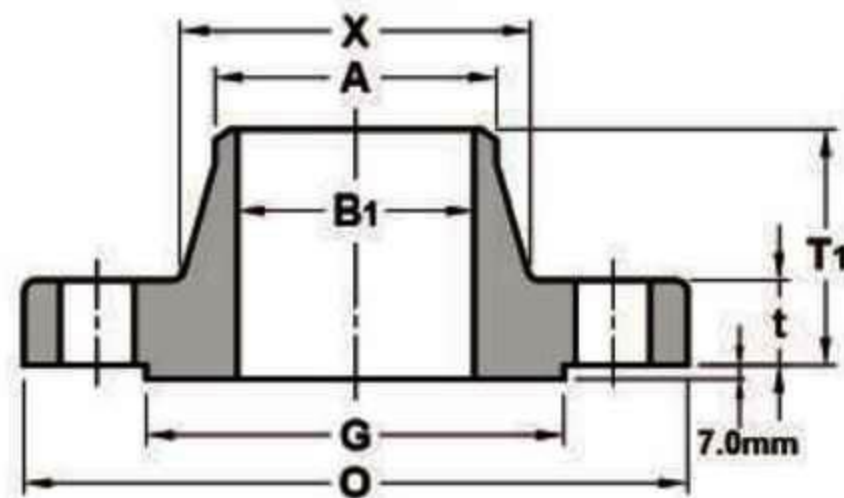
SOCKET WELDING

Unit : mm

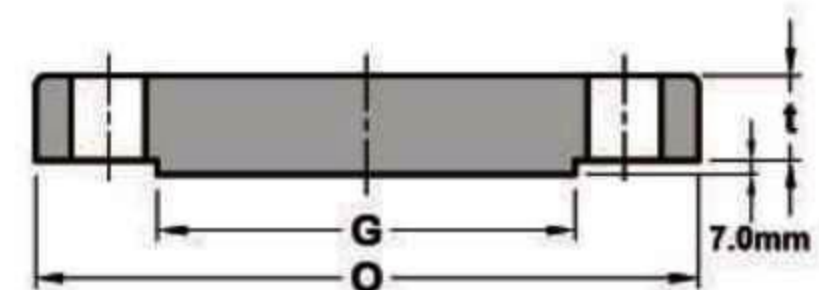
Nominal Pipe Size	Out-side Diam.	Min. Thickness	Diam. of Hub	O.D of Rasied Face	Diam. of Hub at Bevel	Length Through Hub			Min. Thread Length	Bore		
						Welding Neck	Threaded	Lap Joint		Welding Nect / Socket Welding	Min. Lap Joint	Counter Bore Min. Threaded
O	t	X	G	A	T1	T2	T3	Q	B1	B3	B	
1/2	135	30.2	43	35.1	21.3	73	40	40	29	To be Specified by Purchaser	22.9	23.6
3/4	140	31.8	51	42.9	26.7	79	43	43	32		28.2	29
1	160	35	57	50.8	33.4	89	48	48	35		34.9	35.8
1 1/4	185	38.1	73	63.5	42.2	95	52	52	39		43.7	44.4
1 1/2	205	44.5	79	73.2	48.3	111	60	60	45		50	50.6
2	235	50.9	95	91.9	60.3	127	70	70	51		62.5	63.5
2 1/2	265	57.2	114	104.6	73	143	79	79	58		75.4	76.2
3	305	66.7	133	127	88.9	168		92	63.5		91.4	
4	355	76.2	165	157.2	114.3	190		108	69.9		116.8	
5	420	92.1	203	185.7	141.3	229		130	76.2		144.4	
6	485	108	235	215.9	168.3	273		152	82.6		171.4	
8	550	127	305	269.7	219.1	318		178	95.3		222.2	
10	670	165.1	375	323.9	273	419		229	108		277.4	
12	760	184.2	441	381	323.8	464		254	120.7		328.2	



LAP JOINT



WELDING NECK



BLIND

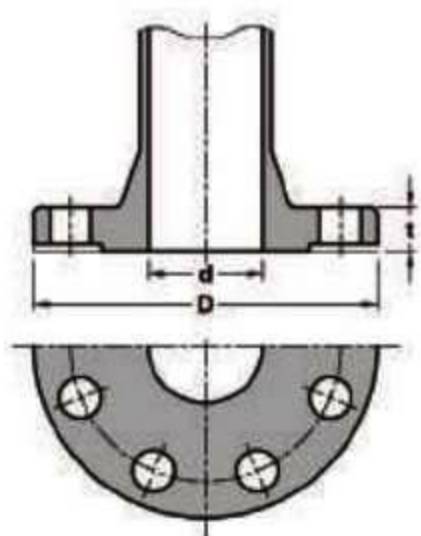
Unit : mm

Nominal Pipe Size	Radius of Lap-Joint	Drilling			Bolting				Approximate Weight(Kg)			
		Bolt Circle Diam.	Num. of Holes	Diam. of Holes	Diam. of Bolt (inch)	Male Female Tongue Groove	Stud Bolt Length		Welding Neck	Slip-on / Threaded	Lap Joint	Blind
							7mm Raised Face	Ring Joint				
1/2	3	88.9	4	22.2	3/4	115	120	120	3.18	3.18	3	3.18
3/4	3	95.2	4	22.2	3/4	120	125	125	4.08	4.08	3.63	4.54
1	3	108	4	25.4	7/8	135	140	140	5.45	5.44	4.99	5.44
1 1/4	5	130.2	4	28.6	1	145	150	150	9.07	8.16	7.26	8.16
1 1/2	6	146	4	31.8	1 1/8	165	170	170	11.35	11	9.99	10.44
2	8	171.4	8	28.6	1	170	180	180	19.07	17.25	16.8	17.71
2 1/2	8	196.8	8	31.8	1 1/8	190	195	205	23.61	24.97	24.06	25.42
3	10	228.6	8	34.9	1 1/4	215	220	230	42.68	37.68	36.32	39.04
4	11	273	8	41.3	1 1/2	250	255	260	64	58	54.48	60.38
5	11	323.8	8	47.6	1 3/4	290	300	310	110.68	95.25	92.53	101.15
6	13	368.3	8	54	2	335	345	355	176.46	146.51	143.01	156.63
8	13	438.2	12	54	2	375	380	395	261.27	219.99	213.38	240.62
10	13	539.8	12	66.7	2 1/2	485	490	510	484.43	419.57	408.6	465.36
12	13	619.1	12	73	2 3/4	535	540	560	692.35	590.2	572.95	664.06

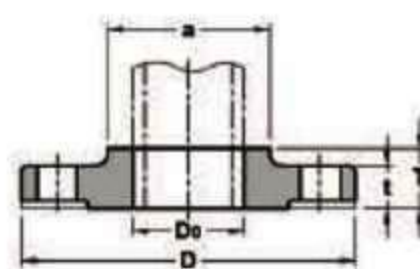
Tolerances

ASME B 16.5 FORGED FLANGES (Reversion of ASME B16.5-1996)

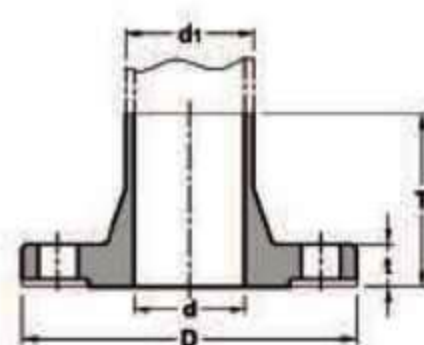
TYPE of GASKET SURFACE



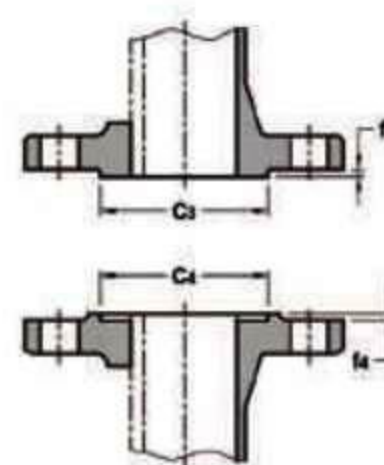
SOLID FLANGE



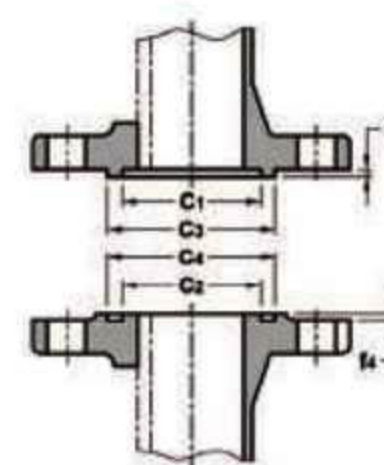
SLIP-ON FLANGE



WELDING NECK



MALE & FEMALE TYPE



TONGUE & GROOVE TYPE

WELDING NECK

Place	Range	Tolerance (mm)
Outside Diameter	When O.D. is 24" or less	$\pm 1.6^* (\pm 0.063\text{in})$
	When O.D. is Over 24"	$\pm 3.2^* (\pm 0.125\text{in})$
Inside Diameter	10" and Smaller	$\pm 1.0^* (\pm 0.03\text{in})$
	12" thru 18"	$\pm 1.5^* (\pm 0.06\text{in})$
	20" and Larger	$+3.0^* (+0.12\text{in})$ $-1.5 (-0.06\text{in})$
Diameter of Contact Face	2.0mm Raised Face (Outside)	$\pm 1.0 (\pm 0.03\text{in})$
	7.0mm Raised Face (Outside)	$\pm 0.5^* (\pm 0.02\text{in})$
	Tongue, groove, female (Inside & Outside)	$\pm 0.5^* (\pm 0.02\text{in})$
Diameter of Hub at Base	When Hub Base is 24" or Smaller	$\pm 1.6^* (\pm 0.063\text{in})$
	When Hub Base is Over 24"	$\pm 3.2^* (\pm 0.125\text{in})$
Diameter of Hub at Welding Point	When O.D. is 5" or Less	$+2.0 (+0.09\text{in})$ $-1.0 (-0.03\text{in})$
	When O.D. is Over 6"	$+4.0 (+0.16\text{in})$ $-1.0 (-0.03\text{in})$
Drilling	Bolt Circle Diameter	$\pm 1.5 (\pm 0.06\text{in})$
	Bolt to Bolt Hole	$\pm 0.8 (\pm 0.03\text{in})$
	Eccentricity of Bolt Circle with Respect to Facing	NPS $\leq 2 \frac{1}{2}$ " 0.8 (0.03in) Max. NPS ≤ 3 " 1.5 (0.06in) Max.
	Eccentricity of Bolt Circle with Respect to Bore	0.8 Max.* (0.03in)
Thickness	When O.D. is 18" or Less	$+3.0 (+0.12\text{in})$ $-0.0 (-0.0\text{in})$
	When O.D. is Over 20"	$+5.0 (+0.19\text{in})$ $-0.0 (-0.0\text{in})$
Length Thru Hub	When O.D. is 4" or Less	$\pm 1.5 (\pm 0.06\text{in})$
	5" thru 10"	$+1.5 (+0.06\text{in})$ $-3.0 (-0.12\text{in})$
	When O.D. is Over 12"	$+3.0 (+0.12\text{in})$ $-5.0 (-0.18\text{in})$

NOTE : * This tolerance is not covered in ASME B16.5, but maker's option.

THREADED, SOCKET-WELDING, SLIP-ON, LAP JOINT AND BLIND

Place	Range		Tolerance (mm)
Outside Diameter	When O.D. is 24" or less		±1.6* (±0.063in)
	When O.D. is Over 24"		±3.2* (±0.125in)
Inside Diameter	Counter-bores Threaded	When O.D is 10" or Less	+1.0 (+0.03in) -0.0 (-0.0in)
		When O.D is Over 12"	+1.5 (+0.06in) -0.0 (-0.0in)
	Counter-bores Socket Welding	1/2≤NPS≤3	±0.25 (±0.01in)
	Lap joint Slip-On Socket Welding	When O.D is 10" or Less	+1.0 (+0.03in) -0.0 (-0.0in)
		When O.D is Over 12"	+1.5 (+0.06in) -0.0 (-0.0in)
	Diameter of Contact Face	2.0mm Raised Face (Outside)	
7.0mm Raised Face (Outside)		±0.5 (±0.02in)	
Tongue, goove, female (Inside & Outside)		±0.5 (±0.02in)	
Diameter of Hub at Base	When Hub Base is 24" or Smaller		±1.6* (±0.063in)
	When Hub Base is Over 24"		±3.2* (±0.125in)
Drilling	Bolt Circle Diameter		±1.5 (±0.06in)
	Bolt to Bolt Hole		±0.8 (±0.03in)
	Eccentricity of Bolt Circle with Respect to Facing		NPS≤2 1/2" ±0.8 (0.03in) Max. NPS≤3" ±1.5 (0.03in) Max.
	Eccentricity of Bolt Circle with Respect to Bore		0.8 Max.* (0.03in)
	Eccentricity of Facing with Respect to Bore		0.8 Max.* (0.03in)
Thickness	When O.D is 18" or Less		+3.0 (+0.12in) 0.0 (-0.0in)
	When O.D is Over 20"		+5.0 (+0.19in) -0.0 (-0.0in)
Length Thru Hub	When O.D is 4" or Less		±1.5 (±0.06in)
	5" thru 10"		+1.5 (+0.06in) -3.0 (-0.12in)
	When O.D is Over 12"		+3.0 (+0.12in) -5.0 (-0.18in)

Welded & seamless pipe Dimensions

ASME B 36.10

Dimensions in inches

Nominal Pipe Size	Outside Diam.	Wall I.D.	NOMINAL WALL THICKNESS AND INSIDE DIAMETER												
			Schedule 10	Schedule 20	Schedule 30	STD	Schedule 40	Schedule 60	XS	Schedule 80	Schedule 100	Schedule 120	Schedule 140	Schedule 160	XXS
1/8	0.405	Wall	-	-	-	0.068	0.068	-	0.095	0.095	-	-	-	-	-
		I.D.	-	-	-	0.269	0.269	-	0.215	0.215	-	-	-	-	-
1/4	0.540	Wall	-	-	-	0.088	0.088	-	0.119	0.119	-	-	-	-	-
		I.D.	-	-	-	0.364	0.364	-	0.302	0.302	-	-	-	-	-
3/8	0.675	Wall	-	-	-	0.091	0.091	-	0.126	0.126	-	-	-	-	-
		I.D.	-	-	-	0.493	0.493	-	0.423	0.423	-	-	-	-	-
1/2	0.840	Wall	-	-	-	0.109	0.109	-	0.147	0.147	-	-	-	0.188	0.294
		I.D.	0.674	-	-	0.622	0.622	-	0.546	0.546	-	-	-	0.466	0.252
3/4	1.050	Wall	-	-	-	0.113	0.113	-	0.154	0.154	-	-	-	0.219	0.308
		I.D.	0.884	-	-	0.824	0.824	-	0.742	0.742	-	-	-	0.612	0.434
1	1.315	Wall	-	-	-	0.133	0.133	-	0.179	0.179	-	-	-	0.250	0.358
		I.D.	1.097	-	-	1.049	1.049	-	0.957	0.957	-	-	-	0.815	0.599
1 1/4	1.660	Wall	-	-	-	0.140	0.140	-	0.191	0.191	-	-	-	0.250	0.382
		I.D.	1.442	-	-	1.380	1.380	-	1.278	1.278	-	-	-	1.160	0.896
1 1/2	1.900	Wall	-	-	-	0.145	0.145	-	0.200	0.200	-	-	-	0.281	0.400
		I.D.	1.682	-	-	1.610	1.610	-	1.500	1.500	-	-	-	1.338	1.100
2	2.375	Wall	-	-	-	0.154	0.154	-	0.218	0.218	-	-	-	0.344	0.436
		I.D.	2.157	-	-	2.067	2.067	-	1.939	1.939	-	-	-	1.687	1.503
2 1/2	2.875	Wall	-	-	-	0.203	0.203	-	0.276	0.276	-	-	-	0.375	0.552
		I.D.	2.635	-	-	2.469	2.469	-	2.323	2.323	-	-	-	2.125	1.771
3	3.500	Wall	-	-	-	0.216	0.216	-	0.300	0.300	-	-	-	0.438	0.600
		I.D.	3.260	-	-	3.068	3.068	-	2.900	2.900	-	-	-	2.624	2.300
3 1/2	4.000	Wall	-	-	-	0.226	0.226	-	0.318	0.318	-	-	-	-	-
		I.D.	3.760	-	-	3.548	3.548	-	3.364	3.364	-	-	-	-	2.728
4	4.500	Wall	-	-	-	0.237	0.237	-	0.337	0.337	-	0.438	-	0.531	0.674
		I.D.	4.260	-	-	4.026	4.026	-	3.826	3.826	-	3.624	-	3.438	3.152
5	5.563	Wall	-	-	-	0.258	0.258	-	0.375	0.375	-	0.500	-	0.625	0.750
		I.D.	5.295	-	-	5.047	5.047	-	4.813	4.813	-	4.563	-	4.313	4.063
6	6.625	Wall	-	-	-	0.280	0.280	-	0.432	0.432	-	0.562	-	0.719	0.864
		I.D.	6.357	-	-	6.065	6.065	-	5.761	5.761	-	5.501	-	5.187	4.897
8	8.625	Wall	-	0.250	0.277	0.322	0.322	0.406	0.500	0.500	0.594	0.719	0.812	0.906	0.875
		I.D.	8.329	8.125	8.071	7.981	7.981	7.813	7.625	7.625	7.437	7.187	7.001	6.813	6.875
10	10.750	Wall	-	0.250	0.307	0.365	0.365	0.500	0.500	0.594	0.719	0.844	1.000	1.125	1.000
		I.D.	10.420	10.250	10.136	10.020	10.020	9.750	9.750	9.562	9.312	9.062	8.750	8.500	-
12	12.750	Wall	-	0.250	0.330	0.375	0.406	0.562	0.500	0.688	0.844	1.000	1.125	1.312	1.000
		I.D.	12.390	12.250	12.090	12.000	11.938	11.626	11.750	11.374	11.062	10.750	10.500	10.126	-
14	14.000	Wall	0.250	0.312	0.375	0.375	0.438	0.594	0.500	0.750	0.938	1.094	1.250	1.406	-
		I.D.	13.500	13.376	13.250	13.250	13.124	12.812	13.000	12.500	12.124	11.812	11.500	11.188	-
16	16.000	Wall	0.250	0.312	0.375	0.375	0.500	0.656	0.500	0.844	1.031	1.219	1.438	1.594	-
		I.D.	15.500	15.376	15.250	15.250	15.000	14.688	15.000	14.312	13.938	13.562	13.124	12.812	-
18	18.000	Wall	0.250	0.312	0.438	0.375	0.562	0.750	0.500	0.938	1.156	1.375	1.562	1.781	-
		I.D.	17.500	17.376	17.124	17.250	16.876	16.500	17.000	16.124	15.250	15.250	14.876	14.438	-
20	20.000	Wall	0.250	0.375	0.500	0.375	0.594	0.812	0.500	1.031	1.281	1.500	1.750	1.969	-
		I.D.	19.500	19.250	19.000	19.250	18.812	18.376	19.000	17.938	17.438	17.000	16.500	16.062	-
24	24.000	Wall	0.250	0.375	0.562	0.375	0.688	0.969	0.500	1.218	1.531	1.812	2.062	2.344	-
		I.D.	23.500	23.250	22.876	23.250	22.624	22.062	23.000	21.562	20.938	20.376	19.876	19.312	-

Not included in B36.10

The wall thickness shown represent nominal or average wall dimensions which are subject to a - 12 ½% mill tolerance.

Note that schedule 40 in, sizes 12" and larger and that schedule 80 in, sizes 10" and larger do not agree with schedule 40S and 80S of ASME B36.19 nor with standard weight and extra strong respectively

Welded & seamless pipe Dimensions

ASME B 36.19

Dimensions in inches

Nominal Pipe Size	Outside Diameter	Wall Thickness Inside Diameter	NOMINAL WALL THICKNESS AND INSIDE DIAMETER		
			Schedule 5S*	Schedule 10S*	Schedule 40S**
1/8	0.405	Wall	-	0.049	0.068
		I.D.	-	0.307	0.269
1/4	0.540	Wall	-	0.065	0.088
		I.D.	-	0.410	0.364
3/8	0.675	Wall	-	0.065	0.091
		I.D.	-	0.545	0.493
1/2	0.840	Wall	0.065	0.083	0.109
		I.D.	0.710	0.674	0.622
3/4	1.050	Wall	0.065	0.083	0.113
		I.D.	0.920	0.884	0.824
1	1.315	Wall	0.065	0.109	0.133
		I.D.	1.185	1.097	1.049
1 1/4	1.660	Wall	0.065	0.109	0.140
		I.D.	1.530	1.442	1.380
1 1/2	1.900	Wall	0.065	0.109	0.145
		I.D.	1.770	1.682	1.610
2	2.375	Wall	0.065	0.109	0.154
		I.D.	2.245	2.157	2.067
2 1/2	2.875	Wall	0.083	0.120	0.203
		I.D.	2.709	2.635	2.469
3	3.500	Wall	0.083	0.120	0.216
		I.D.	3.334	3.260	3.068
3 1/2	4.000	Wall	0.083	0.120	0.226
		I.D.	3.834	3.760	3.548
4	4.500	Wall	0.083	0.120	0.237
		I.D.	4.334	4.260	4.026
5	5.563	Wall	0.109	0.134	0.258
		I.D.	5.345	5.295	5.047
6	6.625	Wall	0.109	0.134	0.280
		I.D.	6.047	6.357	6.065
8	8.625	Wall	0.109	0.148	0.322
		I.D.	8.407	8.329	7.981
10	10.750	Wall	0.134	0.165	0.365
		I.D.	10.482	10.420	10.020
12	12.750	Wall	0.156	0.180	0.375**
		I.D.	12.438	12.390	12.000**
14 ‡	14.000	Wall	0.156	0.188	-
		I.D.	13.688	13.624	-
16 ‡	16.000	Wall	0.165	0.188	-
		I.D.	15.670	15.624	-
18 ‡	18.000	Wall	0.165	0.188	-
		I.D.	17.670	17.624	-
20 ‡	20.000	Wall	0.188	0.218	-
		I.D.	19.624	19.564	-
24 ‡	24.000	Wall	0.218	0.250	-
		I.D.	23.564	23.500	-

The wall thickness shown represent nominal or average wall dimensions which are subject to a - 12 ½% mill tolerance.

‡Size 14" through 30" are not at publication date covered in B36.19, and dimensions listed are those commonly used in the Industry.

* Schedule 5S and 10S wall thickness do not permit threading in accordance with ASME B2.1.

** Note that schedule 40S and schedule 80S in these sizes do not agree with schedule 40 and schedule 80 of ASME B36.10, and that they are identical to standard weight and extra strong respectively of ASME B36.10.

Material Specifications

ASME B16.5 (ASTM STANDARD)

ASTM	Grade	Classification	CHEMICAL COMPOSITION								MECHANICAL PROPERTIES				
			C %	Mn %	P Max %	S Max %	Si %	Ni %	Cr %	Mo %	T.S. Min psi (kg/mm ²)	Y.S. Min psi (kg/mm ²)	EL. Min. %	Red Min. %	HB
A-105*		Carbon steel	MAX 0.35	0.60 ~ 1.05	0.040	0.050	MAX 0.35	MAX 0.40	MAX 0.30	MAX 0.12	70,000 (49.2)	36,000 (25.3)	22	30	MAX 187
A-181	60	Carbon steel	MAX 0.35	MAX 0.90	0.050	0.050	MAX 0.35	-	-	-	60,000 (42.2)	36,000 (21.1)	22	35	-
A-181	70	Carbon steel	MAX 0.35	MAX 0.90	0.050	0.050	MAX 0.35	-	-	-	70,000 (49.2)	36,000 (25.3)	18	24	-
A-182	F1	½Mo	MAX 0.28	0.6 ~ 0.90	0.045	0.045	0.15 ~ 0.35	-	-	0.44 ~ 0.65	70,000 (49.2)	40,000 (28.1)	20	30	143 ~ 192
A-182	F5	5cr - ½ Mo	MAX 0.15	0.30 ~ 0.60	0.030	0.030	MAX 0.50	MAX 0.50	4.0 ~ 6.0	0.44 ~ 0.65	70,000 (49.2)	40,000 (28.1)	20	35	143 ~ 217
A-182	F5a	5cr - ½ Mo	MAX 0.25	MAX 0.6	0.040	0.030	MAX 0.50	MAX 0.50	4.0 ~ 6.0	0.44 ~ 0.65	90,000 (63.3)	65,000 (45.7)	22	50	187 ~ 248
A-182	F11-1	1 ¼Cr - ½ Mo	0.05 ~ 0.15	0.30 ~ 0.60	0.030	0.030	0.50 ~ 1.00	-	1.00 ~ 1.50	0.44 ~ 0.65	60,000 (42.2)	30,000 (21.1)	20	45	121 ~ 174
A-182	F11-2	1 ¼Cr - ½ Mo	0.10 ~ 0.20	0.30 ~ 0.80	0.040	0.040	0.50 ~ 1.00	-	1.00 ~ 1.50	0.44 ~ 0.65	70,000 (49.2)	40,000 (28.1)	20	30	143 ~ 207
A-182	F11-3	1 ¼Cr - ½ Mo	0.10 ~ 0.20	0.30 ~ 0.80	0.040	0.040	0.50 ~ 1.00	-	1.00 ~ 1.50	0.44 ~ 0.65	75,000 (52.7)	45,000 (31.6)	20	30	156 ~ 207
A-182	F12-1	1Cr - ½ Mo	0.05 ~ 0.15	0.30 ~ 0.60	0.045	0.045	MAX 0.50	-	0.80 ~ 1.25	0.44 ~ 0.65	60,000 (42.2)	30,000 (21.1)	20	45	121 ~ 174
A-182	F12-2	1Cr - ½ Mo	0.10 ~ 0.20	0.30 ~ 0.80	0.040	0.040	0.10 ~ 0.60	-	0.80 ~ 1.25	0.44 ~ 0.65	70,000 (49.2)	40,000 (28.1)	20	30	143 ~ 207
A-182	F11	1 ¼Cr - ½ Mo	0.10 ~ 0.20	0.30 ~ 0.60	0.040	0.040	0.5 ~ 1.00	-	1.00 ~ 1.50	0.44 ~ 0.65	70,000 (49.2)	40,000 (28.1)	20	30	143 ~ 207
A-182	F12	1Cr - ½ Mo	0.10 ~ 0.20	0.30 ~ 0.80	0.040	0.040	0.1 ~ 0.6	-	0.80 ~ 1.25	0.44 ~ 0.65	70,000 (49.2)	40,000 (28.1)	20	30	143 ~ 207
A-182	F22	2¼ Cr - 1 Mo	MAX 0.15	0.30 ~ 0.60	0.040	0.040	MAX 0.50	-	2.00 ~ 2.50	0.87 ~ 1.13	75,000 (52.7)	45,000 (31.6)	20	30	156 ~ 207
A-182	F304	18Cr - 8 Ni	MAX 0.08	MAX 2.00	0.040	0.030	MAX 1.00	8.00 ~ 11.00	18.00 ~ 20.00	-	75,000 (52.7)	30,000 (21.1)	30	50	-
A-182	F304L	18Cr - 8 Ni Low	MAX 0.035	MAX 2.00	0.040	0.030	MAX 1.00	8.00 ~ 13.00	18.00 ~ 20.00	-	70,000 (49.2)	25,000 (17.6)	30	50	-
A-182	F316	18Cr - 8 Ni Mo	MAX 0.08	MAX 2.00	0.040	0.030	MAX 1.00	8.00 ~ 14.00	16.00 ~ 18.00	2.00 ~ 3.00	75,000 (52.7)	30,000 (21.7)	30	50	-
A-182	F316L	18Cr - 8 Ni Mo - Low	MAX 0.035	MAX 2.00	0.040	0.030	MAX 1.00	10.00 ~ 15.00	16.00 ~ 18.00	2.00 ~ 3.00	65,000 (45.7)	25,000 (17.6)	30	50	-
A-182	F321	18Cr - 8 Ni Ti	MAX 0.08	MAX 2.00	0.030	0.030	MAX 1.00	9.00 ~ 12.00	Min 17.00	-	75,000 (52.7)	30,000 (21.1)	30	50	-
A-182	F347	18Cr - 8 Ni Cb	MAX 0.08	MAX 2.00	0.030	0.030	MAX 1.00	9.00 ~ 13.00	17.00 ~ 20.00	-	75,000 (52.7)	30,000 (21.1)	30	50	-
A-350*	LF1	Carbon Steel	MAX 0.30	0.75 ~ 1.05	0.035	0.040	0.15 ~ 0.30	MAX 0.40	MAX 0.30	MAX 0.12	60,000 ~ 85,000 (42.2~59.7)	30,000 (21.1)	25	38	-
A-350*	LF2	Carbon Steel	MAX 0.30	MAX 1.35	0.035	0.040	0.15 ~ 0.30	MAX 0.40	MAX 0.30	MAX 0.12	70,000 ~ 95,000 (49.2~66.8)	36,000 (25.3)	22	30	-
A-350*	LF3	3 ½ Ni	MAX 0.20	MAX 0.90	0.035	0.040	0.20 ~ 0.35	3.25 ~ 3.75	MAX 0.30	MAX 0.12	70,000 ~ 95,000 (49.2~66.8)	37,500 (26.4)	22	35	-

OTHER ELEMENTS : Copper (0.40% MAX), Vanadium (0.03% MAX), Columbium (0.02% MAX.)

The sum of Cu, Ni, Cr and Mo shall not be exceed 1.00%

The sum of Cr and Mo shall not be exceed 0.32%

Material Specifications

APPLICABLE ASTM SPECIFICATIONS

GROUP 1 MATERIALS				PRODUCT FORMS			
Material Group No.	Nominal Designation Steel	Forgings		Castings		Plates	
		Spec. - Gr	Notes	Spec. - Gr	Notes	Spec. - Gr	Notes
1.1	Carbon	A105 A350 - LF2	(1)(3)	A216 - WCB	(1)	A515 - 70 A516 - 70 A537 - C1.1	(1) (1)
	C-Mn Si						
1.2	Carbon			A216 - WCC A352 - LCC	(1)		
	2-1/2 Ni			A352 - LC2		A203 - B	
	3-1/2 Ni	A350 - LF3		A352 - LC3		A203 - E	
1.3	Carbon			A352 - LCB	(1)	A203 - A A203 - D A515 - 65 A516 - 65	
1.4	Carbon	A350 - LF1 CL1				A515 - 60 A516 - 60	(1)
1.5	C - 1/2 Mo	A182 - F1	(2)	A217 - WC1 A352 - LC1	(2)(4)	A204 - A A204 - B	(2) (2)
1.7	C - 1/2 Mo					A204 - C	(2)
	1/2 Cr - 1/2 Mo	A182 - F2					
	Ni - Cr - 1/2 Mo			A217 - WC4	(4)		
	3/4Ni - 3/4Cr - 1 Mo			A217 - WC5	(4)		
1.9	1 Cr - 1/2 Mo	A182 - F12 CL2	(4)				
	1 - 1/4 Cr - 1/2 Mo	A182 - F11 CL2	(4)	A217 - WC6	(4)	A387 - 11 C1.2	
1.10	2 - 1/4 Cr - 1 Mo	A182 - F22 CL3		A217 - WC9	(4)	A387 - 22 C1.2	
1.13	5 Cr - 1/2 Mo 9 Cr - 1 Mo	A182 - F5 A182 - F5a		A217 - C5	(4)		
1.14		A182 - F9		A217 - C12	(4)		

GROUP 2 MATERIALS				PRODUCT FORMS			
2.1	18 Cr - 8 Ni	A182 - F304	(5)	A351 - CF3		A240 - 304	(5)(6)
	18 Cr - 8 Ni	A182 - F304H		A351 - CF8	(5)	A240 - 304H	
2.2	16 Cr - 12 Ni - 2 Mo	A182 - F316 A182 - F316H	(5)	A351 - CF3M A351 - CF8M		A240 - 316 A240 - 316H	(5)(6)
	18 Cr - 13 Ni - 3 Mo					A240 - 317	(5)(6)
	19 Cr - 10 Ni - 3 Mo			A351 - CG8M	(5)		
2.3	18 Cr - 8 Ni 16 Cr - 12 Ni - 2 Mo	A182 - F304L A182 - F316L				A240 - 304L A240 - 316L	
2.4	18 Cr - 10 Ni - Ti	A182 - F321 A182 - F321H	(5)			A240 - 321 A240 - 321H	(5)(6)
2.5	18 Cr - 10 Ni - Cb	A182 - F347 A182 - F347H A182 - F348 A182 - F348H	(5) (5)	A351 - CF8C	(5)	A240 - 347 A240 - 347H A240 - 348 A240 - 348H	(5)(6) (5)(6)
	25 Cr - 12 Ni			A351 - CH8 A351 - CH20	(5) (5)		
	23 Cr - 12 Ni					A240 - 309H	(5)(6)
	25 Cr - 20 Ni	A182 - F310	(5)(9)	A351 - CK20	(5)	A240 - 310H	(5)(6)(7)

General Notes:

- For temperature limitations see footnotes in Table 2 and in Annex G.
- Plate materials are listed only for use as blind flanges (see 5.1). Additional plate materials listed in ASME B16.34 may also be used, with corresponding B16.34 Standard class ratings.
- Material Groups not listed in Table 1A are intended for use in valves. See ASME B16.34.

Notes:

- Upon prolonged exposure to temperatures above about 800°F (425°C), the carbide phase of carbon steel may be converted to graphite.
- Upon prolonged exposure to temperatures above about 875°F (470°C), the carbide phase of carbon-molybdenum steel may be converted to graphite.
- Only killed steel shall be used above 850°F (455°C).
- Use normalized and tempered material only.
- At temperatures over 1000°F (540°C), use only when the carbon content is 0.04 percent or higher.
- For temperatures above 1000°F (540°C), use only if the material is heat treated by heating it to a temperature of at least 1900°F (1040°C) and quenching in water or rapidly cooling by other means.
- Service temperature of 1050°F (565°C) and above should be used only when assurance is provided that grain size is not finer than ASTM No. 6.