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OZLINC

PIPELINE SUPPLIES



Product & Technical Information

www.ozlinc.com.au



Company Profile

Ozlinc Industries is a proudly Australian owned and operated business that is recognised as a primary Stockist and Trader of Piping, Piping Components, Hose & Valves within the Mining, Marine, Power, and Oil & Gas industries throughout Australia.

Founded in 1990, the company traded under the name of Couplers Pty Ltd for its first 23 years of operation. In 2013, new business partners acquired a majority shareholding in the company enabling the business to continue its growth strategy.

In 2013, the company was renamed to “Ozlinc Industries Pty Ltd” to reflect the connection with the Australian market and its client base. The rebranding was the first stage of a long-term growth strategy encompassing the realignment of the business with its core strengths, client base and industry sectors.

Ozlinc’s commitment is reflected in the ongoing investment in inventory, facilities and professional staff to meet the needs of our customer base and industry sectors. During the past few years the company has substantially increased its inventory, now equating to approximately 3000 tonne, covering in excess of five thousand individual items, that are managed in our extensive (5000sqm) warehouse operations in O’Connor Western Australia.

The company’s scope of supply is continually evolving with the needs of the industries and now encompasses extensive ranges of Pipe, BW Fittings, ASME & Plate Flanges, Valves, Screwed & Socket Weld Fittings, Hose & Hosing accessories, in a variety of grades.

Vision & Mission

Ozlinc serves the resources & manufacturing markets in Australia

Ozlinc’s vision is to be Australia’s “first port of call” for the supply of piping and piping components.

Ozlinc’s mission is the development and maintenance of a talented team, safe warehousing facilities and strategic stockholdings. Ozlinc endeavours to match our customers quality and delivery requirements with an unbeatable price.



Contents

Scope of Supply.....	4-6
Pipe, Carbon & Stainless	7
Dimensions and Weights.....	7
General Information.....	8
Flanges and Butt weld Fittings.....	9
General Information.....	9
Buttweld Fittings	
Dimensions - ANSI B16.9	10
Dimensional Tolerances	11
Forged Flanges	
Dimensions - ANSI B16.5	12
Dimensional Tolerances - ANSI B16.5	13
Dimensions - ASME B16.47-A (MSS SP44).....	14
Dimensions - ASME B16.47-B (API 605)	15
Dimensions - BS 3293	16
Compact Flanges.....	17
Spectacle & Paddle Blinds and Ring Spacers	
Dimensions - ASME B16.48.....	18
Plate Flanges	
Dimensions - AS2129	19-20
Forged High Pressure Fittings	21
Dimensions - B16.11 / BS3799 / MSS SP-83.....	21-22
Bolting	23
Bolting for ANSI B16.5 & BS3293 Flanges – Dimensions	23
Bolting Standards & Materials.....	24
Valves.....	25
Valve Range.....	25
Valve Standards	26
Weights.....	27
ASME B16.5 / BS3293 / AS2129 Flanges.....	27
ASME B16.47 Flanges	28
Stud Bolts.....	29
Buttweld Fittings	30-35
Forged High Pressure Fittings.....	36
Technical - General Information.....	37
Material Specifications	37
Metallurgical Terms	38
Chemical Elements, Physical Properties & Galvanic Series.....	39
Conversion Chart – Temperature	40
Conversion Factors	41

Scope of Supply



PIPE WELDED & SEAMLESS

Carbon, Impact Tested, High Yield, Stainless, CuNi, CrMo, Duplex, Super Duplex, Nickel Alloys & Titanium



ANSI & PLATE FLANGES

Carbon, Mild Steel, Impact Tested, High Yield, Stainless, CuNi, CrMo, Duplex, Super Duplex, Nickel Alloys & Titanium



COMPACT & ENGINEERED FLANGES

Carbon, Impact Tested, High Yield, Stainless, CuNi, CrMo, Duplex, Super Duplex, Nickel Alloys & Titanium



ANSI BUTTWELD FITTINGS SEAMLESS & WELDED

Carbon, Impact Tested, High Yield, Stainless, CuNi, CrMo, Duplex, Super Duplex, Nickel Alloys & Titanium

HOSE & HOSE FITTINGS

Hose:
Air, Water, Chemical, Delivery & Suction.

Fittings:
Camlocks, Minsups, Clamps & Hose Tails



HIGH & LOW PRESSURE FITTINGS SCREWED & SOCKET WELD

Carbon, Impact Tested, Stainless, Mild Steel, CrMo, Duplex, Super Duplex, Nickel Alloys & Titanium

VALVES - BALL, GATE, GLOBE, CHECK & BUTTERFLY

Carbon, Impact Tested, High Yield, Stainless, CuNi, CrMo, Duplex, Super Duplex, Nickel Alloys & Titanium



BOLTING

Carbon, Impact Tested, High Yield, Stainless, CuNi, CrMo, Duplex, Super Duplex, Nickel Alloys & Titanium



Scope of Supply

Product	Type	Sizing	Local Inventory Grade/s	Schedules & Pressure Classes	International Inventory
Pipe - Carbon Steel	Welded	50NB to 1200NB	ASTM A53 Gr B API 5L Gr B API 5L X42 API 5L Gr X52 AS1163 Gr350LO	Std & XS	Low Temp & High Yield CS
Pipe - Carbon Steel	Seamless	15NB to 750NB	ASTM A53 Gr B API 5L Gr B ASTM A106 Gr B ASTM A333 Gr 6	Std, XS, S80, S160 & XXS	Low Temp, High Yield CS & CrMo
Pipe - Stainless Steel	Welded & Seamless	15NB to 600NB	ASTM A312 TP316 ASTM A312 TP316L	S10s, S40s, S80s, S160 & XXS	Stainless Steel, Duplex, Super Duplex, CuNi, Nickel Alloys & Titanium
Flanges - Forged	Weld Necks, Blinds, Slip Ons, Socket Weld & Threaded	15NB to 900NB	ASTM A105N ASTM A182 F316 ASTM A182 F316L ASTM A350 LF2	Class 150 to 2500lb Std, XS, S80, S160 & XXS	Stainless Steel, Duplex, Super Duplex, CuNi, Nickel Alloys & Titanium
Flanges – Plate	Slip Ons & Blinds	15NB to 900NB	Mild Steel 316SS 316LSS	Table D, E, F, H, JIS & PN	Stainless Steel, Duplex, Super Duplex, CuNi, Nickel Alloys & Titanium
Buttweld Fittings	Elbows, Tees, Reducers & Caps Lap Joint Stub Ends	15NB to 1200NB	ASTM A403 WP316 ASTM A403 WP316L ASTM A234 WPB ASTM A420 WPL6	Std, XS, S80, S160 & XXS	Stainless, Low Temp, High Yield CS, CrMo, Duplex, Super Duplex, CuNi, Nickel Alloys & Titanium
High Pressure Forged Fittings, Threaded & Socket Weld	Elbows, Tees, Caps, Plugs, Nipples, Olets, Unions & Bushes	15NB to 150NB	ASTM A105N ASTM A105N Galv ASTM A182 F316 ASTM A182 F316L ASTM A350 LF2	3000lb, 6000lb & 9000lb	Stainless, Low Temp, High Yield CS, CrMo, Duplex, Super Duplex, CuNi, Nickel Alloys & Titanium
Low Pressure Screwed Fittings	Elbows, Tees, Caps, Plugs, Nipples, Olets, Unions & Bushes	15NB to 150NB	Black Steel Galvanised Steel Stainless 316 Stainless 316L	BSP-T BSP-P NPT	Stainless, Low Temp, High Yield CS, CrMo, Duplex, Super Duplex, CuNi, Nickel Alloys & Titanium
Valves	Ball Gate Check Globe Butterfly Knife Gates	15NB to 200NB	Carbon Steel Stainless Steel	End Connection – Flanges, Screwed & Socket Weld Pressure Rate – Up to 1600Kpa	Stainless, Low Temp, High Yield CS, CrMo, Duplex, Super Duplex, CuNi, Nickel Alloys & Titanium
Hose		6NB to 300NB	Suitable for Air, Water, Chemical, Compressed Air, Fuel & Marine Exhaust		
Hose Fittings	Camlocks Minsup Clamps Hose Tails		Stainless Steel, Aluminum & SG Iron		
Tubing	Heat Exchanger Boiler Super Heater Finned	8NB to 100NB			Carbon, Low Temp, High Yield, CrMo, CuNi, Duplex, Super Duplex, Inconel, Nickel Alloys & Titanium
Engineered Products	Compact Flanges Forged Wye Pieces Swivel Flanges Misalignment Flanges Manifolds	15NB to 1200NB		Class 150 to Class 2500	Carbon, Low Temp, High Yield, CrMo, Duplex, Super Duplex, Inconel, Nickel Alloys & Titanium
Victaulic Products - VicPress - Roll Grooved - Cut Grooved - Shouldered	Couplings Flange Adaptors, Tees, Elbows, Caps, Reducers, Plugs, Threaded Adaptors, 3D Elbows, Outlets, Expansion Joints, Wyes, Valves, Tooling	15NB to 600NB	316 Stainless Steel, Cast Iron, Ductile Iron, Galvanised, Painted, Aluminium, Copper, HDPE		

Scope of Supply



SINCE THE FIRST PATENT IN 1919, VICTAULIC HAS DELIVERED INNOVATIVE PIPE JOINING AND FLOW CONTROL SOLUTIONS THAT HELP CUSTOMERS SUCCEED WORLDWIDE.

Look inside many of the world's most critical mining operations, and you'll find Victaulic solutions at work making bold design innovations possible, speeding time to completion and minimizing downtime, and setting the stage for scalability. Across the globe, Victaulic solutions have benefitted mine owners, engineers, installers and maintenance personnel.

Mine Owners

- Total installed cost reduced by up to 50%
- Safer and faster to install reducing opportunity for injuries
- Keeps plants running more efficiently by drastically reducing the time required for scheduled and unscheduled maintenance

Specifying Engineers and System Designers

- Design versatility not found in other joining methods
- Unparalleled expansion, contraction and deflection capabilities
- Visual verification of joint integrity

Piping Installers

- Faster installation without the need for special tools
- Cold formed joint eliminates fire hazards and fumes associated with welded systems

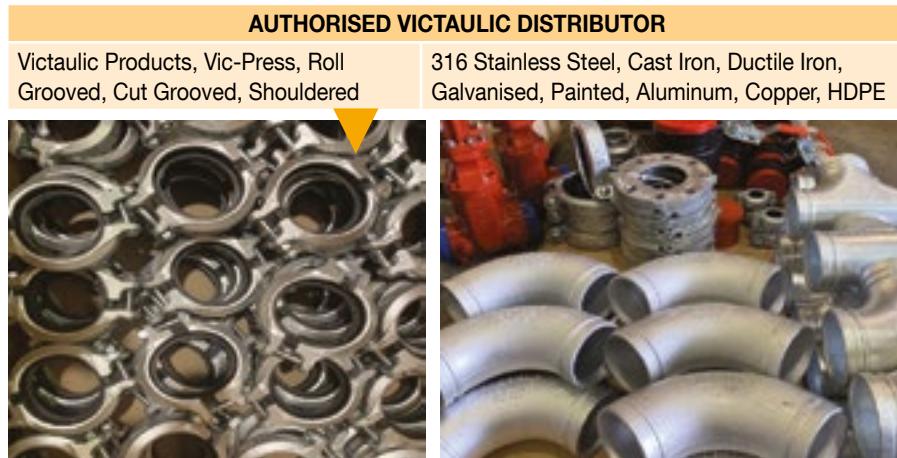
Mining Maintenance Personnel

- Downtime reduced by up to 50%
- Reusable parts expedite maintenance

Known by mining owners, engineers and installers as the most efficient and effective method for joining pipe, Victaulic grooved systems are recognized for being easy-to-install and reliable.

With its many benefits to piping designers Victaulic grooved systems add a level of versatility other joining systems cannot match.

Victaulic systems also continue to evolve and improve. For example the Victaulic Installation-Ready™ couplings install up to twice as fast as standard grooved couplings while maintaining performance and design capabilities.



UPPER FIGURE = WT

LOWER FIGURE = KGS/MTR

INCHES	DN	OD MM	5S	10S	10	20	30	STD	40S	40	60	XS	80S	80	100	120	140	160	XXS
1/8	6	10.3		1.24 0.28				1.73 0.37	1.73 0.36	1.73 0.37		2.41 0.47	2.41 0.48	2.41 0.47					
1/4	8	13.7		1.65 0.51				2.24 0.63	2.24 0.64	2.24 0.63		3.02 0.80	3.02 0.82	3.02 0.80					
3/8	10	17.1		1.65 0.64				2.31 0.84	2.31 0.84	2.31 0.84		3.20 1.10	3.20 1.12	3.20 1.10					
1/2	15	21.3	1.65 0.82	2.11 1.01				2.77 1.27	2.77 1.30	2.77 1.27		3.73 1.62	3.73 1.65	3.73 1.62				4.78 1.95	
3/4	20	26.7	1.65 1.04	2.11 1.31				2.87 1.69	2.87 1.71	2.87 1.69		3.91 2.20	3.91 2.24	3.91 2.20				5.56 2.90	
1	25	33.4	1.65 1.33	2.77 2.13				3.38 2.50	3.38 2.55	3.38 2.50		4.55 3.24	4.55 3.29	4.55 3.24				6.35 4.24	
1 1/4	32	42.2	1.65 1.68	2.77 2.76				3.56 3.39	3.56 3.46	3.56 3.39		4.85 4.47	4.85 4.56	4.85 4.47				6.35 5.61	
1 1/2	40	48.3	1.65 1.95	2.77 3.17				3.68 4.05	3.68 4.13	3.68 4.05		5.08 5.41	5.08 5.51	5.08 5.41				7.14 7.25	
2	50	60.3	1.65 2.44	2.77 4.01				3.91 5.44	3.91 5.54	3.91 5.44		5.54 7.48	5.54 7.63	5.54 7.48				8.74 11.11	
2 1/2	65	73.0	2.11 3.77	3.05 5.36				5.16 8.63	5.16 8.81	5.16 8.63		7.01 11.41	7.01 11.64	7.01 11.41				9.53 14.92	
3	80	88.9	2.11 4.60	3.05 6.59				5.49 11.29	5.49 11.52	5.49 11.29		7.62 15.27	7.62 15.59	7.62 15.27				11.13 21.35	
3 1/2	90	101.6	2.11 5.29	3.05 7.55				5.74 13.57	5.74 13.84	5.74 13.57		8.08 18.63	8.08 19.01	8.08 18.63					
4	100	114.3	2.11 5.96	3.05 8.52				6.02 16.07	6.02 16.40	6.02 16.07		8.56 22.32	8.56 22.77	8.56 22.32				13.49 28.32	
5	125	141.3	2.77 9.67	3.40 11.82				6.55 21.77	6.55 22.20	6.55 21.77		9.53 30.97	9.53 31.59	9.53 30.97				15.88 49.11	
6	150	168.3	2.77 11.55	3.40 14.13				7.11 28.26	7.11 28.83	7.11 28.26		10.97 42.56	10.97 43.42	10.97 42.56				18.26 54.20	
8	200	219.1	2.77 15.09	3.76 20.37			6.35 33.31	7.04 36.81	8.18 42.55	8.18 43.39	8.18 42.55	10.31 53.08	12.70 64.64	12.70 65.95	12.70 64.64	15.09 75.92	18.26 90.44	20.62 100.92	23.01 111.27
10	250	273.1	3.40 23.08	4.19 28.34			6.35 41.77	7.80 51.03	9.27 61.52	9.27 60.31	9.27 61.52	12.70 81.55	12.70 81.55	12.70 81.55	12.70 81.55	15.09 96.01	18.26 114.75	21.44 133.06	28.58 155.15
12	300	323.9	3.96 31.89	4.57 36.73			6.35 49.73	8.38 65.20	9.53 73.88	9.52 75.32	10.31 79.73	14.27 108.96	12.70 97.46	12.70 99.43	17.48 132.08	21.44 159.91	25.40 186.97	28.58 208.14	33.32 238.76
14	350	355.6	3.96 35.06	4.78 42.14	6.35 54.69	7.92 67.90	9.53 81.33	9.53 81.33	9.53 81.33	11.13 94.55	15.09 126.71	12.70 107.39			19.05 158.10	23.83 194.96	27.79 224.65	31.75 251.56	
16	400	406.4	4.19 42.41	4.78 48.26	6.35 62.64	7.92 77.83	9.53 93.27	9.53 93.27	9.53 93.27	12.70 123.30	16.66 160.12	12.70 123.30			21.44 203.53	26.19 245.56	30.96 286.84	36.53 333.19	
18	450	457.2	4.19 47.77	4.78 54.36	6.35 70.57	7.92 87.71	11.13 122.38	9.53 105.16	14.27 155.80	19.05 205.74	12.70 139.15				23.88 254.55	29.36 309.62	34.93 363.56	39.67 408.26	
20	500	508.0	4.78 60.46	5.54 70.00	6.35 78.55	11.13 117.15	9.53 155.12	9.53 117.15	15.09 183.42	20.62 247.83	12.70 155.12			26.19 311.17	32.54 381.53	38.10 441.49	44.45 508.11		
22	550	558.8	4.78 66.57	5.54 77.06	6.35 86.54	12.70 129.13	9.53 171.09	9.53 129.13		22.23 294.25	12.70 171.09				28.58 373.83	34.93 451.42	41.28 527.02	47.63 600.63	
24	600	609.6	5.54 84.16	6.35 96.37	6.35 94.53	12.70 141.12	9.53 209.64	9.53 141.12		17.48 255.41	24.61 355.26	12.70 187.06			30.96 442.08	38.89 547.71	46.02 640.03	52.27 720.15	
26	650	660.4			7.92	12.70		9.53					12.70		20.27				
28	700	711.2			7.92	12.70	15.88	9.53					12.70		21.86				
30	750	762.0	6.35 120.72	7.92 150.36	7.92 147.28	12.70 234.67	15.88 292.18	9.53 176.84					12.70		23.46				
32	800	812.8			7.92	12.70	15.88	9.53		17.48 342.91				12.70		25.64			
34	850	863.6			7.92	12.70	15.88	9.53		17.48 364.90				12.70		26.61			
36	900	914.4			7.92	12.70	15.88	9.53		19.05 420.42				12.70		28.22			
38	950	965.2						9.53					12.70		298.24				
40	1000	1016.0						9.53					12.70		314.22				
42	1050	1066.8						9.53					12.70		330.19				
44	1100	1117.6						9.53					12.70		346.16				
46	1150	1168.4						9.53					12.70		351.82				
48	1200	1219.2						9.53					12.70		377.79				

Formula to attain approximate mass in kilograms per metre (kg/m) for Steel Round Pipe and Tubing

$$M = [Dt] t \times 0.02466$$

Where:

M = Mass to the nearest 0.01 kg/m

D = Outside diameter in millimetres

(To nearest 0.1mm for OD up to 406.4mm)

(To nearest 1.0mm for OD 457mm and above)

t = Wall thickness to nearest 0.01mm

EXAMPLE: Nominal Size DN300 NPS12

OD = 323.9mm W.T. = 9.53mm

Step 1. 323.9 - 9.53 = 314.37

Step 2. 314.37 x 9.53 = 2995.9461

Step 3. 2995.9461 x 0.02466 = 73.88kg/m

Pipe Schedule - ANSI B36.10 / ANSI B36.19 (Sch 5s, 10s, 40s, 80s)

Wall Thickness = mm

Weight = kg/mtr

Stainless Steel Grades

Designations			Typical Chemical Composition Guide %						National Steel Designations Superceded by EN				
	EN	EN Designation	ASTM/UNS	C	N	Cr	Ni	Mo	Others	BS/UK	DIN/Germany	NF/France	SS/Sweden
Wet Corrosion & General Service	Duplex	1.4162 X2CrMnNiN21-5-1	S32101	0.03	0.22	21.5	1.5	0.3	5Mn	-	-	-	-
		1.4362 X2CrNiN23-4	S32304	0.02	0.10	23.0	4.8	0.3	-	-	1.4362	Z3 CN 23-04 Az	2327
		1.4462 X2CrNiMoN22-5-3	S32205/S31803	0.02	0.17	22.0	5.7	3.1	-	318S13	1.4462	Z3 CND 22-05 Az	2377
		1.4501 X2CrNiMoCuWN25-7-4	S32760	0.02	0.27	25.4	6.9	3.8	W, Cu	-	-	-	-
		1.4410 X2CrNiMoN25-7-4	S32750	0.02	0.27	25.0	7.0	4.0	-	-	-	Z3 CND 25-06 Az	2328
	Austenitic	1.4301 X5CrNi18-10	304	0.04	-	18.1	8.1	-	-	304S31	1.4301	Z7 CN 18-09	2333
		1.4307 X2CrNi18-9	304L	0.02	-	18.1	8.1	-	-	304S11	1.4307	Z7 CN 18-10	2352
		1.4311 X2CrNi18-10	304LN	0.02	0.14	18.5	9.2	-	-	304S61	1.4311	Z3 CN 18-10 Az	2371
		1.4541 X6CrNi18-10	321	0.04	-	17.3	9.1	-	Ti	321S31	1.4541	Z6 CNT 18-10	2337
		1.4550 X6CrNiNb18-10	347	0.05	0.04	17.5	9.5	-	Nb	347S31	1.4550	Z6 CNNb 18-10	2338
Heat & Creep	Austenitic	1.4305 X8CrNi18-9	303	0.05	-	17.3	8.2	-	S	303S31	1.4305	Z8 CNF 18-09	2346
		1.4303 X4CrNi18-12	305	0.04	-	17.7	12.5	-	-	305S19	1.4303	Z1 CN 18-12	-
		1.4306 X2CrNi19-11	304L	0.02	-	18.2	10.1	-	-	304S11	1.4306	Z3 CN 18-10	2352
		1.4567 X3CrNiCu18-9-4	S30430	0.01	-	17.7	9.7	-	3Cu	304S17	1.4567	Z3 CNU 18-09 FF	-
		1.4401 X5CrNiMo17-12-2	316	0.04	-	17.2	10.1	2.1	-	316S31	1.4401	Z7 CND 17-11-02	2347
	Austenitic	1.4404 X2CrNiMo17-12-2	316L	0.02	-	17.2	10.1	2.1	-	316S11	1.4404	Z3 CND 17-11-02	2348
		1.4436 X3CrNiMo17-13-3	316	0.04	-	16.9	10.7	2.6	-	316S33	1.4436	Z7 CND 18-12-03	2343
		1.4432 X2CrNiMo17-12-3	316L	0.02	-	16.9	10.7	2.6	-	316S13	1.4432	Z3 CND 18-14-03	2353
		1.4406 X2CrNiMoN17-11-2	316LN	0.02	0.14	17.2	10.3	2.1	-	316S61	1.4406	Z3 CND 17-11 Az	-
		1.4429 X2CrNiMoN17-3-3	S316S3	0.02	0.14	17.3	12.5	2.6	-	316S63	1.4429	Z3 CND 17-12 Az	2375
	Austenitic	1.4571 X6CrNiMoTi17-12-2	316Ti	0.04	-	16.8	10.9	2.1	Ti	320S31	1.4571	Z6 CNDT 17-12	2350
		1.4435 X2CrNiMo18-14-3	316L	0.02	-	17.3	12.6	2.6	-	316S13	1.4435	Z3 CND 18-14-03	2353
		1.4438 X2CrNiMo18-15-4	317L	0.02	-	18.2	13.7	3.1	-	317S12	1.4438	Z3 CND 19-15-04	2367
		1.4439 X2CrNiMoN17-13-5	317LMN	0.02	0.14	17.3	13.7	4.1	-	-	1.4439	Z3 CND 18-14-05 Az	-
		1.4466 X1CrNiMoN25-22-2	S31050	0.01	0.12	25.0	22.3	2.1	-	-	1.4466	Z2 CND 25-22 Az	-
	Austenitic	1.4539 X1NiCrMoCu25-20-5	904L	0.01	-	20.0	25.0	4.3	1.5Cu	904S13	1.4539	Z2 NCDU 25-20	2562
		1.4529 X1NiCrMoCu25-20-7	N08926	0.01	0.20	20.5	24.8	6.5	Cu	-	-	-	-
		1.4547 X1CrNiMoCu20-18-7	S31254	0.01	0.20	20.0	18.0	6.1	Cu	-	-	-	2378
		1.4565 X2CrNiMnMoN25-18-6-5	S345S65	0.02	0.45	24.0	17.0	4.5	5.5Mn	-	1.4565	-	-
		1.4948 XCrNi18-10	304H	0.05	-	18.1	8.3	-	-	304S51	1.4948	Z6 CN 18-09	2333
	Austenitic	1.4878 X8CrNiTi18-10	321H	0.05	-	17.3	9.1	-	Ti	321S51	1.4878	Z6 CNT 18-10	2337
		1.4818 X6CrNiSiNCE19-10	S30415	0.05	0.15	18.5	9.5	-	1.3Si, Ce	-	-	-	2372
		1.4833 X12CrNi23-13	309S	0.06	-	22.3	12.6	-	-	309S16	1.4833	Z15 CN 23-13	-
		1.4835 X9CrNiSiNCE21-11-2	S30815	0.09	0.17	21.0	11.0	-	1.6Si, Ce	-	1.4835	-	2368
		1.4845 X8CrNi25-21	310S	0.05	-	25.0	20.0	-	-	310S16	1.4845	Z8 CN 25-20	2361

Nearest Equivalents for Steel Pipes & Tube Material

Material	ASTM	API	BS	DIN	European Standards	Further Standards
St 33	A53-Gr.A	5L-Gr A	1387	EN 10255		ISO-65/NEN3257
St35NBK (BK)			6323/4 CFS4	E235 EN 10306/1/4		
St45NBK (BK)						
St52NBK (BK)			6323/4 CFS5	E355 EN 10305/1/4		
RSt 34-2NBK (BK/BKM)	A513-1010		6323/5/6 ERW2/CEW2	E235 EN 10305/2/3	TS34.2-NF A49-643	
RSt 37-2NBK (BK/BKM)	A513-1015		6323/5/6 ERW3/CEW3	E235 EN 10305/2/3	TS37.2-NF A49-643	
St 44-2NBK (BK/BKM)	A513-1020		6323/5/6 ERW4/CEW4	E275 EN 10305/2/3	TS42.2-NF A49-643	
St 52-3NBK (BK/BKM)	A513-1024/1524		6323/5/6 ERW5/CEW5	E355 EN 10305/2/3	TS47.3-NF A49-643	
St 33	A53-Gr.A	5L-Gr A		P195T EN10217-1		
St 37.0	A53-Gr.B	5L-Gr B	3601-S-360	P235TR1-EN10216-1/EN10217-1		
St 44.0	A106-Gr.B	5L-GrX42	3601-S-430	P265TR1-EN10216-1/EN10217-1	A672B60/L235 EN10224	
St 52.0	A381 Y52	5L-GrX52		P355N-EN10216-3/EN10217-3	A672C65/L265 EN10224	
St 37.4	A381 Y52	5L-Gr.B	3602-S-360	P235TR2-EN10216-1/EN10217-1	L355 EN10224	
St 44.4		5L-GrX42	3602-S-430	P265TR2-EN10216-1/EN10217-1		
St 52.4	A381 Y52	5L-Gr.X52	6323/2/3-HFS5/HFW5	P335N-EN10216-3/EN10217-3		
RSt 37.2	A500 Gr.A	5L-Gr.B	6323/2/3-HFS3/HFW3	S235JRH EN10210/EN10219	St E255 DIN 17123/17124	
St 37.3			6323/2/3-HFS3/HFW3	St E255 DIN 17123/17124		
St 44.2	A500 GR.B/A501	5L-GrX42	6323/2/3-HFS4/HFW4	S275JRH EN10210/EN10219	St E285 DIN 17123/17124	
St 44.3	A500 GR.B/A501		6323/2/3-HFS4/HFW4	S275J2H EN10210/EN10219	St E285 DIN 17123/17124	
St 52.3	A252 Gr.3	5L-GrX52	6323/2/3-HFS5/HFW5	S355J2H EN10210/EN10219	St E355 DIN 17123/17124 AH36 (LRS)	
St 35.8	A106 Gr.B/A192		3059/3602-S360	P235GH/EN10216-2	TU37C NF A49-213/215	
St 45.8	A106 Gr.B/A210		3059/3602-S440-430	P265GH/EN10216-2	TU42C NF A49-213/215	
15 Mo 3	A335-P1		3059-243	16Mo3 EN10216-2	TU15D3 NF A49-213/215	
13 Cr Mo 44	A335-P11/P12		3059/3604-620/621	13CrMo4-5 EN10216-2	TU13CD4-04 NF A49-213	
10 Cr Mo 9 10	A335-P22		3059/3604-622-490	10CrMo9-10/11CrMo9.10 EN10216-2	TU10CD9.10 NF A49-213	
12 Cr Mo 19 5	A335-P5		3604-625	X11CrMo5 EN10216-2	TUZ10CD5.05 NF A49-213	
TT St 35N	A333 Gr.1/6		3603HFS410LT50	P255 EN10216-4	TU42BT NF A49-215	
10 Ni 14	A333 Gr.3		3603HFS503LT100	12Ni14 EN10216-4	TU10N14 NF A49-215	
A 53-Grade A		API-5L Gr.A	3601-320/360	St 37.0	P195TR1 EN10216-1	
A 53-Grade B		API-5L Gr.B	3601-430	St 44.0	P245/265TR1 EN10216-1/EN10217-1	
A 106 Grade A		API-5L Gr.A	3602/1-360	St 35.8	P235GH EN10216-2	
A 106 Grade B		API-5L Gr.B	3602/1-430	St 45.8	P265GH EN10216-2	
A 179			3059/1 CFS320	St 35.8	P195GH EN10216-2	
A 333 Grade 6			3603HFS410LT50	TT St35/TT St41	P255 EN10216-4	TU42BT NF A49-230
A 333 Grade 3			3603HFS503LT100	10Ni14	12Ni14 EN10216-4	TU10N14 NF A49-230
A 335 Grade P1				15Mo3/16Mo5	16Mo3 EN10216-2	TU15D3 NF A49-213
A 335 Grade P5			3604/1 625	12 CrMo 19 5	X11CrMo5 EN10216-2	TUZ10CD5.05 NF A49-213
A 335 Grade P11			3604/1 620-440	13 CrMo 44	13CrMo4-5 EN10216-2	TU13CD4.04 NF A49-213
A 335 Grade P12			3604-621	13 CrMo 44	13CrMo4-5 EN10216-2	TU13CD4.04 NF A49-213
A 335 Grade P22			3604-622	10 CrMo 9 10	10CrMo9-10/11 CrMo9-10 EN10216-2	TU10CD9-10 NF A49-213
API-5L-Grade A	A53 Gr.A		3601-320/360	E210-7 DIN17172	L210 EN10208-1	TS E220 NF A49-400
API-5L-Grade B PSL1	A53 Gr.B		3601-430	E240-7 DIN17172	L245NB EN10208-2	TS E220 NF A49-400
API-5L-Grade X42 PSL1				St E290.7	L290NB EN10208-2	TU/TS E290 NF A49-400/411
API-5L-Grade X46 PSL1				St E320.7	TU/TS E320 NF A49-400	
API-5L-Grade X52 PSL1	A381-Y52			St E360.7	L360NB EN10208-2	TU/TS E360 NF A49-400/411
API-5L-Grade X56 PSL1				St E385.7		
API-5L-Grade X60 PSL1				St E415.7	L415NB EN10208-2	TU/TS E415 NF A49-400/411

Flanges

A flange is a method of connecting pipes, valves, pumps and other equipment to form a pipe work system. It also provides easy access for cleaning, inspection or modification. Flanges are usually welded or screwed into such systems and then joined with bolts.

Flange Types

Weld Neck

This flange is circumferentially welded into the system at its neck, which means that the integrity of the buttwelded area can be easily examined by radiography. The bores of both pipe and flange match, which reduces turbulence and erosion inside the pipeline. The weld neck is therefore favoured in critical applications.

Slip-on

This flange is slipped over the pipe and then fillet welded. Slip-on flanges are easy to use in fabricated applications.

Blind

This flange is used to blank off pipelines, valves and pumps. It can also be used as an inspection cover. It is sometimes referred to as a blanking flange.

Socket Weld

This flange is counter bored to accept the pipe before being fillet welded. The bore of the pipe and flange are both the same therefore giving good flow characteristics.

Threaded

This flange is referred to as either threaded or screwed. It is used to connect other threaded components in low pressure, non-critical applications. No welding is required.

Lap Joint

These flanges are always used with either a stub end or taft which is buttwelded to the pipe with the flange loose behind it. This means the stub end or taft always makes the face. The lap joint is favoured in low-pressure applications because it is easily assembled and aligned.

Ring Type Joint

This is a method of ensuring leak proof flange connection at high pressures. A metal ring is compressed into a hexagonal groove on the face of the flange to make the seal. This jointing method can be employed on Weld Neck, Slip-on and Blind Flanges.

CARBON

A105(N)

ALLOY STEEL

STAINLESS STEEL

A181

A266

A350 LF1/LF2/LF3

A694 F42

A694 F52

A694 F60

A694 F65

A707/3 CL.2/CL.3

A707/5 CL.3

A182 F1

A182 F2

A182 F5/A

A182 F6/A

A182 F9

A182 F11

A182 F12

A182 F22

A182 F91

A182 F304/H/L

A182 F310

A182 F316/H/L

A182 F321/H

A182 F347/H

A182 F348/H

A182 F10

DUPLEX/S.DUPLEX

A182 F51/UNS S31803

A182 F53/UNS S32750

A182 F55/UNS S32760

A182 F44/UNS S31254

A182 F49/UNS S34565

NICKEL ALLOY

MONEL 400/UNS N04400

INCONEL 600/US N06600

INCONEL 625/UNS N00625

INCOLOY 800/UNS N08800

INCOLOY 825/UNS N08825

ALLOY C276/UNS N10276

TITANIUM

B381 F2

B381 F5

B381 F7

B381 F12

What Are Butt-weld Fittings?

Buttweld fittings are a family of fittings used in connecting and creating pipe work systems whereby they are welded into the system using circumferential buttwelds. They are used only in conjunction with ANSI pipe and are available in the same size range. They are used in areas where pipe work is permanent and are designed to provide good flow characteristics.

For what is each fitting used?



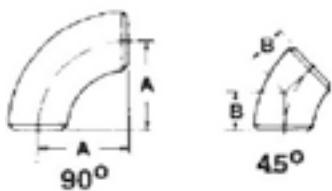
Fitting	Use/Notes	Fitting	Use/Notes
Long Radius Elbows: 45 and 90 Degree Elbow and 180 Degree Return Bends	Concentric Reducer		
	Enables the pipe run to be turned through 45 degree, a right angle or back on itself. Radius is 1.5 times nominal pipe size.		Used to connect two pipes of different dimensions. Designed to have good flow characteristics thus reducing erosion and corrosion.
90 Degree Short Radius Elbows and 180 Degree Return Bends	Eccentric Reducer		
	Enables the pipe run to be turned through a right angle or back on itself. Radius is 1 times nominal pipe size.		Used to connect two pipes of different dimensions. Designed to have good flow characteristics thus reducing erosion and corrosion.
Equal Tee	End Cap		
	Allows connection of a branch at right angles from main pipe run. Branch has same dimensions as main pipe run.		Used to blank off at the end of pipe work.
Reducing Tee	Stub End: Made to MSS SP43		
	Allows connection of a branch at right angles from main pipe run. Branch has smaller dimensions than main pipe run. When stating the size, the larger dimension always specifies the main pipe run, no matter which order the dimensions are quoted in.		Always used with a lap joint flange as a backing flange. Flange can be made of coated mild steel, as it does not come into contact with the product in the pipe. This is a cheap method of flanging in low-pressure, non-critical applications.

ANSI Butt-weld Fittings

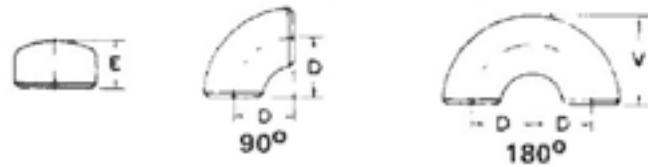
Dimensions – ANSI B16.9

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PIPELINE SUPPLIES

LONG RADIUS WELDING ELBOWS, RETURN BENDS & CAPS



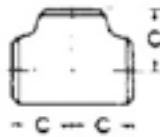
SHORT RADIUS WELDING ELBOWS & RETURN BENDS



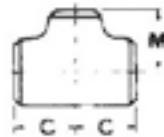
Nom. Size	PIPE OD mm	WALL THICKNESS – MILLIMETRES (mm)												A	B	K	D	V	E	Nom. Size	
		Sch. 10	Sch. 20	Sch. 30	Std. Wt.	Sch. 40	Sch. 60	Sch. 80	Sch. 100	Sch. 120	Sch. 140	Sch. 160	Sch. XXS								
15	½	21.3	-	-	-	2.77	-	3.73	-	-	4.78	7.47	38	16	48	-	-	25.4	15	½	
20	¾	26.7	-	-	-	2.87	-	3.91	-	-	5.56	7.82	38	19	51	-	-	25.4	20	¾	
25	1	33.4	-	-	-	3.38	-	4.55	-	-	6.35	9.09	38	22	56	25	41	38.1	25	1	
32	1¼	42.2	-	-	-	3.56	-	4.85	-	-	6.35	9.70	48	25	70	32	52	38.1	32	1¼	
40	1½	48.3	-	-	-	3.68	-	5.08	-	-	7.14	10.15	57	29	83	38	62	38.1	40	1½	
50	2	60.3	-	-	-	3.91	-	5.54	-	-	8.74	11.07	76	35	106	51	81	38.1	50	2	
65	2½	73.0	-	-	-	5.16	-	7.01	-	-	9.53	14.02	95	44	132	64	100	38.1	65	2½	
80	3	88.9	-	-	-	5.49	-	7.62	-	-	11.13	15.24	114	51	159	76	121	50.8	80	3	
90	3½	101.6	-	-	-	5.74	-	8.08	-	-	-	-	133	184	89	140	140	63.5	90	3½	
100	4	114.3	-	-	-	6.02	-	8.56	-	-	11.13	13.49	152	64	210	102	159	63.5	100	4	
125	5	141.3	-	-	-	6.55	-	9.53	-	-	12.70	15.88	190	79	262	127	197	76.2	125	5	
150	6	168.3	-	-	-	7.11	-	10.97	-	-	14.27	18.26	229	95	313	152	237	88.9	150	6	
200	8	219.1	-	6.35	7.04	8.18	-	10.31	12.70	-	15.09	18.26	20.62	23.01	22.23	305	127	414	203	313	102
250	10	273.1	-	6.35	7.80	9.27	-	12.70	12.70	15.09	18.26	21.44	25.40	28.58	25.40	381	159	518	254	391	127
300	12	323.9	-	6.35	8.38	9.53	10.31	14.27	12.70	17.48	21.44	25.40	28.58	33.32	25.40	457	190	619	305	467	152
350	14	355.6	6.35	7.92	9.53	9.53	11.13	15.09	12.70	19.05	23.83	27.79	31.75	35.71	-	533	222	711	356	533	165
400	16	406.4	6.35	7.92	9.53	9.53	12.70	16.66	21.44	26.19	30.96	36.53	40.49	-	610	254	813	406	610	178	400
450	18	457	6.35	7.92	11.13	9.53	14.27	19.05	12.70	23.88	29.36	34.93	39.67	45.24	-	686	286	914	457	686	203
500	20	508	6.35	9.53	12.70	9.53	15.09	20.62	12.70	26.19	32.54	38.10	44.45	50.01	-	762	318	1016	508	762	229
600	24	610	6.35	9.53	14.27	9.53	17.48	24.61	12.70	30.96	38.89	46.02	52.37	59.54	-	914	381	1219	610	914	267
750	30	762	7.92	12.70	15.88	9.53	19.05	-	12.70	-	-	-	-	-	-	1143	470	-	-	-	267
900	36	914	7.92	12.70	15.88	9.53	-	-	12.70	-	-	-	-	-	-	1372	565	-	-	-	267

All dimensions are in millimetres – (mm)

STRAIGHT TEES



REDUCING TEES



CONCENTRIC & ECCENTRIC REDUCERS



NOMINAL SIZE				C	M	H	NOMINAL SIZE				C	M	H	NOMINAL SIZE				C	M	H
DN	NPS	Large End	Small End				DN	NPS	Large End	Small End				DN	NPS	Large End	Small End			
20	20	¾	¾	29	29	38	100	4	105	-	102	102	-	400	16	16	305	-	305	356
15	15	½	½	-	-	-	90	3½	-	98	102	400	12	12	350	12	295	356		
25	20	1	¾	38	38	50.8	100	4	124	-	117	127	450	18	18	343	-	330	381	
15	15	½	½	38	38	50.8	80	2½	-	114	127	450	14	14	350	10	283	356		
32	32	1¼	48	-	-	-	125	5	-	111	127	450	8	8	321	6	273	356		
25	25	1¼	48	48	48	50.8	100	3½	-	108	127	300	12	12	308	10	264	356		
20	20	½	½	48	48	50.8	80	2½	-	105	127	250	10	10	298	8	298	381		
15	15	½	½	48	48	50.8	65	2	-	105	127	200	8	8	200	6	200	381		
40	40	1½	57	-	-	-	150	6	143	-	137	140	500	20	20	368	-	330	381	
32	32	1½	57	57	57	63.5	100	5	-	130	140	400	16	16	356	12	356	381		
25	25	1½	57	57	57	63.5	80	3½	-	127	140	350	10	10	346	10	333	381		
20	20	½	½	57	57	63.5	65	2½	-	124	140	300	8	8	308	8	298	381		
15	15	½	½	57	57	63.5	50	2	-	121	140	250	6	6	298	6	298	381		
50	50	2	64	-	-	-	200	8	178	-	168	152	600	24	24	432	-	419	508	
40	40	1½	60	60	67	76.2	100	4	-	162	152	500	18	18	450	12	406	508		
32	32	1½	67	67	64	88.9	80	3	-	156	152	400	10	10	346	8	333	508		
25	25	1	57	67	64	88.9	100	3	-	152	152	350	8	8	308	6	308	381		
65	65	2½	76	83	76	88.9	125	5	216	-	194	178	750	30	30	559	-	533	610	
50	50	2½	67	67	64	88.9	100	4	-	191	178	600	24	24	450	18	495	610		
40	40	1½	73	73	70	88.9	100	4	-	184	178	400	16	16	406	12	397	508		
32	32	1½	70	70	70	88.9	125	5	254	-	229	203	300	20	20	384	10	384	508	
80	80	3½	95	-	92	102	300	10	216	-	241	203	900	36	36	673	-	635	610	
65	65	2½	89	89	83	102	200	6	279	-	270	238	750	30	30	559	-	610	610	
50	50	2	102	102	97	102	350	14	279	-	257	238	600	24	24	450	18	584	610	
40	40	1½	79	79	79	102	200	10	279	-	238	203	400	16	16	406	12	572	610	

Note: All dimensions are in millimetres – (mm)

ANSI Butt-weld Fittings

Dimensional Tolerances

Cross-sectional tolerances for all buttwelding fittings (ASME/ANSI B16.9)

Nominal Pipe Size (NPS)	All Fittings				Wall thickness Not less than 87.5% of nominal wall thickness	
	OD at Bevel		ID at Bevel \pm			
	in	mm	in	mm		
½ to 2½	+0.06, -0.03	+1.6, -0.8	0.03	0.8		
3 to 3½	\pm 0.6	\pm 1.6	0.06	1.6		
4	\pm 0.6	\pm 1.6	0.06	1.6		
5 to 8	+0.09, -0.06	+2.4, -1.6	0.06	1.6		
10 to 18	+0.16, -0.12	+4.0, -3.2	0.12	3.2		
20 to 24	+0.25, -0.19	+6.4, -4.8	0.19	4.8		
26 to 30	+0.25, -0.19	+6.4, -4.8	0.19	4.8		
32 to 48	+0.25, -0.19	+6.4, -4.8	0.19	4.8		



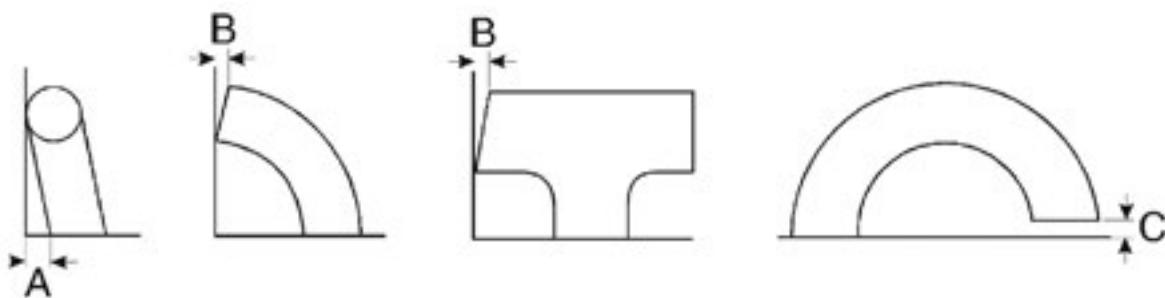
Tolerances for Specific Fittings

Dimensional tolerances for elbows and returns (ASME/ANSI B16.9)

Nominal Pipe Size (NPS)	90° & 45° Long Radius Elbows		180° Returns			
	90° Short Radius Elbows and Tees		Centre-to-Centre Dimension \pm A, B		Back-to-Face Dimension \pm C	
	in	mm	in	mm	in	mm
½ to 2½	0.06	2	0.25	6	0.25	6
3 to 3½	0.06	2	0.25	6	0.25	6
4	0.06	2	0.25	6	0.25	6
5 to 8	0.06	2	0.25	6	0.25	6
10 to 18	0.09	2	0.38	10	0.25	6
20 to 24	0.09	2	0.38	10	0.25	6
26 to 30	0.12	3	—	—	—	—
32 to 48	0.19	5	—	—	—	—

Alignment Tolerances

Alignment tolerances are concerned with the way that the ends of a fitting are cut. Exaggerated distortions are shown for clarity in the diagram below.



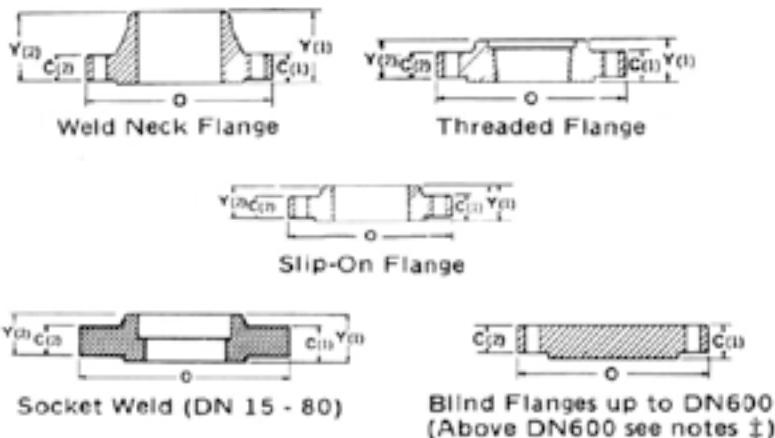
Alignment Tolerances (ASME/ANSI B16.9)

Nominal Pipe Size (NPS)	Off Plane Tolerances, \pm A		Off Plane Tolerances, \pm B		Off Plane Tolerances, \pm C	
	in	mm	in	mm	in	mm
½ to 4	0.06	2	0.03	1	0.03	1
5 to 8	0.12	4	0.06	2	0.03	1
10 to 12	0.19	5	0.09	2	0.06	2
14 to 16	0.25	6	0.09	3	0.06	2
18 to 24	0.38	10	0.12	4	0.06	2
26 to 30	0.38	10	0.19	5	—	—
32 to 42	0.50	13	0.19	5	—	—
44 to 48	0.75	19	0.19	5	—	—

Forged Flanges

Dimensions - ANSI B16.5

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Notes

- Class 150 (PN20) & Class 300 (PN50)**
 - C(2) & Y(2) dimensions do not include the height of the Raised Face (RF) and or Ring Type Groove
 - Raised Face height is 1.5mm (0.06 inch)
- Class 600 (PN100), Class 900 (PN150), Class 1500 (PN250) & Class 2500 (PN420)**
 - C(2) & Y(2) dimensions do not include the height of the Raised Face (RF) and or Ring Type Groove
 - Raised Face height is 6.4mm (0.25 inch)
- For Flanges sizes larger than 600NB, refer to specifications**
 - BS3293
 - ASME B16.47 Series A (MSS SP44)
 - ASME B16.47 Series B (API 605)

Nominal Size		PN 20 (CLASS 150)							PN50 (Class 300)							PN100 (Class 600)									
		Length through Hub			Length through Hub				Length through Hub			Length through Hub				Length through Hub			Length through Hub						
DN	NPS	Dia. of flange O	Minimum Body Thickness of Flange C (2)	Threaded/Slip-on/Socket Weld Y (2)	Weldneck	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	Dia. of flange O	Minimum Body Thickness of Flange C (2)	Threaded/Slip-on/Socket Weld Y (2)	Weldneck	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	Dia. of flange O	Minimum Body Thickness of Flange C (2)	Threaded/Slip-on/Socket Weld Y (2)	Weldneck	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts			
15	1/2"	89	9.7	14	46	60.5	5/8"	4	95	12.7	21	51	66.5	5/8"	4	95	14.2	22	52	66.5	5/8"	4			
20	3/4"	99	11.2	14	51	69.8	5/8"	4	117	14.2	24	56	82.6	3/4"	4	117	15.7	25	57	82.6	3/4"	4			
25	1"	108	12.7	16	54	79.2	5/8"	4	124	15.7	25	60	88.9	3/4"	4	124	17.5	27	62	88.9	3/4"	4			
32	1 1/4"	117	14.2	19	56	88.9	5/8"	4	133	17.5	25	64	98.6	3/4"	4	133	20.6	28	67	98.6	3/4"	4			
40	1 1/2"	127	15.9	21	60	98.6	5/8"	4	155	19	29	67	114.3	7/8"	4	155	22.4	32	70	114.3	7/8"	4			
50	2"	152	17.5	24	62	120.6	3/4"	4	165	20.6	32	68	127	3/4"	8	165	25.4	37	73	127	3/4"	8			
65	2 1/2"	178	20.6	27	68	139.7	3/4"	4	190	23.9	37	75	149.4	7/8"	8	190	28.4	41	79	149.4	7/8"	8			
80	3"	190	22.4	28	68	152.4	3/4"	4	210	26.9	41	78	168.1	7/8"	8	210	31.8	46	83	168.1	7/8"	8			
90	3 1/2"	216	22.4	30	70	177.8	3/4"	8	229	28.4	43	80	184.2	7/8"	8	229	35.1	49	86	184.2	1"	8			
100	4"	229	22.4	32	75	190.5	3/4"	8	254	30.2	46	84	200.2	7/8"	8	273	38.1	54	102	215.9	1"	8			
125	5"	254	22.4	35	87	215.9	7/8"	8	279	33.3	49	97	235	7/8"	8	330	44.4	60	114	266.7	1 1/8"	8			
150	6"	279	23.9	38	87	241.3	7/8"	8	318	35.1	51	97	269.7	7/8"	12	356	47.8	67	117	292.1	1 1/8"	12			
200	8"	343	26.9	43	100	298.4	7/8"	8	381	39.6	60	110	330.2	1"	12	419	55.6	76	133	349.2	1 1/4"	12			
250	10"	406	28.4	48	100	362	1"	12	444	46	65	116	387.4	1 1/8"	16	508	63.5	86	152	431.8	1 3/8"	16			
300	12"	483	30.2	54	113	431.8	1"	12	521	49.3	72	129	450.8	1 1/4"	16	559	66.5	92	155	489	1 3/8"	20			
350	14"	553	33.3	56	125	476.2	1 1/8"	12	584	52.3	75	141	514.4	1 1/4"	20	603	69.8	94	165	527	1 1/2"	20			
400	16"	597	35.1	62	125	539.8	1 1/8"	16	648	55.6	81	145	571.5	1 3/8"	20	686	76.2	106	178	603.2	1 5/8"	20			
450	18"	635	38.1	67	138	577.8	1 1/4"	16	711	58.7	87	157	628.6	1 3/8"	24	743	82.6	117	184	654	1 3/4"	20			
500	20"	693	41.1	71	143	635	1 1/4"	20	775	62	94	161	685.8	1 3/8"	24	813	88.9	127	190	723.9	1 3/4"	24			
550	22"	749	44.4	78	148	692.2	1 3/8"	20	838	65	100	164	743	1 5/8"	24	870	95.2	133	197	777.7	1 7/8"	24			
600	24"	813	46	81	151	749.3	1 3/8"	20	914	68.3	105	167	812.8	1 5/8"	24	940	101.6	140	203	838.2	2"	24			
Nominal Size		PN150 (CLASS 900)							PN250 (Class 1500)							PN420 (Class 2500)									
		Length through Hub			Length through Hub				Length through Hub			Length through Hub				Length through Hub			Length through Hub						
DN	NPS	Dia. of flange O	Minimum Body Thickness of Flange C (2)	Threaded/Slip-on/Weldneck Y (2)	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	Dia. of flange O	Minimum Body Thickness of Flange C (2)	Threaded/Slip-on/Weldneck Y (2)	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	Dia. of flange O	Minimum Body Thickness of Flange C (2)	Threaded/Slip-on/Weldneck Y (2)	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	Dia. of flange O	Minimum Body Thickness of Flange C (2)	Threaded/Slip-on/Weldneck Y (2)	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts
15	1/2"	USE PN250 (Class 1500) In these sizes							121	22.4	32	60	82.6	7/8"	4	133	30.2	40	73	88.9	7/8"	4			
20	3/4"	130	25.4	35	70	88.9	7/8"	4	140	31.8	43	79	95.2	7/8"	4										
25	1"	149	28.4	41	73	101.6	1	4	159	35.1	48	89	108	1"	4										
32	1 1/4"	159	28.4	41	73	111.1	1	4	184	38.1	52	95	130	1 1/8"	4										
40	1 1/2"	178	31.8	44	83	124	1 1/8"	4	203	44.4	60	111	146	1 1/4"	4										
50	2"	216	38.1	57	102	165.1	1	8	235	50.8	70	127	171.4	1 1/8"	8										
65	2 1/2"	244	41.1	64	105	190.5	1 1/8"	8	267	57.2	79	143	196.8	1 1/4"	8										
80	3"	241	38.1	54	102	190.5	1"	8	267	47.8		117	203.2	1 1/4"	8	305	66.5		168	228.6	1 3/8"	8			
100	4"	292	44.5	70	114	235	1 1/4"	8	311	53.8		124	241.3	1 3/8"	8	356	76.2		190	273	1 5/8"	8			
125	5"	349	50.8	79	127	279.4	1 3/8"	8	375	73.2		155	292.1	1 5/8"	8	419	91.9		229	323.8	1 7/8"	8			
150	6"	381	55.6	86	140	317.5	1 1/4"	12	394	82.6		171	317.5	1 1/2"	12	483	108		273	368.3	2 5/8"	12			
200	8"	470	63.5	102	162	393.7	1 1/2"	12	483	91.9		213	393.7	1 3/4"	12	552	127		318	438.2	2 1/8"	12			
250	10"	546	69.8	108	184	469.9	1 1/4"	16	584	108		254	482.6	2"	12	673	165.1		419	539.8	2 5/8"	12			
300	12"	610	79.2	117	200	533.4	1 1/2"	20	673	124		282	571.5	2 1/8"	16	762	184.2		464	619.3	2 7/8"	12			
350	14"	641	85.9	130	213	558.8	1 5/8"	20	749	133.4		298	635	2 3/8"	16	Special Design as not covered by B16.5									
400	16"	705	88.9	133	216	616	1 3/4"	20	826	146		311	704.8	2 5/8"	16										
450	18"	787	101.6	152	229	685.8	2"	20	914	162.1		327	774.7	2 7/8"	16										
500	20"	857	108	159	248	749.3	2 1/8"	20	984	177.8		356	831.8	3 1/8"	16										
600	24"	1041	139.7	203	292	901.7	2 5/8"	20	1170	203.2		406	990.6	3 5/8"	16										

Forged Flanges

Dimensional Tolerances - ANSI B16.5

The tolerances listed below are always observed in the flange production and are to be understood as maximum limits, since the manufacture, effected by modern and properly equipped machines, usually ranges between more narrow limits. Said tolerances, unless otherwise specified, and those approved by American Standard ANSI B16.5.

DIMENSIONS IN INCHES

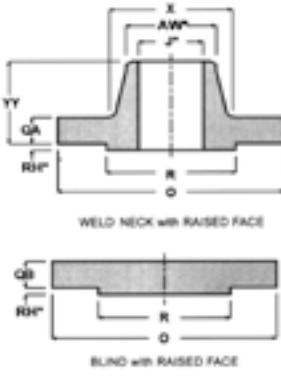
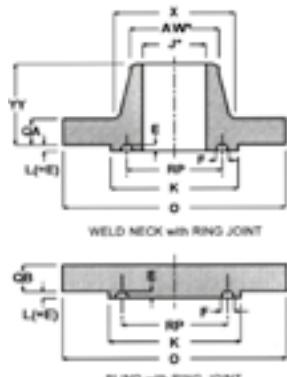
THREADED, SOCKET-WELD SLIP-ON, LAP JOINT AND BLIND FLANGES			WELDNECK FLANGES		
OUTSIDE DIAMETER	When O.D. is 5" or less	+0.08", -0.03"	OUTSIDE DIAMETER	When O.D. is 5" or less	+0.08", -0.04"
	When O.D. is 6" and above	+ 0.16", -0.04"		When O.D. is 6" and above	+ 0.16", -0.04"
INSIDE DIAMETER	Threaded	To Standard Gauge Limits	INSIDE DIAMETER	Sizes 10" and smaller	± 0.04"
	Socket-welding Slip-on and Lap Joint Sizes 10" and smaller	± 0.04"		Sizes 12" through 18"	± 0.06"
	Sizes 12" to 18"	± 0.06"		Sizes 20" and larger	+ 0.12", -0.06"
	Sizes 20" and above	+0.12", -0.06"	DIAMETER OF CONTACT FACE	0.06" Raised Face	± 0.04"
DIAMETER OF COUNTERBORE	Threaded Sizes 10" and below	+0.04", -0"		0.25" Raised Face	± 0.02"
	Threaded Sizes 12" and above	+0.06", -0"		Tongue and Groove or Male and Female	± 0.02"
	Socket Weld 3" and below	± 0.010"	DRILLING	Bolt Circle	± 0.06"
DIAMETER OF CONTACT FACE	0.06" Raised Face	± 0.04"		Bolt Hole Spacing	± 0.03"
	0.25" Raised Face Tongue and Groove or Male and Female	± 0.02"		Concentricity of Bolt Circle and Facing 2 1/2" and below	0.03"
DRILLING	Bolt Circle	± 0.06"		Concentricity of Bolt Circle and Facing 3" and above	0.06"
	Bolt Hole Spacing	± 0.03"	LENGTH THRU HUB	Sizes 4" and smaller	± 0.06"
	Concentricity of Bolt Circle and Facing 2 1/2" and below	0.03"		Sizes 5" to 10"	+0.06", -0.12"
	Concentricity of Bolt Circle and Facing 3" and above	0.06"		Sizes 12" and above	+ 0.12", -0.20"
LENGTH THRU HUB	Sizes 18" and smaller	+ 0.12", -0.03"	THICKNESS	Sizes 18" and smaller	+ 0.12", -0"
	Sizes 20" and larger	+ 0.19", -0.06"		Sizes 20" and larger	+ 0.20", -0"
THICKNESS	Sizes 18" and smaller	+ 0.12", -0"			
	Sizes 20" and larger	+ 0.19", -0"			

Forged Flanges

Dimensions - ASME B16.47-A (MSS SP44)

OZLINC
PIPELINE SUPPLIES

RATING	Nominal Pipe Size Inches	Nominal Pipe Size DN	OD of Flange O	Flange Thickness Weld Neck QA	Flange Thickness Blind QB	Length through Hub YY	Diam of Hub X	Diam of Hub - Top AW	Raised Face Diam R	Diam of Bolt Circle	No of Bolt Holes	Diam of Bolt Hole (inches)	Diam of Bolt (inches)	RTJ Diameter K	Ring Pitch Diameter RP	Depth of Groove E	Width of Groove F	Groove Number
150	26	650	870	66.8	66.8	119	676	660.4	749	806.4	24	1 1/8"	1 1/4"					
	28	700	927	69.8	69.8	124	727	711.2	800	863.6	28	1 1/8"	1 1/4"					
	30	750	984	73.2	73.2	135	781	762	857	914.4	28	1 1/8"	1 1/4"					
	32	800	1060	79.5	79.5	143	832	812.8	914	977.9	28	1 1/8"	1 1/2"					
	34	850	1111	81	81	148	883	863.6	965	1028.7	32	1 1/8"	1 1/2"					
	36	900	1168	88.9	88.9	156	933	914.4	1022	1085.8	32	1 1/8"	1 1/2"					
	38	950	1238	85.9	85.9	156	991	965.2	1073	1149.4	32	1 1/8"	1 1/2"					
	40	1000	1289	88.9	88.9	162	1041	1016	1124	1200.2	36	1 1/8"	1 1/2"					
	42	1050	1346	95.2	95.2	170	1092	1066.8	1194	1257.3	36	1 1/8"	1 1/2"					
	44	1100	1403	100.1	100.1	176	1143	1117.6	1245	1314.4	40	1 5/8"	1 1/2"					
	46	1150	1454	101.6	101.6	184	1197	1168.4	1295	1365.2	40	1 5/8"	1 1/2"					
	48	1200	1511	106.4	106.4	191	1248	1219.2	1359	1422.4	44	1 1/8"	1 1/2"					
	50	1250	1568	109.7	109.7	202	1302	1270	1410	1479.6	44	1 7/8"	1 3/4"					
	52	1300	1626	114.3	114.3	208	1353	1320.8	1461	1536.7	44	1 7/8"	1 3/4"					
	54	1350	1683	119.1	119.1	214	1403	1371.6	1511	1593.8	44	1 7/8"	1 3/4"					
	56	1400	1746	122.4	122.4	227	1457	1422.4	1575	1651	48	1 7/8"	1 3/4"					
	58	1450	1803	127	127	233	1508	1473.2	1626	1708.2	48	1 7/8"	1 3/4"					
	60	1500	1854	130.3	130.3	238	1559	1524	1676	1759	52	1 7/8"	1 3/4"					
300	26	650	972	78	82.6	183	721	660.4	749	876.3	28	1 1/4"	1 1/8"	810	749.3	12.7	19.84	R93
	28	700	1035	84.3	88.9	195	775	711.2	800	939.8	28	1 1/4"	1 1/8"	861	800.1	12.7	19.84	R94
	30	750	1092	90.7	93.7	208	827	762	857	997	28	1 7/8"	1 3/4"	917	857.25	12.7	19.84	R95
	32	800	1149	97	98.6	221	881	812.8	914	1054.1	28	2"	1 7/8"	984	914.4	14.27	23.01	R96
	34	850	1206	100.1	103.4	230	937	863.6	965	1104.9	28	2"	1 7/8"	1035	965.2	14.27	23.01	R97
	36	900	1270	103.4	109.7	240	991	914.4	1022	1168.4	32	2 1/8"	2"	1092	1022.35	14.27	23.01	R98
	38	950	1168	106.4	106.4	179	994	965.2	1029	1092.2	32	1 5/8"	1 1/2"					
	40	1000	1238	112.8	112.8	192	1048	1016	1086	1155.7	32	1 3/4"	1 5/8"					
	42	1050	1289	117.6	117.6	199	1099	1066.8	1137	1206.5	32	1 3/4"	1 5/8"					
	44	1100	1353	122.4	122.4	205	1149	1117.6	1194	1263.6	32	1 7/8"	1 3/4"					
	46	1150	1416	127	127	214	1203	1168.4	1245	1320.8	28	2"	1 7/8"					
	48	1200	1467	131.8	131.8	222	1254	1219.2	1302	1371.6	32	2"	1 7/8"					
	50	1250	1530	138.2	138.2	230	1305	1270	1359	1428.8	32	2 1/8"	2"					
	52	1300	1581	143	143	237	1356	1320.8	1410	1479.6	32	2 1/8"	2"					
	54	1350	1657	150.9	150.9	251	1410	1371.6	1467	1549.4	28	2 3/8"	2 1/4"					
	56	1400	1708	152.4	152.4	259	1464	1422.4	1518	1600.2	28	2 3/8"	2 1/4"					
	58	1450	1759	157.2	157.2	265	1514	1473.2	1575	1651	32	2 3/8"	2 1/4"					
	60	1500	1810	160.1	160.1	272	1565	1524	1626	1701.8	32	2 3/8"	2 1/4"					
600	26	650	1016	108	125.5	222	748	660.4	749	914.4	28	2"	1 7/8"	810	749.3	12.7	19.84	R93
	28	700	1073	111.3	131.8	235	803	711.2	800	965.2	28	2 1/8"	2"	861	800.1	12.7	19.84	R94
	30	750	1130	114.3	139.7	248	862	762	857	1022.4	28	2 1/8"	2"	917	857.25	12.7	19.84	R95
	32	800	1194	117.3	147.6	260	917	812.8	914	1079.5	28	2 3/8"	2 1/4"	984	914.4	14.27	23.01	R96
	34	850	1245	120.6	153.9	270	973	863.6	965	1130.3	28	2 3/8"	2 1/4"	1035	965.2	14.27	23.01	R97
	36	900	1314	124	162.1	282	1032	914.4	1022	1193.8	28	2 5/8"	2 1/2"	1092	1022.35	14.27	23.01	R98
	38	950	1270	152.4	155.4	254	1022	965.2	1054	1162	28	2 3/8"	2 1/4"					
	40	1000	1321	158.8	162.1	264	1073	1016	1111	1212.8	32	2 3/8"	2 1/4"					
	42	1050	1403	168.1	171.4	279	1127	1066.8	1168	1282.7	28	2 5/8"	2 1/2"					
	44	1100	1454	173	177.8	289	1181	1117.6	1226	1333.5	32	2 5/8"	2 1/2"					
	46	1150	1511	179.3	185.7	300	1235	1168.4	1276	1390.6	32	2 5/8"	2 1/2"					
	48	1200	1594	189	195.3	316	1289	1219.2	1334	1460.5	32	2 7/8"	2 3/4"					
	50	1250	1670	196.8	203.2	329	1343	1270	1384	1524	28	3 1/8"	3"					
	52	1300	1721	203.2	209.6	337	1394	1320.8	1435	1574.8	32	3 1/8"	3"					
	54	1350	1778	209.6	217.4	349	1448	1371.6	1492	1632	32	3 1/8"	3"					
	56	1400	1854	217.4	225.6	362	1502	1422.4	1543	1695.4	32	3 3/8"	3 1/4"					
	58	1450	1905	222.2	231.6	370	1553	1473.2	1600	1746.2	32	3 3/8"	3 1/4"					
	60	1500	1994	233.4	242.8	389	1610	1524	1657	1822.4	28	3 5/8"	3 1/2"					
900	26	650	1086	139.7	160.3	286	775	660.4	749	952.5	20	2 7/8"	2 3/4"	832	749.3	17.48	30.18	R100
	28	700	1168	142.7	171.4	298	832	711.2	800	1022.4	20	3 1/8"	3"	889	800.1	17.48	33.32	R101
	30	750	1232	129.4	182.4	311	889	762	857	1085.8	20	3 1/8"	3"	946	857.25	17.48	33.32	R102
	32	800	1314	158.8	193.5	330	946	812.8	914	1155.7	20	3 3/8"	3 1/4"	1003	914.4	17.48	33.32	R103
	34	850	1397	165.1	204.7	349	1006	863.6	965	1225.6	20	3 5/8"	3 1/2"	1067	965.2	20.62	36.53	R104
	36	900	1460	171.4	214.4	362	1064	914.4	1022	1289	20	3 5/8"	3 1/2"	1124	1022.35	20.62	36.53	R105
	38	950	1460	190.5	215.9	353	1073	965.2	1099	1289	20	3 5/8"	3 1/2"					
	40	1000	1511	196.8	223.8	363	1127	11016	1162	1339.8	24	3 3/8"	3 1/2"					
	42	1050	1562	206.2	231.6	371	1176	1066.8	1213	1390.6	24	3 5/8"	3 1/2"					
	44	1100	1648	214.4	242.8	391	1235	1117.6	1270	1463.5	24	3 7/8"	3 3/4"					
	46	1150	1734	225.6	255.5	411	1292	1168.4	1334	1536.7	24	4 1/8"	4"					
	48	1200	1784	233.4	263.7	419	1343	1219.2	1384	1587.7	24	4 1/8"	4"					



*RH SIZE: 150 & 300 RATING 1.6mm NOT INCLUDED IN QA, QB AND YY DIMENSION.

600 & 900 RATING 6.4mm NOT INCLUDED IN QA, QB AND YY DIMENSION.

*WN DIAMETER J: TO BE SPECIFIED BY PURCHASER.

*All dimensions are in millimetres (mm)

Forged Flanges

Dimensions - ASME B16.47-B (API 605)

RATING	Nominal Pipe Size Inches	Nominal Pipe Size DN	OD of Flange O	Flange Thickness Weld Neck QA	Flange Thickness Blind QB	Length through Hub YY	Diam of Hub X	Diam of Hub - Top AW	Raised Face Diam R	Diam of Bolt Circle	No of Bolt Holes	Diam of Bolt Hole (inches)	Diam of Bolt (inches)
150	26	650	786	39.9	42.9	87	684	661.9	711	744.5	36	7/8"	3/4"
	28	700	837	42.9	46.2	94	735	712.7	762	795.3	40	7/8"	3/4"
	30	750	887	42.9	49.3	98	787	763.5	813	846.1	44	7/8"	3/4"
	32	800	941	44.4	52.6	106	840	814.3	864	900.2	48	7/8"	3/4"
	34	850	1005	47.8	55.6	109	892	865.1	921	957.3	40	1"	7/8"
	36	900	1057	50.8	57.2	116	945	915.9	972	1009.6	44	1"	7/8"
	38	950	1124	52.6	62	122	997	968.2	1022	1069.8	40	1 1/8"	1"
	40	1000	1175	54.1	65.3	127	1049	1019	1080	1120.6	44	1 1/8"	1"
	42	1050	1226	57.2	66.8	132	1102	1069.8	1130	1171.4	48	1 1/8"	1"
	44	1100	1276	58.9	69.8	135	1153	1120.6	1181	1222.2	52	1 1/8"	1"
	46	1150	1341	60.5	73.2	143	1205	1171.4	1235	1284.2	40	1 1/4"	1 1/8"
	48	1200	1392	63.5	76.2	148	1257	1222.2	1289	1335	44	1 1/4"	1 1/8"
	50	1250	1443	66.8	79.5	152	1308	1273	1340	1385.8	48	1 1/4"	1 1/8"
	52	1300	1494	68.3	82.6	156	1360	1323.8	1391	1436.6	52	1 1/4"	1 1/8"
	54	1350	1549	69.8	85.9	161	1413	1374.6	1441	1492.2	56	1 1/4"	1 1/8"
	56	1400	1600	71.6	88.9	165	1465	1425.4	1492	1543	60	1 1/4"	1 1/8"
	58	1450	1675	73.2	91.9	173	1516	1476.2	1543	1611.4	48	1 3/8"	1 1/4"
	60	1500	1726	74.7	95.2	178	1570	1527	1600	1662.2	52	1 3/8"	1 1/4"
300	26	650	867	87.4	87.4	143	702	665.2	737	8032.1	32	1 3/8"	1 1/4"
	28	700	921	87.4	87.4	148	756	716	787	857.2	36	1 3/8"	1 1/4"
	30	750	991	92.2	92.2	156	813	768.4	845	920.8	36	1 1/2"	1 3/8"
	32	800	1054	101.6	101.6	167	864	819.2	902	977.9	32	1 5/8"	1 1/2"
	34	850	1108	101.6	101.6	171	917	870	952	1031.7	36	1 5/8"	1 1/2"
	36	900	1171	101.6	101.6	179	965	920.8	1010	1089.2	32	1 3/4"	1 5/8"
	38	950	1222	109.5	109.5	190	1016	971.6	1060	1140	36	1 3/4"	1 5/8"
	40	1000	1273	114.3	114.3	197	1067	1022.4	1115	1190.8	40	1 3/4"	1 5/8"
	42	1050	1334	117.6	117.6	203	1118	1074.7	1168	1244.6	36	1 7/8"	1 3/4"
	44	1100	1384	125.5	125.5	213	1173	1125.5	1219	1295.4	40	1 7/8"	1 3/4"
	46	1150	1460	127	128.5	221	1229	1176.3	1270	1365.2	36	2"	1 7/8"
	48	1200	1511	127	133.4	222	1278	1227.1	1327	1416	40	2"	1 7/8"
	50	1250	1562	136.7	138.2	233	1330	1277.9	1378	1466.8	44	2"	1 7/8"
	52	1300	1613	141.2	142.5	241	1383	1328.7	1429	1517.6	48	2"	1 7/8"
	54	1350	1673	135.1	147.6	238	1435	1379.5	1480	1577.8	48	2"	1 7/8"
	56	1400	1765	152.4	155.4	267	1494	1430.3	1537	1651	36	2 3/8"	2 1/4"
	58	1450	1827	152.4	160.3	273	1548	1481.1	1594	1713	40	2 3/8"	2 1/4"
	60	1500	1878	149.4	165.1	270	1599	1531.9	1651	1763.8	40	2 3/8"	2 1/4"
600	26	650	889	111.3	111.3	181	698	660.4	727	806.4	28	1 3/4"	1 5/8"
	28	700	952	115.8	115.8	190	752	711.2	784	863.6	28	1 7/8"	1 3/4"
	30	750	1022	125.5	127	205	806	762	841	927.1	28	2"	1 7/8"
	32	800	1086	130	134.9	216	861	812.8	895	984.2	28	2 1/8"	2"
	34	850	1162	141.2	144.3	233	914	863.6	952	1054.1	24	2 3/8"	2 1/4"
	36	900	1213	146	150.9	243	968	914.4	1010	1104.9	28	2 3/8"	2 1/4"
900	26	650	1022	134.9	153.9	259	743	660.4	762	901.7	20	2 5/8"	2 1/2"
	28	700	1105	147.6	166.6	276	797	711.2	819	971.6	20	2 7/8"	2 3/4"
	30	750	1181	155.4	176	289	851	762	876	1035	20	3 1/8"	3"
	32	800	1238	160.3	185.7	303	908	812.8	927	1092.2	20	3 1/8"	3"
	34	850	1314	171.4	195	319	962	863.6	991	1157.7	20	3 3/8"	3 1/4"
	36	900	1346	173	201.7	325	1016	914.4	1029	1200.2	24	3 1/8"	3"

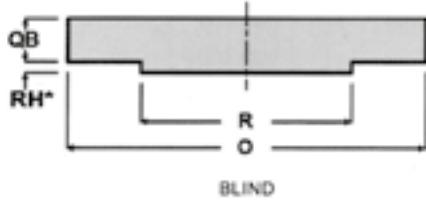
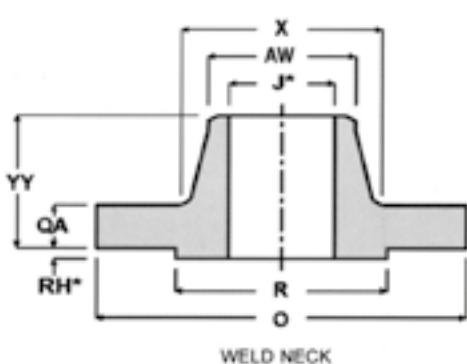
*RH SIZE: 150 & 300 RATING 1.6mm NOT INCLUDED IN QA, QB AND YY DIMENSION.

600 & 900 RATING 6.4mm NOT INCLUDED IN QA, QB AND YY DIMENSION.

*WN BORE J: TO BE SPECIFIED BY PURCHASER.

*All dimensions are in millimetres (mm)

*For tolerance please refer to ASME B16.47

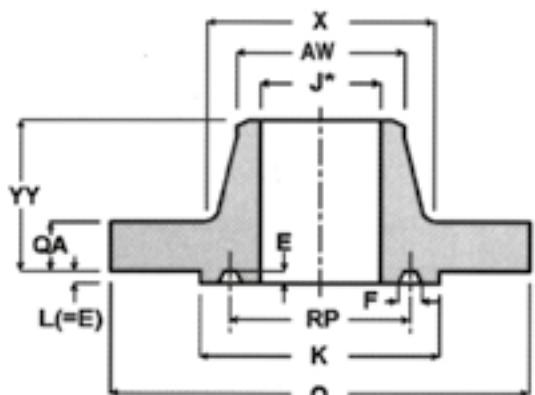


Forged Flanges

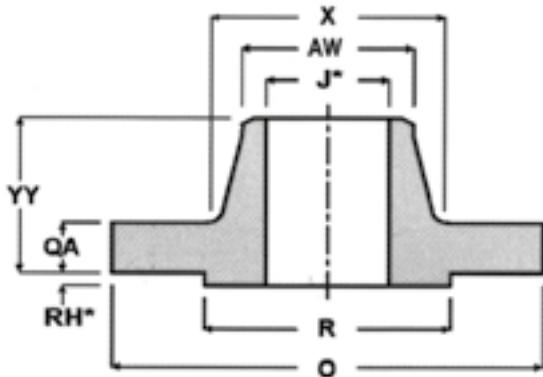
Dimensions - BS 3293

Large Diameter Flanges Specifications BS 3293

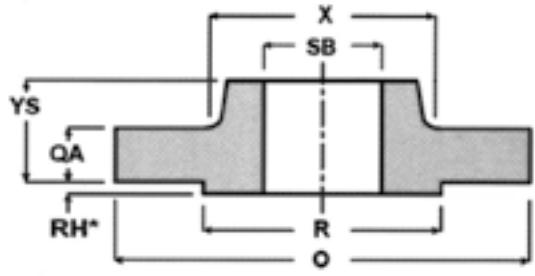
RATING	NOMINAL PIPE SIZE	OD FLANGE	FLANGE THICKNESS	OVERALL HEIGHT	SLIP ON BORE	HUB DIAMETER	NECK DIAMETER	PCD	NUMBER HOLES	HOLE DIAMETER	RF DIAMETER	RTJ DIAMETER	RING PITCH DIAMETER	DEPTH GROOVE	WIDTH GROOVE	RING NUMBER	
		O	QA	YY	YS	SB	X	AW			R	K	RP	E	F	RN	
150	650	870.0	50.9	127.1	85.8	666.7	724.0	660.5	806.4	24	34.9	743.0					
	700	927.2	52.4	128.6	87.3	717.5	781.1	711.3	863.6	28	34.9	793.8					
	750	984.3	53.9	130.2	89.0	768.3	831.9	762.1	914.4	28	34.9	857.3					
	800	1060.5	57.2	133.4	92.1	819.1	889.1	812.9	977.9	28	41.2	908.1					
	850	1111.3	58.8	135.0	93.7	869.9	939.9	863.7	1028.7	32	41.2	958.9					
	900	1168.5	60.4	136.6	95.3	920.7	997.0	914.5	1085.8	32	41.2	1022.4					
	950	1238.3	60.4	136.6	95.3	971.5	1060.5	965.3	1149.3	32	41.2	1073.2					
	1000	1289.1	63.6	139.8	98.5	1022.3	1111.3	1016.1	1200.1	36	41.2	1124.0					
	1050	1346.3	66.7	142.9	101.7	1073.1	1168.5	1066.9	1257.3	36	41.2	1193.9					
	1100	1403.4	66.7	142.9	101.7	1123.9	1219.3	1117.7	1314.4	40	41.2	1244.7					
300	1150	1454.2	68.3	144.5	103.2	1174.7	1270.1	1168.5	1365.2	40	41.2	1295.5					
	1200	1511.4	69.9	146.1	104.8	1225.5	1327.2	1219.3	1422.4	44	41.2	1359.0					
	650	971.6	79.4	184.2	184.2	666.7	720.8	666.8	876.3	28.0	44.4	749.4	809.6	749.3	12.7	19.8	93
	700	1035.1	85.8	196.9	196.9	717.5	774.8	717.6	939.8	28.0	44.4	800.2	860.4	800.1	12.7	19.8	94
	750	1092.3	92.1	209.6	209.6	768.3	825.5	768.4	996.9	28.0	47.6	857.3	917.5	857.2	12.7	19.8	95
	800	1149.4	98.5	222.3	222.3	819.1	881.1	819.2	1054.1	28.0	50.8	914.5	984.2	914.4	14.2	23.0	96
600	850	1206.6	101.7	231.8	231.8	869.9	936.7	871.6	1104.9	28.0	50.8	965.3	1035.0	965.2	14.2	23.0	97
	900	1270.1	104.8	241.4	241.4	920.7	990.7	922.4	1168.4	32.0	53.9	1022.4	1092.2	1022.3	14.2	23.0	98
	650	1016.1	108.0	222.3	222.3	666.7	747.7	671.5	914.4	28	50.8	749.4	809.6	749.3	12.7	19.8	93
	700	1073.2	111.2	235.0	235.0	717.5	803.3	724.0	965.2	28	53.9	800.2	860.4	800.1	12.7	19.8	94
	750	1130.4	114.4	247.7	247.7	768.3	862.1	774.8	1022.3	28	53.9	857.3	917.5	857.2	12.7	19.8	95
	800	1193.9	117.5	260.4	260.4	819.1	917.6	825.6	1079.5	28	60.3	914.5	984.2	914.4	14.2	23.0	96
	850	1244.7	120.7	269.9	269.9	869.9	973.2	877.9	1130.3	28	60.3	965.3	1035.0	965.2	14.2	23.0	97
	900	1314.5	123.9	282.6	282.6	920.7	1031.9	928.7	1193.8	28	66.6	1022.4	1092.2	1022.3	14.2	23.0	98



WELD NECK with RING JOINT



WELD NECK



SLIP-ON

*RH SIZE: 150 & 300 RATING 1.6mm INCLUDED IN YY AND YS DIMENSION.

600 RATING 6.4mm NOT INCLUDED IN YY AND YS DIMENSION.

*WN BORE J: TO BE SPECIFIED BY PURCHASER.

*All dimensions are in millimetres (mm)

*For tolerance please refer to BS3293

Compact Flanges

The Compact Flange System® is a fully proven alternative to the conventional flanged connection used throughout the oil, gas, petrochemical and power generation industries. Produced in a comprehensive range of sizes and materials, they offer versatility, compactness, weight saving and cost effectiveness in connecting piping system.

Standard pressure classes, sizes and flange types

A full range of compact flanges – equivalent to or with higher rating than ASME flanges are readily available.

The Compact Flange covers the usual range of nominal pipe size from $\frac{1}{2}$ " to 42". It is also available, as standard, in sizes from 26" to 42" for Class 1500, from 14" to 24" for Class 2500 and from $\frac{1}{2}$ " to 20" for Class 4500.

The Compact Flange is available as standard, with the following flange types: weld neck flange, blind flange, swivel flange, integral (equipment) flange, rigid interface and line blanks. Orifice flanges, restriction orifices and drip rings are also available on request.

The integral (valve) flange neck outside diameter fulfils the minimum wall thickness requirements given in ASME B16.34, Table 3 with the inside diameter given in ASME B167.34, Table A1.

Access is made for torque tool with standard sockets in order to allow for valve-to-valve make up.

The envelope for CL600 to CL1500 up to 24" and CL2500 up to 12" is within the ANSI flange envelope. This means that standard flange castings "former" can be used without any modification. Major valve manufacturers covering ball, gate, globe, choke and plug valves, have confirmed that they can use the integral compact flange on their valves.

Materials

Compact Flanges are available from standard forging with seal ring in compatible high strength material. The table below lists the more common material combinations:

All seal rings are coated to provide lubrication during make-up. A polymer based coating (PTFE) is used up to 250°C, and molybdenum disulphide (MoS₂) coating is used up to 350°C. Silver plating is available for liquid oxygen service.

FLANGE	SEAL RING	BOLTING
ASTM A105 ASTM A350 LF2 ASTM A694 F52 ASTM A694 F60 ASTM A694 F65 AISI 4130 (UNS 41400)	AISI 4140	ASTM A193 B7 ASTM A193 B16 ASTM A320 L7 ASTM A320 L43
ASTM 182 F316 ASTM 182 F44 (6Mo)ASTM A182 F51 ASTM 182 F49 ASTM 182 F51 (Duplex) ASTM 182 F53/F55 (Super Duplex)	ASTM A564 630 (17-4PH) ASTM A182 F53/F55 INCONEL 625 INCOLOY 825	

OVERLAY ON SEALING AREA, CONTACT SURFACE AND BORE IF REQUIRED.

Applications

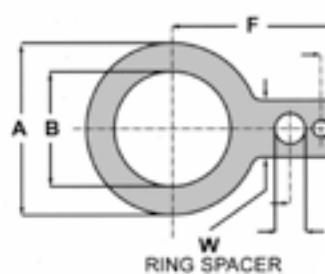
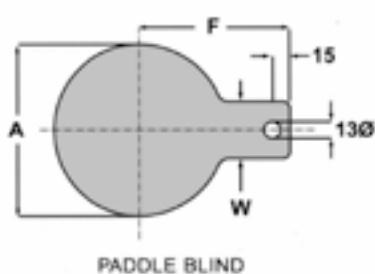
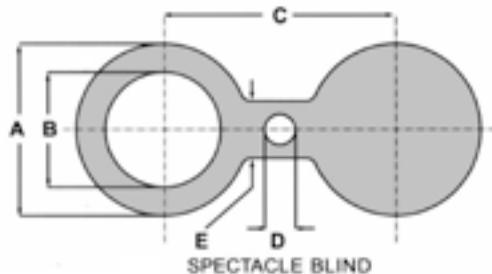
The compact flange can be used in many applications throughout a variety of different industries. The many features and benefits of the sealing integrity have gained acceptance in a variety of service conditions. The following is a partial list existing and/or potential service applications.

General – High-pressure, high temperature, hard to hold gas streams, vibrating or pulsating conditions and corrosive service.

Oil and Gas production – Subsea and onshore pipeline transmission/distribution, flow lines, risers, manifolds, well heads, injection systems, end fittings.



Specification: ASME B16.48



3.2 – 6.3 Ra FINISH BOTH SIDES T = THICKNESS

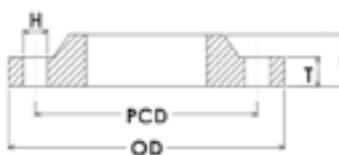
*NOTE: (1) Dimensions based on sizes designed to suit ANSI B16.5 Flanges.
(2) All dimensions are in Millimetres (mm).

NOMINAL BORE mm	ANSI 150								ANSI 300							
	A	B	C	D	E	W	F	T	A	B	C	D	E	W	F	T
25	64.0	27	80	15.8	38	38	145.0	3.0	70	27	90	19.0	38	38	150.0	6.4
40	83.0	48	100	15.8	38	38	155.0	6.4	92	48	115	22.2	38	38	170.0	6.4
50	102.0	61	120	19.0	51	51	165.0	6.4	108	61	125	19.0	51	51	173.0	9.7
80	133.0	89	150	19.0	64	64	175.0	6.4	146	89	170	22.2	64	64	195.0	9.7
100	172.0	114	190	19.0	64	64	205.0	9.7	178	114	200	22.2	64	64	215.0	12.7
150	219.0	168	240	22.2	76	76	230.0	12.7	248	168	270	22.2	76	76	250.0	15.7
200	276.0	219	300	22.2	76	76	260.0	12.7	305	219	330	25.4	76	76	280.0	22.4
250	337.0	273	360	25.4	102	102	295.0	15.7	359	273	385	28.5	102	102	312.0	25.4
300	406.0	324	430	25.4	102	102	330.0	19.1	419	324	450	31.7	102	102	350.0	28.4
350	448.0	356	475	28.5	108	108	360.0	19.1	483	356	515	31.7	108	108	383.0	31.8
400	511.0	406	540	28.5	108	108	390.0	22.4	536	406	570	34.9	108	108	415.0	31.8
450	546.0	457	580	31.7	114	114	410.0	25.4	594	457	630	34.9	114	114	445.0	41.1
500	603.0	508	635	31.7	121	121	440.0	28.4	651	508	685	34.9	121	121	447.0	44.5
600	714.0	610	750	34.9	140	140	500.0	31.8	772	610	810	41.2	140	140	547.0	50.8

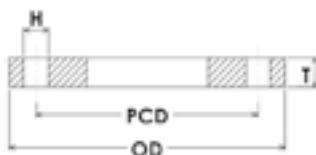
NOMINAL BORE mm	ANSI 600								ANSI 900							
	A	B	C	D	E	W	F	T	A	B	C	D	E	W	F	T
25	70	27	90	19.0	57	57	150.0	6.4	76	27	100	25.4	57	57	164.0	6.4
40	92	43	115	22.2	67	67	170.0	9.7	95	43	125	28.5	67	67	179.0	9.7
50	108	55	125	19.0	57	57	173.0	9.7	140	55	165	25.4	57	57	198.0	12.7
80	146	83	170	22.2	67	67	195.0	12.7	165	83	190	25.4	67	67	210.0	15.7
100	191	108	215	25.4	76	76	225.0	15.7	203	108	235	31.7	76	76	235.0	19.1
150	264	162	290	28.5	86	86	267.0	22.4	286	162	320	31.7	86	86	280.0	25.4
200	318	212	350	31.7	95	95	300.0	28.4	356	212	395	38.1	95	95	325.0	35.1
250	397	265	430	34.9	105	105	345.0	35.1	432	265	470	38.1	105	105	363.0	41.1
300	454	315	490	34.97	105	105	370.0	41.1	495	315	535	38.1	105	105	395.0	47.8
350	489	346	525	38.1	114	114	393.0	44.5	518	346	560	41.2	114	114	410.0	53.8
400	562	397	605	41.2	124	124	432.0	50.8	572	397	615	44.4	124	124	443.0	60.5
450	610	448	655	44.4	133	133	463.0	53.8	635	448	685	50.8	133	133	485.0	66.5
500	679	497	725	44.4	133	133	500.0	63.5	696	497	750	53.9	133	133	520.0	73.2
600	787	597	840	50.8	152	152	560.0	73.2	835	597	900	66.6	152	152	615.0	88.9

Plate Flanges

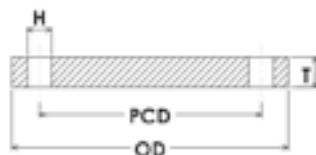
Dimensions - AS 2129



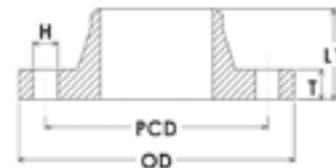
BOSSED SOW



SLIP ON



BLIND



WELD NECK

TABLE D

NOMINAL PIPE SIZE			LENGTH THROUGH HUB		DRILLING DATA			
MM	INCH	OD	BOSSED SOW	WELD NECK	PITCH CIRCLE DIAMETER	BOLT HOLE DIAMETER	NUMBER OF BOLT HOLES	
		T	L	L1	PCD	H	#	
15	1/2	95	5	15	27	67	14	4
20	3/4	100	5	16	27	73	14	4
25	1	115	5	16	27	83	14	4
32	1 1/4	120	6	17	31	87	14	4
40	1 1/2	135	6	19	35	98	14	4
50	2	150	8	21	37	114	18	4
65	2 1/2	165	8	24	40	127	18	4
80	3	185	10	26	45	146	18	4
90	3 1/2	205	10	27	45	165	18	4
100	4	215	10	29	51	178	18	4
125	5	255	13	32	57	210	18	8
150	6	280	13	32	61	235	18	8
200	8	335	13	35	64	292	18	8
250	10	405	16	43	80	356	22	8
300	12	455	19	48	89	406	22	12
350	14	525	22		95	470	26	12
400	16	580	22		521	26	12	
450	18	640	25		584	26	12	
500	20	705	29		641	26	16	
550	22	760	29		699	30	16	
600	24	825	32		756	30	16	
700	28	910	35		845	30	20	
750	30	995	41		927	33	20	
800	32	1060	41		984	36	20	
850	34	1090	44		1016	36	20	
900	36	1175	48		1092	36	24	
1000	40	1255	51		1175	36	24	
1050	42	1335	54		1251	36	28	
1200	48	1490	60		1410	36	32	

NOTES: (1) Plate Flanges less than 12mm thickness may suffer unacceptable distortion after welding.
(2) Bore sizes to suit ASME B 36.10 pipe unless otherwise specified.
(3) Flanges are generally supplied flat faced.
(4) All dimensions are in millimetres (mm)

TABLE E

NOMINAL PIPE SIZE			FLANGE OUTSIDE DIAMETER		THICKNESS OF FLANGE (Refer Note.1)			LENGTH THROUGH HUB		DRILLING DATA		
MM	INCH	OD	BOSSED SOW	WELD NECK	PCD	H	#	L	L1	PITCH CIRCLE DIAMETER	BOLT HOLE DIAMETER	NUMBER OF BOLT HOLES
		T	L	L1								
15	1/2	95	6	16	28	67	14	4				
20	3/4	100	6	17	28	73	14	4				
25	1	115	7	18	29	83	14	4				
32	1 1/4	120	8	19	33	87	14	4				
40	1 1/2	135	9	22	38	98	14	4				
50	2	150	10	23	39	114	18	4				
65	2 1/2	165	10	26	42	127	18	4				
80	3	185	11	27	46	146	18	4				
90	3 1/2	205	12	29	47	165	18	8				
100	4	215	13	32	54	178	18	8				
125	5	255	14	33	58	210	18	8				
150	6	280	17	36	65	235	22	8				
200	8	335	19	41	70	292	22	8				
250	10	405	22	49	86	356	22	12				
300	12	455	25	54	95	406	26	12				
350	14	525	29		102	470	26	12				
400	16	580	32		521		26	12				
450	18	640	35		584		26	16				
500	20	705	38		641		26	16				
550	22	760	44		699		30	16				
600	24	825	48		756		33	16				
700	28	910	51		845		33	20				
750	30	995	54		927		36	20				
800	32	1060	54		984		36	20				
850	34	1090	57		1016		36	20				
900	36	1175	64		1092		36	24				
1000	40	1255	67		1175		39	24				
1050	42	1335	70		1251		39	28				
1200	48	1490	79		1410		39	32				

NOTES: (1) Plate Flanges less than 12mm thickness may suffer unacceptable distortion after welding.
(2) Bore sizes to suit ASME B 36.10 pipe unless otherwise specified.
(3) Flanges are generally supplied flat faced.
(4) All dimensions are in millimetres (mm)

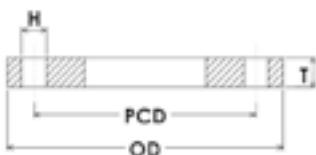
Plate Flanges

Dimensions - AS 2129

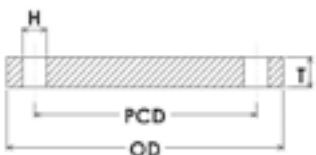
OZLINC
PIPELINE SUPPLIES



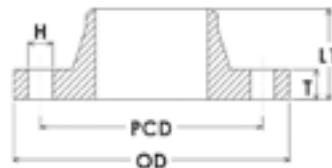
BOSSSED SOW



SLIP ON



BLIND



WELD NECK

TABLE F

				LENGTH THROUGH HUB		DRILLING DATA			
NOMINAL PIPE SIZE		FLANGE OUTSIDE DIAMETER	THICKNESS OF FLANGE (Refer Note.1)	BOSSED SOW	WELD NECK	PITCH CIRCLE DIAMETER	BOLT HOLE DIAMETER	NUMBER OF BOLT HOLES	
MM	INCH	OD	T	L	L1	PCD	H	#	
15	1/2	95	10	20	32	67	14	4	
20	3/4	100	10	21	32	73	14	4	
25	1	120	10	21	39	87	18	4	
32	1 1/4	135	13	24	48	98	18	4	
40	1 1/2	140	13	26	48	105	18	4	
50	2	165	16	29	51	127	18	4	
65	2 1/2	185	16	32	54	146	18	8	
80	3	205	16	32	60	165	18	8	
90	3 1/2	215	19	36	63	178	18	8	
100	4	230	19	38	70	191	18	8	
125	5	280	22	41	79	235	22	8	
150	6	305	22	41	79	260	22	12	
200	8	370	25	47	92	324	22	12	
250	10	430	29	56	102	381	26	12	
300	12	490	32	61	111	438	26	16	
350	14	550	35			495	30	16	
400	16	610	41			552	30	20	
450	18	675	44			610	33	20	
500	20	735	51			673	33	24	
550	22	785	54			724	33	24	
600	24	850	57			781	36	24	
700	28	935	60			857	36	24	
750	30	1015	67			940	36	28	
800	32	1060	68			984	36	28	
850	34	1090	70			1016	36	32	
900	36	1185	76			1105	39	32	
1000	40	1275	83			1194	39	36	
1050	42	1355	86			1270	39	36	
1200	48	1530	95			1441	42	40	

NOTES: (1) Plate Flanges less than 12mm thickness may suffer unacceptable distortion after welding.
(2) Bore sizes to suit ASME B 36.10 pipe unless otherwise specified.
(3) Flanges are generally supplied flat faced.
(4) All dimensions are in millimetres (mm)

TABLE H

				LENGTH THROUGH HUB		DRILLING DATA			
NOMINAL PIPE SIZE		FLANGE OUTSIDE DIAMETER	THICKNESS OF FLANGE (Refer Note.1)	BOSSED SOW	WELD NECK	PITCH CIRCLE DIAMETER	BOLT HOLE DIAMETER	NUMBER OF BOLT HOLES	
MM	INCH	OD	T	L	L1	PCD	H	#	
15	1/2	115	13	23	42	83	18	4	
20	3/4	115	13	24	42	83	18	4	
25	1	120	14	25	43	87	18	4	
32	1 1/4	135	17	28	52	98	18	4	
40	1 1/2	140	17	30	52	105	18	4	
50	2	165	19	32	54	127	18	4	
65	2 1/2	185	19	35	57	146	18	8	
80	3	205	22	38	66	165	18	8	
90	3 1/2	215	22	39	66	178	18	8	
100	4	230	25	44	76	191	18	8	
125	5	280	29	48	86	235	22	8	
150	6	305	29	48	86	260	22	12	
200	8	370	32	54	99	324	22	12	
250	10	430	35	62	108	381	26	12	
300	12	490	41	70	120	438	26	16	
350	14	550	48			495	30	16	
400	16	610	54			552	30	20	
450	18	675	60			610	33	20	
500	20	735	67			673	33	24	
550	22	785	70			724	33	24	
600	24	850	76			781	36	24	

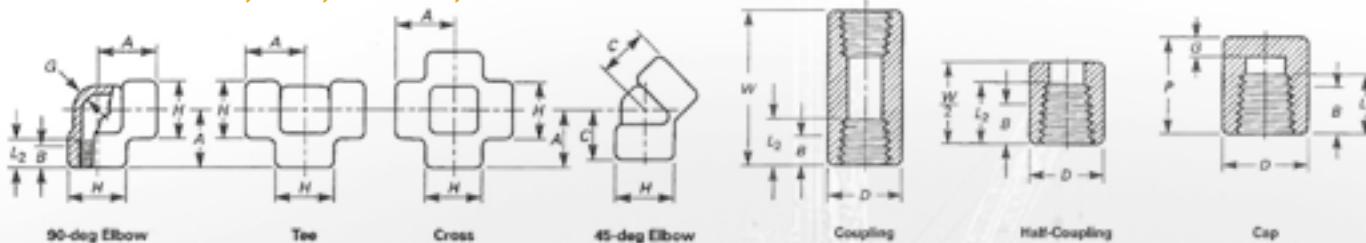
NOTES: (1) Plate Flanges less than 12mm thickness may suffer unacceptable distortion after welding.
(2) Bore sizes to suit ASME B 36.10 pipe unless otherwise specified.
(3) Flanges are generally supplied flat faced.
(4) All dimensions are in millimetres (mm)

Forged High Pressure Fittings

Dimensions - B16.11 / BS3799 / MSS SP-83

OZLINC
PIPELINE SUPPLIES

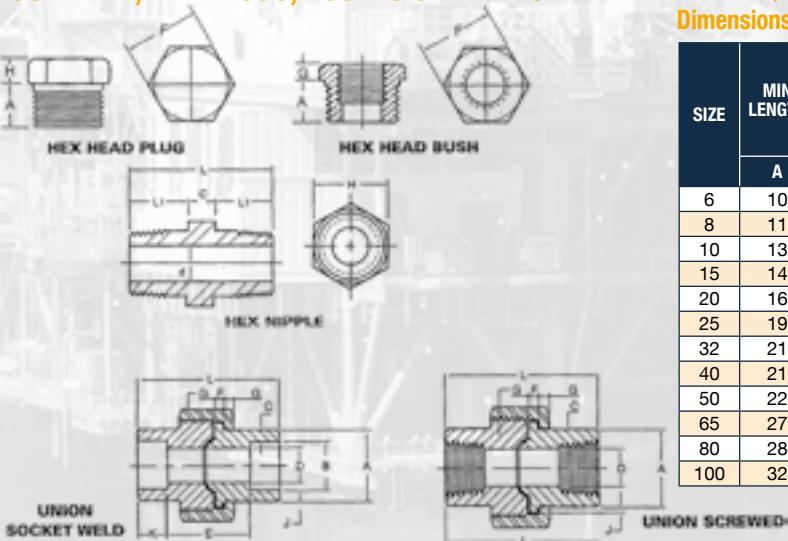
SCREWED ELBOWS, TEES, CROSSES, CAPS & COUPLINGS



SCREWED NPT ELBOW, TEE, CROSS, CAP & COUPLING B16.11 Dimensions in Millimetres (mm)

SIZE	CENTER TO END 90 ELBOW, TEE AND CROSS		CENTER TO END 45 ELBOW		OUTSIDE DIAMETER OF BAND		MINIMUM WALL THICKNESS		THREAD LENGTH MINIMUM		END TO END W	END TO END W ₂	END TO END CAPS		OUTSIDE DIAMETER COUPLING, CAP		END THICKNESS MIN CAP	
	A		C		H		G		CLASS		3000 & 6000	3000 & 6000	P		D		G	
	3000	6000	3000	6000	3000	6000	3000	6000	B	L2	3000	6000	3000	6000	3000	6000	3000	6000
6	21	25	17	19	22	25	3.18	6.35	6.4	6.7	32	16	19	22	16	22	4.8	6.4
8	25	28	19	22	25	33	3.30	6.60	8.1	10.2	35	17	25	27	19	25	4.8	6.4
10	28	33	22	25	33	38	3.51	6.98	9.1	10.4	48	24	32	27	22	32	4.8	6.4
15	33	38	25	28	38	46	4.09	8.15	10.9	13.6	48	24	32	33	28	38	6.4	7.9
20	38	44	28	33	46	56	4.32	8.53	12.7	13.9	51	25	37	38	35	44	6.4	7.9
25	44	51	33	35	56	62	4.98	9.93	14.7	17.3	60	30	41	43	44	57	9.7	11.2
32	51	60	35	43	62	75	5.28	10.59	17.0	18.0	67	33	44	46	57	64	9.7	11.2
40	60	64	43	44	75	84	5.56	11.07	17.8	18.4	79	39	44	48	64	76	11.2	12.7
50	64	83	44	52	84	102	7.14	12.09	19.0	19.2	86	43	48	51	76	92	12.7	15.7
65	83	95	52	64	102	121	7.65	15.29	23.6	28.9	92	46	60	64	92	108	15.7	19.0
80	95	106	64	79	121	146	8.84	16.64	25.9	30.5	108	54	65	68	108	127	19.0	22.4
100	114	114	79	79	152	152	11.18	18.67	27.7	33.0	121	60	68	75	140	159	22.4	28.4

SCREWED, HEX PLUGS, BUSHES & NIPPLES



SCREWED, NPT HEX PLUGS, BUSHES & NIPPLES B16.11 & BS3799

Dimensions in Millimetres (mm)

SIZE	MIN LENGTH	PLUGS & BUSHES		HEX NIPPLES (BS 3799)									
		WIDTH FLATS	HEX HEIGHT	BUSH	PLUG	G	H	C	L1	L	D (3000lb)	D (6000lb)	H
				A	F								
6	10	11.11		6	6	10	26	5	2	11			
8	11	15.88	3	6	6	15	36	8	6	15			
10	13	17.46	4	8	8	16	40	11	8	18			
15	14	22.23	5	8	8	20	48	14	11	22			
20	16	26.99	6	10	10	21	52	19	13	27			
25	19	34.93	6	10	10	25	60	24	17	35			
32	21	44.45	7	14	-	-	-	-	-	-			
40	21	50.80	8	16	16	26	68	38	30	50			
50	22	63.50	9	18	17	27	71	49	39	62			
65	27	76.20	10	19	-	-	-	-	-	-			
80	28	88.90	10	21	-	-	-	-	-	-			
100	32	117.48	13	25	-	-	-	-	-	-			

NOTE: Hex head bushes of one size reduction should not be used in services wherein they might be subject to harmful loads and forces other than internal pressures.

CLASS 3000 UNIONS TO MSS SP-83 in Millimetres (mm)

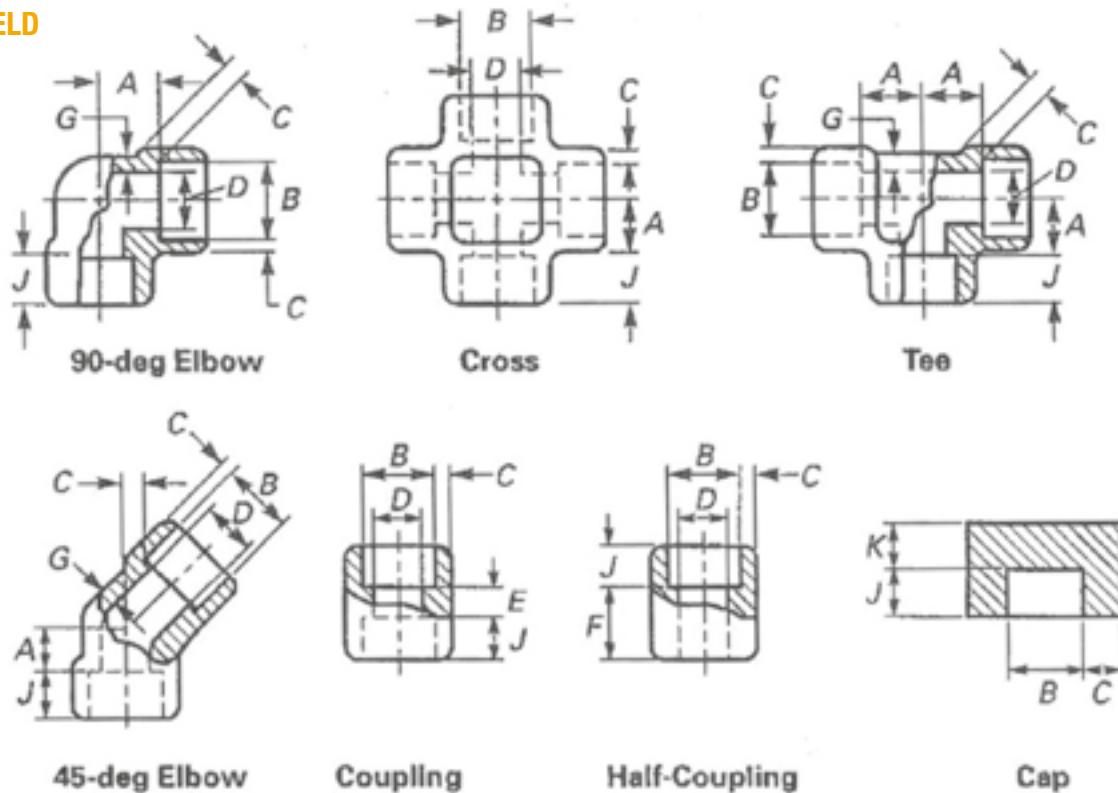
SIZE	COMMON DIMENSIONS				SOCKET WELD DIMENSIONS					SCREWED DIMENSIONS			
	MALE FLANGE F MIN	NUT G MIN	BEARING J MIN	LENGTH L	END A MIN	BORE B MAX	WALL C MIN	BORE D MAX/MIN	LAY LTH E MAX	SOCKET K MIN	END A MIN	WALL C MIN	BORE D MAX/MIN
6	3.17	3.17	1.24	41.40	21.80	11.18	3.17	7.59 / 6.07	22.40	9.65	14.73	2.41	8.43 / 6.43
8	3.17	3.17	1.24	41.40	21.80	14.60	3.30	10.01 / 8.48	22.40	9.65	19.05	3.02	11.12 / 9.45
10	3.43	3.43	1.37	46.00	25.90	18.03	3.50	13.28 / 11.76	26.90	9.65	22.86	3.20	14.27 / 13.51
15	3.68	3.68	1.50	49.00	31.20	22.25	4.09	16.56 / 15.04	26.90	9.65	27.68	3.73	17.85 / 17.07
20	4.06	4.06	1.68	56.90	37.10	27.55	4.27	21.69 / 20.17	31.80	12.70	33.53	3.91	23.01 / 21.39
25	4.57	4.44	1.85	62.00	45.50	34.30	4.95	27.40 / 25.88	34.30	12.70	41.40	4.55	28.98 / 27.74
32	5.33	5.21	2.13	71.10	54.90	43.05	5.28	35.81 / 34.29	40.60	12.70	50.55	4.85	37.69 / 35.36
40	5.84	5.59	2.31	76.45	61.50	49.15	5.54	41.65 / 40.13	42.20	12.70	57.15	5.08	43.54 / 41.20
50	6.60	6.35	2.69	86.10	75.20	61.62	6.05	53.26 / 51.74	45.50	15.75	70.10	5.54	55.58 / 52.12
65	7.49	7.11	3.07	102.40	91.70	74.45	7.65	64.24 / 61.19	61.70	15.75	85.35	7.01	66.27 / 64.31
80	8.25	8.00	3.53	109.00	109.20	90.42	8.31	79.45 / 76.40	63.80	15.75	102.36	7.62	82.55 / 77.27

Forged High Pressure Fittings

Dimensions - B16.11 / BS3799 / MSS SP-83

OZLINC
PIPELINE SUPPLIES

SOCKET WELD



SOCKET WELD FITTINGS B16.11 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	CENTRE TO BOTTOM OF SOCKET A		LAYING LENGTH		END WALL THICKNESS K MIN CLASS			
				3000	6000	3000	6000		3000	6000	3000	6000	3000	6000		
		MAX/MIN														
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	3.68	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	17.50	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	32.00	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

WORKING PRESSURES

Possible Temperature Limitations

Nominal Pressure Ratings	TEMPERATURE °C																		
	38	66	93	121	149	177	204	232	260	288	316	343	371	399	427	427*	482*	510*	538*
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)

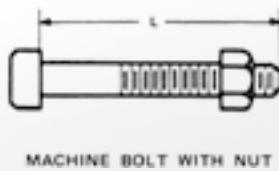
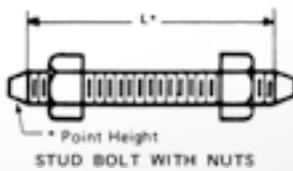
* Suggest Alloy Steel above 482°C.

Bolting for ANSI B16.5 & BS3293 Flanges

Dimensions

OZLINC
PIPELINE SUPPLIES

To suit R.F. Flange sizes DN 15 to 600 to ANSI B16.5 and DN 750 & 900 to BS3293



Diameter of Bolts is shown in inches. For nominal diameters 1 inch and smaller, threads are U.N.C.; nominal diameters 1 1/8 inch and larger threads are 8 U.N. (8 T.P.I.).

Length of Bolts (L) is shown in millimetres rounded to the nearest 5mm. Stud Bolt lengths (L*) do not include the height of points. Machine Bolt lengths (L) include the height of point. The length shown includes the height of the Raised Face in all cases.

NOMINAL FLANGE SIZE		PN20 (CLASS 150)				PN50 (CLASS 300)				PN100 (CLASS 600)				PN150 (CLASS 900)				PN250 (CLASS 1500)				PN420 (CLASS 2500)				NOMINAL FLANGE SIZE	
V DN	I NPS	No. Bolts	Dia. Bolts ins.	L Stud Bolts mm	Mach. Bolts mm	No. Bolts	Dia. Bolts ins.	L Stud Bolts mm	Mach. Bolts mm	No. Bolts	Dia. Bolts ins.	L Stud Bolts mm	No. Bolts	Dia. Bolts ins.	L Stud Bolts mm	No. Bolts	Dia. Bolts ins.	L Stud Bolts mm	No. Bolts	Dia. Bolts ins.	L Stud Bolts mm	No. Bolts	Dia. Bolts ins.	L Stud Bolts mm	V DN	I NPS	
15	1/2	4	1/2	60	45	4	1/2	65	55	4	1/2	80	4	1/2	80	4	3/4	105	4	3/4	125	15	1/2				
20	3/4	4	1/2	65	50	4	5/8	75	60	4	5/8	90	4	5/8	90	4	3/4	115	4	3/4	125	20	3/4				
25	1	4	1/2	65	55	4	5/8	80	65	4	5/8	90	4	7/8	125	4	7/8	140	4	7/8	140	25	1				
32	1 1/4	4	1/2	70	55	4	5/8	80	65	4	5/8	100	4	7/8	125	4	7/8	150	32	1 1/4							
40	1 1/2	4	1/2	70	60	4	3/4	90	75	4	3/4	105	4	1	140	4	1	170	40	1 1/2							
50	2	4	5/8	80	65	8	5/8	90	75	8	5/8	105	8	7/8	145	8	1	175	50	2							
65	2 1/2	4	5/8	90	75	8	3/4	100	85	8	3/4	120	8	1	160	8	1	195	65	2 1/2							
80	3	4	5/8	90	75	8	3/4	110	90	8	3/4	125	8	7/8	145	8	1 1/8	180	8	1 1/4	220	80	3				
90	3 1/2	8	5/8	90	75	8	3/4	110	95	8	7/8	140	-	-	-	-	-	-	-	-	-	90	3 1/2				
100	4	8	5/8	90	75	8	3/4	110	95	8	7/8	145	8	1 1/8	170	8	1 1/4	195	8	1 1/2	255	100	4				
125	5	8	3/4	90	80	8	3/4	120	100	8	1	165	8	1 1/4	190	8	1 1/2	250	8	1 3/4	300	125	5				
150	6	8	3/4	100	85	12	125	105	12	1	170	12	1 1/8	195	12	1 3/8	260	8	2	345	150	6					
200	8	8	3/4	110	90	12	7/8	140	110	12	1 1/8	195	12	1 3/8	220	12	1 5/8	290	12	2	380	200	8				
250	10	12	7/8	115	95	16	1	155	130	16	1 1/4	215	16	1 3/8	235	12	1 7/8	335	12	2 1/2	485	250	10				
300	12	12	7/8	120	100	16	1 1/8	170	145	20	1 1/4	220	20	1 3/8	255	16	2	375	12	2 3/4	540	300	12				
350	14	12	1	130	110	20	1 1/8	175	150	20	1 3/8	235	20	1 1/2	275	16	2 1/4	405				350	14				
400	16	16	1	135	115	20	1 1/4	190	160	20	1 1/2	255	20	1 5/8	285	16	2 1/2	445				400	16				
450	18	16	1 1/8	150	125	24	1 1/4	195	170	20	1 5/8	275	20	1 7/8	325	16	2 3/4	495				450	18				
500	20	20	1 1/8	160	135	24	1 1/4	205	180	24	1 5/8	290	20	2	345	16	3	540				500	20				
600	24	20	1 1/4	175	145	24	1 1/2	230	195	24	1 7/8	330	20	2 1/2	435	16	3 1/2	615				600	24				
750	30	28	1 1/4	190	160	28	1 3/4	290	250	28	2	355										750	30				
900	36	32	1 1/2	215	180	32	2	325	280	28	2 1/2	400										900	36				

Raised Face height of 1.6mm for PN20 & 50 and 6.4mm for PN100, 150, 250 & 420 is included in dimension L (Bolt Length).

Materials

- ASTM A193 B7 / A194 2H
- ASTM A320 L7 / A194 Gr4 or Gr7
- ASTM A193 B16
- ASTM A193 B7M / A194 2HM
- ASTM A320 L7M / A194 Gr7M
- ASTM A193 B8 / A194 Gr8
- ASTM A193 B8M / A194 Gr8M
- Hastelloy C276, C22, B2, B3 & X
- Inconel Alloy 600, 625, 718, 800, 825, & 925
- Titanium Grade 2 & 5
- Monel Alloy 400 or K500
- Super Duplex UNS S32750, UNS S32760 FLT, UNS S32760 SA
- Zeron 100 SA & Zeron 100 FLT
- Ferralium
- Duplex, UNS S31803

Bolting Standards & Materials

OZLINC
PIPELINE SUPPLIES

TYPICAL STEELS FOR BOLTING GRADES ASTM A193-A320	AISI	ASTM	UNS	W-Nr	CHEMICAL COMPOSITION %						MECHANICAL TESTS			
					C	Ni	Cr	Mo	Others	UTS MPa	YS MPa	KV J		
501	B5	S50100	1.7362	>0,10	-	-	4-6	0,4-0,5	-	-	>690	>550	-	
410	B6	S41000	1.4006	<0,15	-	-	11,5-13,5	-	-	-	>760	>585	-	
4140	B7	G41400	1.7225	0,37-0,49	-	-	0,75-1,2	0,15-0,25	-	-	>860	>720	-	
-	B16	K14072	1.7711	0,36-0,47	-	-	0,8-1,15	0,5-0,65	V0,25-0,35	-	-	>860	>720	-
4140	L7	G41400	1.7225	0,38-0,48	-	-	0,8-1,1	0,15-0,25	-	-	-	>860	>725	>27
4140	L7M	G41400	1.7225	0,38-0,48	-	-	0,8-1,1	0,15-0,25	-	-	-	>690	>550	>27
4340	L43	G43400	1.6565	0,38-0,43	1,65-2	-	0,7-0,9	0,2-0,3	-	-	-	>860	>725	>27
4140	B7M	G41400	1.7225	0,37-0,49	-	-	0,75-1,2	0,15-0,25	-	-	-	>690	>550	-
304	B8	S30400	1.4301	<0,08	8-10,5	-	18-20	-	-	-	-	>515	>205	-
347	B8C	S34700	1.4550	<0,08	9-13	-	17-19	-	Cb+Ta >10XC	-	-	>515	>205	-
316	B8M	S31600	1.4401	<0,08	10-14	-	16-18	2-3	-	-	-	>515	>205	-
-	B8S	S21800	-	<0,10	8-9	-	16-18	-	Si 3,5-4,5	N,08-18	-	>655	>345	-
321	B8T	S32100	1.4541	<0,08	9-12	-	17-19	-	Ti > 5XC	-	-	>515	>205	-

HEAT-RESISTANT ALLOYS	ALLOY	ASTM	UNS	W-Nr	CHEMICAL COMPOSITION %						MECHANICAL TESTS		
					C	Ni	Cr	Mo	Others	UTS MPa	YS MPa	KV J	
600	B166	N06600	2.4816	<0,15	>72	-	14-17	-	Fe 6-10	-	>550	>240	-
660	A453	S66286	1.4980	<0,08	24-27	13,5-16	-	1-1,15	Ti 1,9-2,35	V0,1-0,5	>895	>585	-
662A	A453	S66220	-	<0,08	24-28	-	12-15	2-3,5	Ti 1,8-2,1	Mn 0,4-1	>895	>585	-
665B	A453	S66545	1.4943	<0,08	24-28	-	12-15	1,25-2,25	Ti 2,7-3,3	Mn 1,25-2	>860	>550	-
718	B637	N07718	2.4668	<0,08	50-55	-	17-21	2,8-3,3	Cb 4,75-5,5	Ti 0,65-1,15	>1275	>1035	-
X-750	B637	N07750	2.4669	<0,08	>70	-	14-17	-	Ti 2,25-2,75	Fe 5-9	>1170	>790	-
800H	B408	N08810	1.4876	0,05-0,10	30-35	-	19-23	-	Fe > 39,5	-	>450	>170	-
80A	B637	N07080	2.4952	<0,10	Balance	-	18-21	-	Fe < 3	Ti 1,8-2,7	>930	>620	-

CORROSION RESISTANT ALLOYS	ALLOY	ASTM	UNS	W-Nr	CHEMICAL COMPOSITION %						MECHANICAL TESTS		
					C	Ni	Cr	Mo	Others	UTS MPa	YS MPa	KV J	
400	F467/8	N04400	2.4360	<0,30	63-70	-	-	-	Cu bal	-	>550	>275	-
K-500	F467/8	N05500	2.4375	<0,25	63-70	-	-	-	Cu bal	Al 2,3-3,15	>900	>620	-
600	B166	N06600	2.4816	<0,15	>72	-	14-17	-	Fe 6-10	-	>550	>240	-
625	B446	N06625	2.4856	<0,10	>58	-	20-23	8-10	Cb 3,15-4,15	Fe < 5	>830	>415	-
660	A453	S66286	1.4980	<0,08	24-27	13,5-16	-	1-1,5	Ti 1,9-2,35	V 0,1-0,5	>895	>585	-
662A	A453	S66220	-	<0,08	24-28	-	12-15	2-3,5	Ti 1,8-2,1	Mn 0,4-1	>895	>585	-
665B	A453	S66545	1.4943	<0,08	24-28	-	12-15	1,25-2,25	Ti 2,7-3,3	Mn 1,25-2	>860	>550	-
718	B637	N07718	2.4668	<0,08	50-55	-	17-21	2,8-3,3	Cb 4,75-5,5	Ni 0,65-1,15	>1275	>1035	-

CORROSION RESISTANT ALLOYS WITH HIGH-YIELD LIMITS	ALLOY	ASTM	UNS	W-Nr	CHEMICAL COMPOSITION %						MECHANICAL TESTS		
					C	Ni	Cr	Mo	Others	UTS MPa	YS MPa	KV J	
-	A479	S31803	1.4462	<0,03	4,5-6,5	21-23	2,5-3,5	N 0,08-0,2	-	>620	>450	-	
-	A479	S32750	1.4468	<0,03	6-8	24-26	3-5	N 0,24-0,32	-	>800	>550	-	
-	A276	S32760	1.4496	<0,03	6-8	24-26	3-4	N 0,2-0,3	Cu 0,5-1	>860	>720	-	
-	A479	S32550	1.4515	<0,04	4,5-6,5	24-27	2,9-3,9	N 0,1-0,25	Cu 1,5-2,5	>760	>550	-	
-	A479	S31254	1.4529	<0,02	17,5-18,5	19,5-20,5	6-6,5	N 0,18-0,22	Cu 0,5-1	>655	>305	-	
K-500	F467/8	N05500	2.4375	<0,25	63-70	-	-	Cu bal	Al 2,3-3,15	>900	>620	-	
660	A453	S66286	1.4980	<0,08	24-27	13,5-16	1-1,5	Ti 1,9-2,35	V 0,1-0,5	>895	>585	-	

CORROSION RESISTANT ALLOYS WITH LOW SPECIFIC WEIGHT	ALLOY	ASTM	UNS	W-Nr	CHEMICAL COMPOSITION %						MECHANICAL TESTS		
					C	Ti	N	H	Fe	O	UTS MPa	YS MPa	KV J
Ti gr. 1	B348	R50250	3.7025	<0,10	Balance	<0,03	<0,01	<0,2	<0,18	>240	>170	-	
Ti gr. 2	B348	R50400	3.7035	<0,10	Balance	<0,03	<0,01	<0,3	<0,25	>345	>275	-	
Ti gr. 3	B348	R50500	3.7055	<0,10	Balance	<0,05	<0,01	<0,35	<0,35	>450	>380	-	
Ti gr. 4	B348	R50700	3.7065	<0,10	Balance	<0,05	<0,01	<0,4	<0,40	>550	>483	-	
Ti gr. 5	B348	R56400	3.7165	<0,10	Balance	<0,05	<0,01	<0,4	<0,20	>895	>825	-	
Ti gr. 6	B348	R54520	-	<0,10	Balance	<0,05	<0,01	<0,5	<0,20	>825	>795	-	
Ti gr. 7	B348	R52400	3.7235	<0,10	Balance	<0,03	<0,01	<0,3	<0,25	>345	>275	-	
Ti gr. 10	B348	R58030	-	<0,10	Balance	<0,05	<0,02	<0,35	<0,18	>690	>620	-	
Ti gr. 11	B348	R52250	3.7225	<0,10	Balance	<0,03	<0,01	<0,2	<0,18	>240	>170	-	
Ti gr. 12	B348	R53400	-	<0,08	Balance	<0,03	<0,01	<0,3	<0,25	>483	>345	-	

Valve Range

Ball Valves

Codes

API 6D, API 6A, ANSI B16.34, BS5351

Construction

- Trunnion mounted side and top entry and welded body
- Floating ball type

Services

Low to high temperatures from -196 to 400 deg C, metal to metal, cryogenic, crude oil, gas, sea water and sour, etc

Sizes

1/4 to 60 inch

Pressure Classes

ANSI 150 to 2500#

API 3000 to 15000#

End Connections

Flanged, buttweld, hubs

Materials of Construction

Carbon Steel, Stainless Steel, 6mo, Titanium, Duplex, Super Duplex, Inconel, Incoloy and Special Alloys

Bore

Full, reduced and venturi

Fire Safe

BS6755, API RP 6FA, API 607

Gate, Globe, Check & Butterfly Valves

Codes

ASME, ANSI, BS & API

Sizes

1/2 to 60 inch

Pressure Classes

ANSI 150 to 4500#

API 2000 to 15000#

End Connections

Flanged, Butt weld, Socket Weld, Screwed and Wafer

Materials of Construction

Materials in Castings and or Forgings include Carbon, Stainless, Duplex, Super Duplex and Nickel Alloys.



Valve Standards

An Overview of the American Petroleum Institute - API - Valve Standards

Valve standards from API - the American Petroleum Institute:

- **API SPEC 6D** – Specification for Pipeline Valves. API Specification 6D is an adoption of ISO 14313:1999, Petroleum and Natural Gas Industries-Pipeline Transportation Systems-Pipeline Valves. This International Standard specifies requirements and gives recommendations for the design, manufacturing, testing and documentation of ball, check, gate and plug valves for application in pipeline systems.
- **API 526** – Flanged Steel Pressure Relief Valves. The standard is a purchase specification for flanged steel pressure relief valves. Basic requirements are given for direct spring-loaded pressure relief valves and pilot-operated pressure relief valves as follows: orifice designation and area/valve size and pressure rating, inlet and outlet; materials; pressure-temperature limits; and centre-to-face dimensions, inlet and outlet.
- **API 527** – Seat Tightness of Pressure Relief Valves R(2002). Describes methods of determining the seat tightness of metal and soft-seated pressure relief valves, including those of conventional, bellows and pilot-operated designs.
- **ANSI/API STD 594** – Check Valves: Flanged, Lug, Wafer and Butt welding. API Standard 594 covers design, material, face-to-face dimensions, pressure-temperature ratings and examination, inspection and test requirements for two types of check valves.
- **API 598** – Valve Inspection and Testing. The standard covers inspection, supplementary examination and pressure test requirements for both resilient-seated and metal-to-metal seated gate, globe, plug, ball, check and butterfly valves. Pertains to inspection by the purchaser and to any supplementary examinations the purchaser may require at the valve manufacturer's plant.
- **ANSI/API 599** – Metal Plug Valves - Flanged, Threaded and Welding Ends. A purchase specification that covers requirements for metal plug valves with flanged or butt welding ends, and ductile iron plug valves with flanged ends, in sizes NPS 1 through NPS 24, which correspond to nominal pipe sizes in ASME B36.10M. Valve bodies conforming to ASME B16.34 may have flanged end and one butt welding end. It also covers both lubricated and non-lubricated valves that have two-way coaxial ports, and includes requirements for valves fitted with internal body, plug or port linings or applied hard facings on the body, body ports, plug or plug port.
- **ANSI/API 600** – Bolted Bonnet Steel Gate Valves for Petroleum and Natural Gas Industries - Modified National Adoption of ISO 10434:1998.
- **API 602** – Compact Steel Gate Valves - Flanged, Threaded, Welding and Extended-Body Ends. The standard covers threaded-end, socket-welding-end, butt welding-end and flanged-end compact carbon steel gate valves in sizes NPS4 and smaller.
- **ANSI/API 603** – Corrosion-Resistant, Bolted Bonnet Gate Valves - Flanged and Butt welding Ends. The standard covers corrosion-resistant bolted bonnet gate valves with flanged or butt weld ends in sizes NPS ½ through 24, corresponding to nominal pipe sizes in ASME B36.10M, and Classes 150, 300 and 600, as specified in ASME B16.34.
- **ANSI/API 607** – Fire Test for Soft-Seated Quarter Turn Valves. The standard covers the requirements for testing and evaluating the performance of straightway, soft-seated quarter turn valves when the valves are exposed to certain fire conditions defined in this standard. The procedures described in this standard apply to all classes and sizes of such valves that are made of materials listed in ASME B16.34.
- **API 609** – Butterfly Valves: Double Flanged, Lug and Wafer-Type. The standard covers design, materials, face-to-face dimensions, pressure-temperature ratings and examination, inspection and test requirements for gray iron, ductile iron, bronze, steel, nickel-base alloy, or special alloy butterfly valves that provide tight shutoff in the closed position and are suitable for flow regulation.
- **API 6FA** – Specification for Fire Test for Valves. The standard covers the requirements for testing and evaluating the performance of API Spec 6A and Spec 6D valves with automatic backseats when exposed to specifically defined fire conditions.
- **API 6RS** – Referenced Standards for Committee 6, Standardization of Valves and Wellhead Equipment.
- **API 11V6** – Design of Continuous Flow Gas Lift Installations Using Injection Pressure Operated Valves. The standard sets guidelines for continuous flow gas lift installation designs using injection pressure operated valves.
- **ANSI/API RP 11V7** – Recommended Practice for Repair, Testing and Setting Gas Lift Valves. The standard applies to repair, testing and setting gas lift valves and reverse flow (check) valves.
- **API 520-1** – Sizing, Selection and Installation of Pressure-Relieving Devices in Refineries: Part I - Sizing and Selection. The recommended practice applies to the sizing and selection of pressure relief devices used in refineries and related industries for equipment that has a maximum allowable working pressure of 15 psig (1.03 bar g or 103 kPa g) or greater.
- **API 520-2** – Recommended Practice 520: Sizing, Selection and Installation of Pressure-Relieving Devices in Refineries: Part II - Installation. The recommended practice covers methods of installation for pressure-relief devices for equipment that has a maximum allowable working pressure of 15 psig (1.03 bar g or 103 kPa g) or greater. It covers gas, vapor, steam, two-phase and incompressible fluid service.
- **ANSI/API 574** – Inspection Practices for Piping System Components. The standard covers the inspection of piping, tubing, valves (other than control valves) and fittings used in petroleum refineries.
- **ANSI/API 576** – Inspection of Pressure-Relieving Devices. The recommended practice describes the inspection and repair practices for automatic pressure-relieving devices commonly used in the oil and petrochemical industries.
- **ANSI/API 608** – Metal Ball Valves - Flanged and Butt welding Ends. The standard covers Class 150 ad Class 300 metal ball valves that have either butt welding or flanged ends and are for use in on-off service.

Flanges

ASME B16.5/BS 3293/AS2129

Approximate Weights

OZLINC
PIPELINE SUPPLIES

Flange Specifications <= 600NB: ASME B16.5 > 600NB: BS3293

Nominal Bore	Rating 150			Rating 300			Rating 600			Rating 900			Rating 1500			Rating 2500		
	Weld Neck Kg	Slip On Kg	Blind Kg	Weld Neck Kg	Slip On Kg	Blind Kg	Weld Neck Kg	Slip On Kg	Blind Kg	Weld Neck Kg	Slip On Kg	Blind Kg	Weld Neck Kg	Slip On Kg	Blind Kg	Weld Neck Kg	Slip On Kg	Blind Kg
15	0.9	0.5	0.9	0.9	0.7	0.9	1.4	0.9	0.9	2.3	2.7	1.8	2.3	2.7	1.8	3.6	3.2	3.2
20	0.9	0.7	0.9	1.4	1.1	1.4	1.6	1.4	1.4	3.2	2.7	2.7	3.2	2.7	2.7	4.1	4.1	4.6
25	1.4	0.9	0.9	1.8	1.4	1.8	1.8	1.6	1.8	3.9	3.8	4.1	3.9	3.8	4.1	5.9	5.5	5.5
32	1.4	1.1	1.4	2.3	2.1	2.7	2.5	2.1	2.7	4.6	4.6	4.6	4.6	4.6	4.6	9.1	8.2	8.2
40	1.8	1.4	1.8	3.2	3.0	3.2	3.6	3.2	3.6	6.4	6.4	6.4	6.4	6.4	6.4	12.7	11.4	11.4
50	2.7	2.3	2.3	3.6	3.2	3.6	4.6	3.6	4.6	10.9	10.0	11.4	10.9	10.0	11.4	19.1	17.3	17.7
65	4.6	3.2	3.2	5.5	4.6	5.5	6.4	5.5	6.8	16.4	16.4	15.9	16.4	16.4	15.9	23.6	25.0	25.5
80	5.2	3.6	4.1	6.9	5.9	7.3	8.2	6.8	9.1	13.2	14.1	14.0	21.8	21.8	21.8	42.7	37.7	39.1
90	5.5	5.0	5.9	9.1	7.3	9.6	11.8	9.6	13.2									
100	7.8	5.9	7.7	12.1	10.5	12.7	16.8	15.0	18.6	23.2	24.1	24.6	31.4	33.2	33.2	66.0	58.0	60.0
125	9.6	6.8	9.1	16.4	13.2	16.8	30.9	28.6	30.9	39.1	37.7	39.6	60.0	60.0	65.0	111.0	95.0	101.0
150	12.5	8.0	12.0	21.1	16.3	21.8	33.2	36.4	39.1	50.0	49.1	51.0	75.0	75.0	72.0	172.0	147.0	157.0
200	19.9	12.8	21.4	31.4	25.0	35.9	51.0	44.1	63.0	85.0	78.0	90.0	124.0	117.0	137.0	262.0	220.0	242.0
250	24.6	18.0	30.5	44.0	35.0	55.0	86.0	80.0	105.0	122.0	111.0	132.0	206.0	198.0	230.0	485.0	420.0	466.0
300	40.0	27.7	50.0	65.0	51.0	83.0	103.0	98.0	134.0	169.0	148.0	188.0	314.0	303.0	352.0	731.0	591.0	665.0
350	52.0	37.7	63.0	94.0	72.0	110.0	125.0	118.0	172.0	255.0	173.0	225.0						
400	65.0	48.2	85.0	113.0	95.0	143.0	200.0	166.0	240.0	311.0	209.0	281.0						
450	76.0	59.0	99.0	139.0	115.0	188.0	252.0	216.0	302.0	420.0	294.0	400.0						
500	90.0	67.0	129.0	168.0	140.0	234.0	314.0	278.0	389.0	529.0	360.0	503.0						
550	102.0	72.0	151.0	195.0	197.0	270.0	323.0	292.0	437.0									
600	123.0	96.0	190.0	236.0	223.0	364.0	444.0	398.0	534.0	958.0	673.0	954.0						
650	136.0	114.0	226.0	267.0	247.0	432.0	449.0	406.0	677.0		705.0	1000.0						
700	151.0	130.0	265.0	322.0	301.0	503.0	459.0	459.0	760.0									
750	164.0	143.0	314.0	375.0	351.0	638.0	569.0	517.0	896.0	1041.0	905.0	1375.0						
800	198.0	180.0	378.0	431.0	404.0	649.0	590.0	590.0	992.0									
850	211.0	191.0	425.0	490.0	454.0	863.0	719.0	650.0	1186.0	1468.0	1282.0	1943.0						
900	236.0	218.0	485.0	545.0	508.0	978.0	816.0	741.0	1370.0	1659.0	1455.0	2227.0						

NOTE: FOR SOCKET WELD, LAP JOINT, SCREWED USE SLIP ON WEIGHT. ALL WEIGHTS ARE KG EACH AND ARE APPROXIMATE ONLY.

Flange Specification: AS2129

Nominal Bore	Table D		Table E		Table F		Table H	
	Slip On Kg	Blind Kg						
15	0.6	0.6	0.6	0.7	0.6	0.7	0.8	1.0
20	0.7	0.7	0.7	0.8	0.7	0.8	0.9	1.0
25	0.9	1.0	0.9	1.0	0.9	1.0	1.1	1.2
32	0.9	1.1	1.0	1.1	1.1	1.3	1.5	1.8
40	1.2	1.4	1.2	1.4	1.2	1.4	1.7	2.0
50	1.4	1.7	1.4	1.7	2.2	2.6	2.6	3.1
65	1.6	2.1	1.6	2.1	2.5	3.0	3.1	3.8
80	2.0	2.7	2.0	2.7	3.0	3.8	4.3	5.4
100	2.5	3.6	2.5	3.6	4.3	5.9	5.8	7.9
125	3.3	4.9	3.7	5.5	7.4	10.1	9.9	12.6
150	4.0	6.1	5.0	8.3	8.1	11.9	10.8	15.4
200	5.0	8.8	7.1	12.9	12.7	20.3	16.3	26.2
250	8.7	15.8	11.4	21.9	18.1	31.4	22.1	38.0
300	11.3	23.6	15.1	31.8	23.9	44.7	31.0	58.0
350	19.6	36.6	25.3	47.6	35.3	63.0	47.7	85.0
400	22.3	44.9	31.3	66.0	47.6	90.0	62.0	118.0
450	29.9	63.0	40.8	87.0	62.0	120.0	82.0	161.0
500	39.9	86.0	53.0	114.0	80.0	162.0	105.0	213.0
550	44.0	101.0	74.0	153.0	91.0	197.0	118.0	255.0
600	58.0	125.0	85.0	195.0	112.0	243.0	147.0	324.0
750	102.0	245.0	133.0	321.0	167.0	411.0		
900	159.0	400.0	212.0	533.0	240.0	636.0		



Weights

NOTE: ALL WEIGHTS ARE KG EACH AND ARE APPROXIMATE ONLY.
SLIP ON WEIGHTS SHOWN ARE FOR PLATE TYPE SLIP ON (NO BOSS).

Flange ASME B16.47-A (MSS SP 44)

NPS SIZE	CLASS 150		CLASS 300		CLASS 600		CLASS 900	
	WELD NECK	BLIND	WELD NECK	BLIND	WELD NECK	BLIND	WELD NECK	BLIND
26	154	321	291	477	450	777	890	1100
28	175	380	352	584	506	909	1055	1350
30	204	450	405	685	575	1074	1230	1610
32	254	560	465	793	642	1253	1480	1940
34	273	625	523	919	705	1427	1750	2310
36	321	760	580	1072	800	1665	1997	2660
38	358	830	324	900	674	1509	2000	2690
40	386	925	391	1066	725	1695	2161	2950
42	442	1080	428	1206	895	2028	2379	3280
44	491	1230	485	1378	951	2246	3321	3810
46	525	1345	559	1570	1055	2543	3224	4430
48	580	1520	597	1745	1247	2951	3500	4860
50	624	1668	674	1983	1423	3381		
52	689	1867	728	2194	1493	3682		
54	760	2088	871	2538	1637	4091		
56	845	2308	921	2728	1843	4585		
58	923	2554	968	2975	1954	4986		
60	971	2765	1032	3250	2353	5750		

Weight in "Kg"

Flange ASME B16.47-B (API 605)

NPS SIZE	CLASS 150		CLASS 300		CLASS 600		CLASS 900	
	WELD NECK	BLIND	WELD NECK	BLIND	WELD NECK	BLIND	WELD NECK	BLIND
26	65	165	193	404	260	534	478	994
28	75	200	211	457	305	637	691	1256
30	82	226	258	555	378	793	828	1516
32	94	263	315	693	436	925	939	1757
34	113	320	339	765	550	1150	1114	2080
36	128	374	380	858	591	1290	1146	2256
38	153	434	425	1005				
40	166	489	459	1132				
42	182	560	514	1280				
44	195	626	567	1466				
46	229	709	666	1657				
48	248	799	687	1772				
50	268	899	797	2029				
52	284	985	806	2230				
54	309	1081	840	2310				
56	329	1181	1117	2891				
58	391	1322	1194	3093				
60	414	1430	1215	3213				

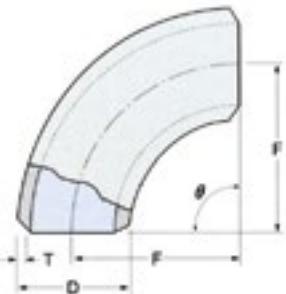
Weight in "Kg"

Stud Bolts

Approximate Weights

		WEIGHTS OF STUD BOLTS (ANSI) Dimensions in kilos per 100 pieces with 2 assembled nuts																			
diam. length (mm)		3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 3/8"	1 1/2"	1 5/8"	1 3/4"	1 7/8"	2"	2 1/4"	2 1/2"	2 3/4"	3"
60	5,5	7,6	10,8	13,5																	
70	5,9	8,2	11,6	14,5	19,8																
80	6,3	8,8	12,4	15,5	21	32,4															
90	6,7	9,4	13,2	16,5	22,2	34,3	50														
100	7,1	10	14	17,5	23,4	36,2	52,6	71,8													
110	7,5	10,6	14,8	18,5	24,6	38,1	55,2	75,2	102												
120	7,9	11,2	15,6	19,5	25,8	40	57,8	78,6	106	137											
130	8,5	11,8	16,4	20,5	27	41,9	60,4	82	111	142	179										
140	8,9	12,2	17,2	21,5	28,2	43,8	63	85,4	115	147	186	234									
150	9,4	12,8	18,00	22,5	29,4	45,7	65,6	88,8	119	153	193	242	289								
160		13,4	18,8	23,5	30,6	47,6	68,2	92,2	123	158	200	250	298	363							
170		14,0	19,6	24,5	32,3	49,5	70,8	95,6	128	164	206	258	308	374	437						
180		14,7	20,4	25,5	33,5	50,8	73,4	99	132	169	213	266	317	385	449						
190			21,2	26,5	34,8	52,7	75,5	103	136	174	220	275	326	396	462						
200			22,0	27,6	36,1	54,5	78,0	106	141	180	226	283	336	407	475						
210				28,6	37,3	56,3	80,5	108	145	185	233	291	345	418	488						
220				29,6	38,6	58,1	83,1	112	149	191	240	299	354	429	500	593					
230				30,6	39,8	60,0	85,6	115	153	196	246	307	364	440	513	607	811				
240					41,1	61,8	88,2	118	158	201	253	316	373	451	526	622	830				
250						63,7	90,7	122	162	206	260	324	382	463	538	637	849				
260							93,3	125	166	212	267	332	391	474	551	651	868				
270								128	171	217	273	340	401	485	564	666	887				
280								132	175	223	279	345	410	496	576	680	906				
290								135	179	228	285	350	419	507	589	695	925				
300								138	184	233	292	358	429	518	602	710	944				
320									192	244	305	374	449	540	627	739	982	1255			
340									201	255	319	390	468	562	653	768	1020	1301	1629		
360									210	266	332	406	487	583	678	797	1058	1347	1685		
380										277	345	422	506	605	703	826	1096	1394	1742	2147	
400										288	359	437	524	627	731	856	1126	1440	1798	2214	
420											372	453	543	649	756	884	1164	1487	1854	2282	
440											385	469	562	672	781	913	1201	1533	1911	2350	
460											399	485	581	690	807	942	1239	1579	1967	2417	
480												501	600	716	832	971	1276	1626	2024	2484	
500												517	619	738	858	1000	1313	1672	2080	2552	
520													638	760	884	1029	1350	1719	2136	2620	
540													656	782	909	1058	1388	1765	2193	2687	
560													675	804	935	1088	1425	1811	2249	2755	
580														960	1117	1462	1859	2306	2822		
600														986	1146	1500	1904	2362	2890		
620															1011	1175	1537	1951	2419	2957	
640																1205	1574	1997	2475	3025	
660																1233	1611	2043	2531	3092	
680																	1649	2090	2588	3160	
700																	1686	2136	2644	3227	

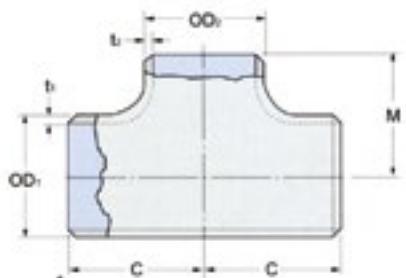
1. ELBOW



$$W = 15.4864 \times \theta / 360 \times F \times T \times (D - T) \times 10^{-5}$$

W = Weight (kg)
 F = Center to End (mm)
 D = Outside Diameter (mm)
 T = Wall Thickness (mm)
 θ = Angle

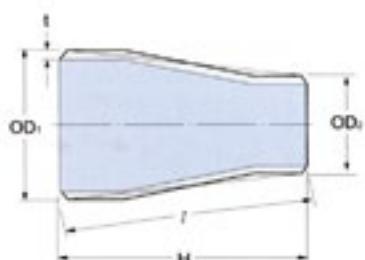
2. TEE



$$W = [0.02466\{2Ct_1;OD_1-t_1\} + (OD_2-t_2) \times M - OD_1/2] \times 10^{-3} \times K$$

W = Weight (kg)
 C = Center to End (mm)
 OD₁ = Outside Diameter (mm)
 OD₂ = Outside Diameter (mm)
 M = Center to End (mm)
 K = 1 (PLATE)
 t₁ = Wall Thickness (mm)
 t₂ = Wall Thickness (mm)
 K = 1.363 (PIPE)

3. REDUCER

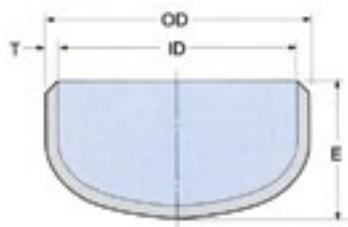


$$W = 1.3232t_1;OD_1 + OD_2 - 2t_1;l \times 10^{-5}$$

$$l = \sqrt{H^2 + (OD_1 + OD_2)^2} / 2$$

W = Weight (kg)
 H = End to End (mm)
 OD₁ = Large Size Outside Diameter (mm)
 OD₂ = Small Size
 t₁ = Wall Thickness (mm)

4. CAP



$$W = 7.85 \times \frac{\pi}{4} (OD+E)^2 \times T \times 10^{-6}$$

W = Weight (kg)
 OD = Outside Diameter (mm)
 T = Wall Thickness (mm)
 E = End to End (mm)

Buttweld Fittings

Approximate weight

90° Elbow

Long Radius

(Unit: kg)

Nominal Pipe Size		STD	S40	XS	S80	XXS	S160
DN	INCHES						
15	½	0.08	0.08	0.10	0.10	0.15	0.12
20	¾	0.11	0.11	0.14	0.14	0.22	0.13
25	1	0.16	0.16	0.20	0.20	0.36	0.25
32	1¼	0.26	0.26	0.35	0.35	0.64	0.42
40	1½	0.37	0.37	0.50	0.50	0.93	0.65
50	2	0.66	0.66	0.90	0.90	1.69	1.33
65	2½	1.29	1.29	1.79	1.79	3.43	2.33
80	3	2.04	2.04	2.74	2.74	5.25	3.83
100	4	3.84	3.84	5.36	5.36	10.20	8.02
125	5	6.48	6.48	9.13	9.13	17.60	14.70
150	6	9.94	9.94	15.00	15.00	29.10	24.20
200	8	20.10	20.10	30.50	30.50	51.40	53.20
250	10	35.40	35.40	47.70	57.00	82.00	103.00
300	12	52.00	57.00	68.70	94.00	134.00	171.00
350	14	67.90	79.10	89.90	133.00		236.00
400	16	89.00	118.00	118.00	195.00		350.00
450	18	113.00	169.00	150.00	275.00		495.00
500	20	140.00	220.00	186.00	373.00		676.00
550	22	169.00	267.00	225.00	493.00		886.00
600	24	202.00	366.00	268.00	636.00		1160.00
650	26	237.00	430.00	315.00			
700	28	276.00	500.00	367.00			
750	30	316.00	575.00	421.00			
800	32	361.00	654.00	480.00			
850	34	408.00	739.00	543.00			
900	36	457.00	904.00	608.00			
950	38	510.00		679.00			
1000	40	565.00		753.00			
1050	42	622.00		828.00			
1100	44	684.00		912.00			
1150	46	748.00		997.00			
1200	48	814.00		1085.00			
1250	50	884.00		1178.00			
1300	52	956.00		1305.00			
1350	54	1031.00		1375.00			
1400	56	1109.00		1480.00			
1450	58	1190.00		1588.00			
1500	60	1274.00		1700.00			

Short Radius

(Unit: kg)

Nominal Pipe Size		STD	S40	XS	S80	XXS	S160
DN	INCHES						
15	½						
20	¾						
25	1	0.11	0.11	0.14	0.14	0.22	0.13
32	1¼	0.26	0.26	0.35	0.35	0.64	0.42
40	1½	0.37	0.37	0.50	0.50	0.93	0.65
50	2	0.66	0.66	0.90	0.90	1.69	1.33
65	2½	1.29	1.29	1.79	1.79	3.43	2.33
80	3	2.04	2.04	2.74	2.74	5.25	3.83
100	4	3.84	3.84	5.36	5.36	10.20	8.02
125	5	6.48	6.48	9.13	9.13	17.60	14.70
150	6	9.94	9.94	15.00	15.00	29.10	24.20
200	8	20.10	20.10	30.50	30.50	51.40	53.20
250	10	35.40	35.40	47.70	57.00	82.00	103.00
300	12	52.00	57.00	68.70	94.00	134.00	171.00
350	14	67.90	79.10	89.90	133.00		236.00
400	16	89.00	118.00	118.00	195.00		350.00
450	18	113.00	169.00	150.00	275.00		495.00
500	20	140.00	220.00	186.00	373.00		676.00
550	22	169.00	267.00	225.00	493.00		886.00
600	24	202.00	366.00	268.00	636.00		1160.00
650	26	237.00	430.00	315.00			
700	28	276.00	500.00	367.00			
750	30	316.00	575.00	421.00			
800	32	361.00	654.00	480.00			
850	34	408.00	739.00	543.00			
900	36	457.00	904.00	608.00			
950	38	510.00		679.00			
1000	40	565.00		753.00			
1050	42	622.00		828.00			
1100	44	684.00		912.00			
1150	46	748.00		997.00			
1200	48	814.00		1085.00			
1250	50	884.00		1178.00			
1300	52	956.00		1305.00			
1350	54	1031.00		1375.00			
1400	56	1109.00		1480.00			
1450	58	1190.00		1588.00			
1500	60	1274.00		1700.00			

45° Elbow

Long Radius

(Unit: kg)

Nominal Pipe Size		STD	S40	XS	S80	XXS	S160
DN	INCHES						
15	½	0.04	0.04	0.05	0.05		
20	¾	0.06	0.06	0.07	0.07		
25	1	0.08	0.08	0.10	0.10	0.18	0.13
32	1¼	0.13	0.13	0.18	0.18	0.32	0.21
40	1½	0.19	0.19	0.25	0.25	0.47	0.33
50	2	0.33	0.33	0.45	0.45	0.85	0.67
65	2½	0.69	0.69	0.90	0.90	1.72	1.17
80	3	1.02	1.02	1.37	1.37	2.63	1.92
100	4	1.92	1.92	2.68	2.68	5.09	4.01
125	5	3.24	3.24	4.57	4.57	8.80	7.35
150	6	4.97	4.97	7.50	7.50	14.50	12.10
200	8	10.10	10.10	15.30	15.30	25.70	26.60
250	10	17.70	17.70	23.90	28.50	41.00	51.50
300	12	26.00	28.50	34.40	47.00	65.00	85.50
350	14	34.00	40.10	45.00	66.50		118.00
400	16	44.50	59.00	59.00	97.50		175.00
450	18	56.50	84.50	75.50	138.00		247.00
500	20	70.00	110.00	93.00	187.00		338.00
550	22	84.50		113.00	257.00		443.00
600	24	101.00	183.00	134.00	318.00		580.00
650	26	119.00		158.00			
700	28	138.00		184.00			
750	30	158.00		211.00			
800	32	180.00	327.00	240.00			
850	34	204.00	369.00	272.00			
900	36	228.00	452.00	304.00			
950	38	255.00		339.00			
1000	40	282.00		376.00			
1050	42	311.00		414.00			
1100	44	342.00		456.00			
1150	46	374.00		498.00			
1200	48	407.00		542.00			

Cap

(Unit: kg)

Nominal Pipe Size		STD	S40	XS	S80	XXS	S160
DN	INCHES						
15	½	0.04	0.04	0.05	0.05	0.10	0.06
20	¾	0.05	0.05	0.07	0.07	0.13	0.09
25	1	0.11	0.11	0.15	0.15	0.29	0.20
32	1¼	0.14	0.14	0.20	0.20	0.39	0.25
40	1½	0.17	0.17	0.24	0.24	0.50	0.35
50	2	0.24	0.24	0.33	0.33	0.68	0.54
65	2½	0.42	0.42	0.57	0.57	1.33	0.77
80	3	0.67	0.67	0.92	0.92	2.18	1.40
100	4	1.17	1.17	1.68	1.68	3.80	2.76
125	5	1.90	1.90	2.73	2.73	6.22	4.85
150	6	2.83	2.83	4.38	4.38	9.85	7.81
200	8	5.11	5.11	7.91	7.91	16.40	15.20
250	10	8.92	8.92	12.20	16.40	28.35	28.90
300	12	13.10	13.10	17.40	26.40	39.40	47.70
350	14	15.90	18.60	21.20	34.90		61.20
400	16	20.00	26.70	26.70	49.00		92.80



Cap

(Unit: kg)

Nominal Pipe Size		STD	S40	XS	S80	XXS	S160
DN	INCHES						
450	18	25.50	41.50	34.10	69.00		131.00
500	20	31.80	54.10	42.50	93.70		179.00
550	22	38.80	61.40	51.70	116.00		219.00
600	24	45.10	90.10	60.10	160.00		307.00
650	26	50.50	92.30	67.30			
700	28	56.20	103.00	74.90			
750	30	62.10	114.00	82.80			
800	32	68.40	126.00	91.20			
850	34	75.00	138.00	100.00			
900	36	81.90	164.00	109.00			
950	38	94.70		126.00			
1000	40	102.00		137.00			
1050	42	110.00		147.00			
1100	44	126.00		167.00			
1150	46	134.00		179.00			
1200	48	143.00		191.00			

Buttweld Fittings

Approximate weight

Tee

(Unit: kg)

Nominal Pipe Size DN	INCHES	STD	S40	XS	S80	XXS	S160
15 x15	1/2 x 1/2	0.09	0.09	0.11	0.11	0.17	0.12
20 x 20	3/4 x 3/4	0.13	0.13	0.17	0.17	0.26	0.21
20 x 15	1/2	0.12	0.12	0.16	0.16	0.24	0.19
25 x 25	1 x 1	0.25	0.25	0.32	0.32	0.53	0.41
25 x 20	3/4	0.24	0.24	0.30	0.30	0.49	0.38
25 x 15	1/2	0.23	0.23	0.26	0.26	0.47	0.37
32 x 32	1 1/4 x 1 1/4	0.43	0.43	0.56	0.56	0.95	0.69
32 x 25	1	0.40	0.40	0.53	0.53	0.89	0.65
32 x 20	3/4	0.37	0.37	0.48	0.48	0.84	0.62
32 x 15	1/2	0.36	0.36	0.47	0.47	0.81	0.59
40 x 40	1 1/2 X 1 1/2	0.61	0.61	0.81	0.81	1.40	1.07
40 x 32	1 1/4	0.59	0.59	0.78	0.78	1.35	1.01
40 x 25	1	0.56	0.56	0.74	0.74	1.28	0.97
40 x 20	3/4	0.53	0.53	0.70	0.70	1.21	0.92
40 x 15	1/2	0.51	0.51	0.67	0.67	1.17	0.90
50 x 50	2 x 2	0.88	0.88	1.20	1.20	2.16	1.78
50 x 40	1 1/2	0.82	0.82	1.11	1.11	2.00	1.63
50 x 32	1 1/4	0.79	0.79	1.07	1.07	1.91	1.56
50 x 25	1	0.75	0.75	1.01	1.01	1.81	1.50
50 x 20	3/4	0.71	0.71	0.98	0.98	1.76	1.45
65 x 65	2 1/2 x 2 1/2	1.74	1.74	2.28	2.28	3.92	2.86
65 x 50	2	1.56	1.56	2.06	2.06	3.56	2.64
65 x 40	1 1/2	1.51	1.51	1.98	1.98	3.40	2.48
65 x 32	1 1/4	1.48	1.48	1.94	1.94	3.32	2.42
65 x 25	1	1.36	1.36	1.80	1.80	3.22	2.36
80 x 80	3 x 3	2.41	2.41	3.25	3.25	5.90	4.55
80 x 65	2 1/2	2.29	2.29	3.07	3.07	5.53	4.23
80 x 50	2	2.12	2.12	2.85	2.85	5.18	4.02
80 x 40	1 1/2	2.06	2.06	2.77	2.77	5.03	3.87
80 x 32	1 1/4	2.02	2.02	2.74	2.74	4.95	3.80
100 x 100	4 x 4	4.12	4.12	5.77	5.77	10.60	8.50
100 x 80	3	3.83	3.83	5.33	5.33	9.76	7.92
100 x 65	2 1/2	3.71	3.71	5.15	5.15	9.39	7.56
100 x 50	2	3.53	3.53	4.94	4.94	9.02	7.34
100 x 40	1 1/2	3.48	3.48	4.83	4.83	8.87	7.23
125 x 125	5 x 5	6.54	6.54	9.20	9.20	17.30	14.80
125 x 100	4	6.13	6.13	8.63	8.63	16.10	13.70
125 x 80	3	5.83	5.83	8.19	8.19	15.30	13.00
125 x 65	2 1/2	5.71	5.71	8.01	8.01	15.00	12.80
125 x 50	2	5.58	5.58	7.92	7.92	14.70	12.50
150 x 150	6 x 6	9.58	9.58	14.50	14.50	27.20	23.30
150 x 125	5	9.08	9.08	13.60	13.60	25.60	21.90
150 x 100	4	8.67	8.67	13.00	13.00	24.50	20.80
150 x 80	3	8.38	8.38	12.60	12.60	23.70	20.10
150 x 65	2 1/2	8.36	8.36	12.50	12.50	23.30	19.80
200 x 200	8 x 8	17.90	17.90	27.10	27.10	45.70	47.20
200 x 150	6	16.60	16.60	25.20	25.20	43.00	43.50
200 x 125	5	16.10	16.10	24.30	24.30	41.40	42.10
200 x 100	4	15.70	15.70	23.70	23.70	41.00	40.30
250 x 250	10 X 10	30.40	30.40	41.00	49.00	79.20	88.00
250 x 200	8	28.50	28.50	38.90	45.80	54.40	81.40
250 x 150	6	27.20	27.20	37.00	43.90	71.50	78.50
250 x 125	5	26.80	26.80	36.20	43.10	70.00	77.00
250 x 100	4	26.80	26.80	36.20	42.50	68.90	76.30
300 x 300	12 X 12	43.60	48.70	57.70	79.20	113.00	143.00
300 x 250	10	41.60	45.30	55.20	74.80	107.00	135.00
300 x 200	8	39.70	42.50	53.10	71.40	102.00	128.00
300 x 150	6	38.40	42.00	51.20	69.50	100.00	125.00
300 x 125	5	38.70	41.70	51.20	68.70	98.30	124.00
350 x 350	14 X 14	53.50	62.40	70.90	104.00		186.00
350 x 300	12	51.90	60.20	68.80	100.00		179.00
350 x 250	10	49.90	57.60	66.30	95.90		174.00
350 x 200	8	48.20	55.80	64.50	92.90		168.00
350 x 150	6	47.10	54.50	62.60	91.00		164.00
400 x 400	16 x 16	66.10	88.00	87.70	145.00		260.00
400 x 350	14	64.90	86.00	86.10	140.00		255.00
400 x 300	12	63.10	84.00	83.60	136.00		248.00
400 x 250	10	61.30	82.00	81.20	132.00		241.00
400 x 200	8	59.80	79.00	80.00	129.00		235.00
400 x 150	6	58.50	77.00	77.80	127.00		230.00

Tee

(Unit: kg)

Nominal Pipe Size DN	INCHES	STD	S40	XS	S80	XXS	S160
450 x 450	18 x 18	83.90	125.00	111.00	204.00		356.00
450 x 400	16	81.40	121.00	108.00	197.00		352.00
450 x 350	14	80.20	119.00	106.00	194.00		344.00
450 x 300	12	78.30	117.00	104.00	189.00		337.00
450 x 250	10	76.90	114.00	102.00	186.00		329.00
500 x 500	20 x 20	104.00	163.00	138.00	277.00		502.00
500 x 450	18	101.00	158.00	134.00	268.00		488.00
500 x 400	16	98.40	154.00	131.00	262.00		475.00
500 x 350	14	97.20	152.00	129.00	258.00		469.00
500 x 300	12	96.00	150.00	127.00	254.00		462.00
500 x 250	10	94.00	147.00	125.00	250.00		452.00
500 x 200	8	92.10	145.00	123.00	245.00		444.00
550 x 550	22 x 22	126.00	198.00	167.00	365.00		657.00
550 x 500	20	123.00	193.00	163.00	356.00		640.00
550 x 450	18	120.00	188.00	159.00	347.00		624.00
550 x 400	16	117.00	183.00	156.00	340.00		610.00
600 x 600	24 x 24	139.00	252.00	185.00	438.00		800.00
600 x 550	22	138.00	249.00	183.00	432.00		790.00
600 x 500	20	136.00	247.00	181.00	427.00		782.00
600 x 450	18	133.00	241.00	177.00	418.00		764.00
650 x 650	26 x 26	176.00	319.00	234.00			
650 x 600	24	172.00	312.00	229.00			
650 x 550	22	169.00	308.00	225.00			
650 x 500	20	166.00	302.00	221.00			
700 x 700	28 x 28	198.00	359.00	264.00			
700 x 650	26	197.00	356.00	261.00			
700 x 600	24	193.00	350.00	256.00			
700 x 550	22	190.00	347.00	252.00			
750 x 750	30 x 30	228.00	414.00	304.00			
750 x 700	28	226.00	406.00	301.00			
750 x 650	26	222.00	356.00	296.00			
750 x 600	24	218.00	350.00	291.00			
800 x 800	32 x 32	259.00	474.00	347.00			
800 x 750	30	256.00	466.00	341.00			
800 x 700	28	252.00	458.00	335.00			
800 x 650	26	250.00	455.00	333.00			
850 x 850	34 x 34	295.00	535.00	393.00			
850 x 800	32	292.00	526.00	389.00			
850 x 750	30	290.00	518.00	380.00			
850 x 700	28	288.00	511.00	377.00			
900 x 900	36 x 36	331.00	656.00	441.00			
900 x 850	34	329.00	645.00	434.00			
900 x 800	32	326.00	636.00	431.00			
900 x 750	30	323.00	627.00	422.00			
950 x 950	38 x 38	370.00		493.00			
950 x 900	36	367.00		489.00			
950 x 850	34	362.00		481.00			
950 x 800	32	357.00		476.00			
1000 x 1000	40 x 40	411.00		547.00			
1000 x 950	38	408.00		543.00			
1000 x 900	36	402.00		536.00			
1000 x 850	34	397.00		529.00			
1050 x 1050	42 x 42	422.00		562.00			
1050 x 1000	40	420.00		559.00			
1050 x 950	38	418.00		557.00			
1050 x 900	36	416.00		554.00			
1100 x 1100	44 x 44	475.00		633.00			
1100 x 1050	42	473.00		630.00			
1100 x 1000	40	467.00		623.00			
1100 x 950	38	462.00		616.00			
1150 x 1150	46 x 46	521.00		695.00			
1150 x 1100	44	519.00		691.00			
1150 x 1050	42	513.00		683.00			
1150 x 1000	40	507.00					

Buttweld Fittings

Approximate weight

Reducer

(Unit: kg)

Nominal Pipe Size DN	INCHES	STD	S40	XS	S80	XXS	S160
20 x 15	3/4 x 1/2	0.06	0.06	0.08	0.08		
25 x 20	1 x 3/4	0.12	0.12	0.15	0.15	0.25	0.19
25 x 15	1/2	0.11	0.11	0.14	0.14	0.22	0.17
32 x 25	1 1/4 x 1	0.16	0.16	0.21	0.21	0.35	0.25
32 x 20	3/4	0.15	0.15	0.19	0.19	0.31	0.23
32 x 15	1/2	0.14	0.14	0.18	0.18		
40 x 32	1 1/2 x 1 1/4	0.25	0.25	0.33	0.33	0.57	0.43
40 x 25	1	0.22	0.22	0.30	0.30	0.50	0.38
40 x 20	3/4	0.21	0.21	0.27	0.27	0.45	0.35
40 x 15	1/2	0.18	0.18	0.24	0.24	0.40	0.32
50 x 40	2 x 1 1/2	0.38	0.38	0.51	0.51	0.91	0.75
50 x 32	1 1/4	0.36	0.36	0.48	0.48	0.85	0.70
50 x 25	1	0.33	0.33	0.44	0.44	0.77	0.64
50 x 20	3/4	0.30	0.30	0.40	0.40	0.69	0.58
65 x 50	2 1/2 x 2	0.73	0.73	0.95	0.95	1.68	1.20
65 x 40	1 1/2	0.67	0.67	0.87	0.87	1.51	1.08
65 x 32	1 1/4	0.64	0.64	0.83	0.83	1.42	1.02
65 x 25	1	0.56	0.56	0.73	0.73	1.23	0.93
80 x 65	3 x 2 1/2	0.94	0.94	1.25	1.25	2.25	1.71
80 x 50	2	0.85	0.85	1.13	1.13	2.01	1.57
80 x 40	1 1/2	0.79	0.79	1.04	1.04	1.83	1.44
80 x 32	1 1/4	0.75	0.75	1.00	1.00	1.74	1.37
100 x 80	4 x 3	1.45	1.45	2.02	2.02	3.65	3.00
100 x 65	2 1/2	1.37	1.37	1.90	1.90	3.41	2.76
100 x 50	2	1.27	1.27	1.76	1.76	3.11	2.58
100 x 40	1 1/2	1.19	1.19	1.64	1.64	2.89	2.41
125 x 100	5 x 4	2.50	2.50	3.52	3.52	6.47	5.59
125 x 80	3	2.27	2.27	3.18	3.18	5.78	5.30
125 x 65	2 1/2	2.16	2.16	3.02	3.02	5.46	4.70
125 x 50	2	2.03	2.03	2.85	2.85	5.12	4.43
150 x 125	6 x 5	3.57	3.57	5.38	5.38	9.89	8.63
150 x 100	4	3.30	3.30	4.96	4.96	8.98	7.88
150 x 80	3	3.04	3.04	4.56	4.56	8.21	7.21
150 x 65	2 1/2	2.94	2.94	4.38	4.38	7.88	6.80
200 x 150	8 x 6	5.71	5.71	8.63	8.63	14.30	15.00
200 x 125	5	5.40	5.40	8.14	8.14	13.40	14.00
200 x 100	4	5.10	5.10	7.68	7.68	12.60	13.10
250 x 200	10 x 8	9.58	9.58	12.90	15.40	24.30	27.50
250 x 150	6	8.78	8.78	11.80	14.20	22.10	25.10
250 x 125	5	8.42	8.42	11.30	14.50	21.10	23.90
250 x 100	4	8.20	8.20	11.00	14.00	20.50	22.60
300 x 250	12 x 10	13.60	14.70	18.00	24.80	35.00	44.60
300 x 200	8	12.70	13.70	16.70	22.70	33.00	41.00
300 x 150	6	11.80	12.80	15.60	21.40	32.00	38.00
300 x 125	5	11.70	12.60	15.30	20.60	31.00	36.40
350 x 300	14 x 12	25.40	29.50	33.60	49.80		88.50
350 x 250	10	23.60	27.40	31.20	46.10		81.60
350 x 200	8	21.80	25.40	28.90	42.20		74.70
350 x 150	6	20.30	23.60	26.80	39.10		68.30
400 x 350	16 x 14	31.00	41.10	41.10	67.70		121.00
400 x 300	12	29.60	39.20	39.20	65.00		116.00
400 x 250	10	27.80	36.80	36.80	60.80		108.00
400 x 200	8	26.20	34.50	34.50	56.60		99.90
450 x 400	18 x 16	37.80	56.20	50.10	91.40		165.00
450 x 350	14	35.70	53.00	47.40	86.40		155.00
450 x 300	12	33.20	51.70	44.00	83.00		149.00
450 x 250	10	32.70	48.40	43.20	78.50		140.00
500 x 450	20 x 18	56.40	88.40	74.90	150.00		
500 x 400	16	53.50	83.90	71.10	142.00		
500 x 350	14	50.80	79.60	67.40	136.00		233.00
500 x 300	12	49.20	76.90	65.10	130.00		

Reducer

(Unit: kg)

Nominal Pipe Size DN	INCHES	STD	S40	XS	S80	XXS	S160
550 x 500	22 x 20	62.40	98.00	82.90	181.00		
550 x 450	18	59.40	93.20	78.90	172.00		
550 x 400	16	56.40	98.40	74.80	164.00		
550 x 350	14	54.30	83.60	72.10	156.00		
600 x 550	24 x 22	68.40	124.00	91.00	215.00		
600 x 500	20	65.70	119.00	87.30	206.00		
600 x 450	18	63.00	114.00	83.80	197.00		
600 x 400	16	60.50	109.00	80.30	185.00		
650 x 600	26 x 24	89.40	162.00	119.00			
650 x 550	22	85.80	155.00	114.00			
650 x 500	20	82.10	148.00	109.00			
650 x 450	18	79.50	142.00	106.00			
700 x 650	28 x 26	96.60	175.00	129.00			
700 x 600	24	93.00	168.00	124.00			
700 x 550	22	89.40	162.00	119.00			
700 x 500	20	88.80	155.00	115.00			
750 x 700	30 x 28	104.00	188.00	138.00			
750 x 650	26	100.00	182.00	133.00			
750 x 600	24	96.60	175.00	129.00			
750 x 550	22	94.20	168.00	125.00			
800 x 750	32 x 30	111.00	202.00	148.00			
800 x 700	28	108.00	195.00	143.00			
800 x 650	26	104.00	188.00	138.00			
800 x 600	24	102.00	184.00	135.00			
850 x 800	34 x 32	118.00	215.00	158.00			
850 x 750	30	115.00	208.00	153.00			
850 x 700	28	111.00	205.00	148.00			
850 x 650	26	109.00	200.00	145.00			
900 x 850	36 x 34	125.60	250.00	167.30			
900 x 800	32	122.00	243.00	162.40			
900 x 750	30	118.40	238.00	157.60			
900 x 700	28	114.70	234.00	152.80			
950 x 900	38 x 36	133.00		177.00			
950 x 850	34	129.00		172.00			
950 x 800	32	126.00		167.00			
900 x 750	30	124.00		165.00			
1000 x 950	40 x 38	140.00		187.00			
1000 x 900	36	137.00		182.00			
1000 x 850	34	133.00		177.00			
1000 x 800	32	131.00		174.00			
1050 x 1000	42 x 40	147.00		196.00			
1050 x 950	38	144.00		192.00			
1050 x 900	36	140.00		187.00			
1050 x 850	34	138.00		184.00			
1100 x 1050	44 x 42	155.00		206.00			
1100 x 1000	40	151.00		201.00			
1100 x 950	38	147.00		196.00			
1100 x 900	36	146.00		194.00			
1150 x 1100	46 x 44	189.00		252.00			
1150 x 1050	42	185.00		246.00			
1150 x 1000	40	180.00		241.00			
1150 x 950	38	178.00		237.00			
1200 x 1150	48 x 46	197.00		263.00			
1200 x 1100	44	193.00		257.00			
1200 x 1050	42	189.00		252.00			
1200 x 1000	40	186.00		248.00			

Stainless Steel Fittings

(Unit: kg)

Nominal Pipe Size		90° Elbow (LR)			45° Elbow			Tee			Reducer			Cap		
DN	INCHES	S10s	S40s / STD	S80s / XS	S10s	S40s / STD	S80s / XS	S10s	S40s / STD	S80s / XS	S10s	S40s / STD	S80s / XS	S10s	S40s / STD	S80s / XS
15	1/4	0.06	0.08	0.10	0.03	0.04	0.05	0.06	0.09	0.11				0.03	0.04	0.05
20	3/4	0.08	0.11	0.14	0.04	0.06	0.07	0.08	0.13	0.17	0.04	0.06	0.08	0.04	0.05	0.07
25	1	0.13	0.16	0.20	0.06	0.08	0.10	0.20	0.25	0.32	0.09	0.12	0.15	0.09	0.11	0.15
32	1 1/4	0.20	0.26	0.35	0.16	0.13	0.18	0.33	0.43	0.56	0.12	0.16	0.21	0.11	0.14	0.20
40	1 1/2	0.28	0.37	0.50	0.14	0.19	0.25	0.46	0.61	0.81	0.18	0.25	0.33	0.13	0.17	0.24
50	2	0.47	0.66	0.90	0.23	0.33	0.45	0.63	0.88	1.20	0.27	0.38	0.51	0.17	0.24	0.33
65	2 1/2	0.79	1.29	1.79	0.39	0.69	0.90	1.00	1.74	2.28	0.43	0.73	0.95	0.23	0.42	0.57
80	3	1.16	2.04	2.74	0.58	1.02	1.37	1.38	2.41	3.25	0.52	0.94	1.25	0.37	0.67	0.92
100	4	2.00	3.84	5.36	1.00	1.92	2.68	2.15	4.12	5.77	0.80	1.45	2.02	0.59	1.17	1.68
125	5	3.46	6.48	9.13	1.72	3.24	4.57	3.48	6.54	9.20	1.33	2.50	3.52	0.99	1.9	2.73
150	6	4.96	9.94	15.00	2.47	4.97	7.50	4.75	9.58	14.50	1.78	3.57	5.38	1.39	2.83	4.38
200	8	9.55	20.10	30.50	4.77	10.10	15.30	8.43	17.90	27.10	2.72	5.71	8.63	2.38	5.11	7.91
250	10	16.60	35.40	47.70	8.30	17.70	23.90	14.20	30.40	41.00	4.49	9.58	12.90	4.13	8.92	12.20
300	12	25.80	52.00	68.70	13.00	26.00	34.40	21.60	43.60	57.70	6.78	13.60	18.00	6.39	13.10	17.40
350	14	34.60	67.90	89.90	17.30	34.00	45.00	27.30	53.50	70.90	13.00	25.40	33.60	7.99	15.90	21.20
400	16	45.30	89.00	118.00	22.70	44.50	59.00	33.70	66.10	87.70	15.80	31.00	41.10	10.10	20.00	26.70
450	18	57.40	113.00	150.00	28.80	56.50	75.00	42.70	83.90	111.00	19.20	37.80	50.10	12.90	25.50	34.10
500	20	82.10	140.00	186.00	41.30	70.00	93.00	61.00	104.00	138.00	33.10	56.40	74.90	18.50	31.80	42.50
550	22	99.50	169.00	225.00	49.30	84.50	113.00	74.10	126.00	138.00	36.70	62.40	82.90	22.60	38.80	51.70
600	24	136.00	202.00	268.00	67.70	101.00	134.00	93.90	139.00	185.00	46.00	68.40	91.00	30.10	45.10	60.10

Lap Joint Stub-end

(Unit: kg)

Size		MSS SP-43 Type A / B				
DN	INCHES	S10s	S40s	Std	S80s	XS
15	1/2	0.08	0.12		0.13	
20	3/4	0.09	0.15		0.17	
25	1	0.15	0.20		0.25	
32	1 1/4	0.20	0.30		0.35	
40	1 1/2	0.25	0.38		0.46	
50	2	0.40	0.55		0.75	
65	2 1/2	0.50	0.80		1.00	
80	3	0.60	1.10		1.50	
100	4	1.00	1.80		2.50	
125	5	0.25	2.50		3.50	
150	6	1.95	3.70		5.50	
200	8	3.10	5.90		10.0	
250	10	4.90	10.5		14.0	
300	12	7.10	15.0		20.0	
350	14	7.80		15.5		20.5
400	16	9.00		18.8		24.0
450	18	10.50		21.0		28.0
500	20	13.50		23.5		31.0
550	22	18.90				
600	24	18.90		28.5		38.0



Forged High Pressure Fittings

Approximate weight

OZLINC
PIPELINE SUPPLIES

Socket Weld Fittings

(Unit: kg)

Nominal Pipe Size		90° Elbow		45° Elbow		Tee		Cross		F/Coupling		H/Coupling		Cap		Boss		Union	
DN	INCHES	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000
8	1/4	0.11	0.12	0.09	0.18	0.10	0.17	0.17	0.23	0.06	0.06	0.06	0.07	0.04	0.04	0.09	0.09	0.23	0.25
10	3/8	0.12	0.20	0.17	0.19	0.16	0.19	0.18	0.40	0.06	0.07	0.08	0.08	0.05	0.06	0.14	0.15	0.35	0.42
15	1/2	0.20	0.30	0.18	0.23	0.28	0.31	0.36	0.66	0.11	0.14	0.14	0.30	0.07	0.22	0.24	0.45	0.40	0.85
20	3/4	0.28	0.60	0.23	0.50	0.37	0.86	0.51	1.12	0.17	0.25	0.20	0.43	0.13	0.35	0.28	0.52	0.50	1.00
25	1	0.46	1.05	0.35	0.69	0.57	1.45	0.68	1.73	0.27	0.36	0.34	0.69	0.21	0.55	0.41	0.73	0.70	1.30
32	1 1/4	0.65	1.40	0.65	0.88	0.87	1.70	1.02	2.38	0.35	0.46	0.48	0.96	0.37	0.89	0.44	0.77	1.20	2.00
40	1 1/2	0.96	2.40	0.80	1.85	1.28	3.04	1.38	3.75	0.43	0.58	0.51	1.20	0.60	1.15	0.63	1.12	1.50	3.80
50	2	1.50	3.65	1.20	2.93	1.80	4.44	2.32	7.86	0.72	1.20	1.00	2.05	0.99	2.05	1.09	1.82	2.58	6.40
65	2 1/2	2.25		3.06		2.85		7.48		1.13	1.60	1.55	3.25	1.50	3.75			5.14	6.87
80	3	4.00		4.76		5.50		10.43		1.50	2.18	2.13	4.33	2.30	5.10			7.12	10.85
100	4	9.40		8.25		12.24		18.14		2.50	3.95	3.65	6.45	4.00	8.20			12.40	

O-LETS

(Unit: kg)

Nominal Pipe Size		Weld-outlet				Socket-outlet		Thread-outlet	
DN	INCHES	S.T.D	XS	Sch160	XXS	3000	6000	3000	6000
15	1/2	0.08	0.09	0.11	0.11	0.14	0.23	0.11	0.20
20	3/4	0.11	0.14	0.32	0.32	0.15	0.36	0.16	0.34
25	1	0.23	0.21	0.38	0.38	0.27	0.59	0.28	0.56
32	1 1/4	0.36	0.41	0.57	0.57	0.39	0.73	0.41	0.71
40	1 1/2	0.45	0.50	0.80	0.80	0.47	0.91	0.45	0.89
50	2	0.80	0.80	1.00	1.00	0.73	2.33	0.80	2.30
65	2 1/2	1.14	1.20	1.54	1.54	1.25		1.36	
80	3	1.82	1.90	2.90	2.90	1.73		1.98	
100	4	2.86	2.90	4.80	4.80	3.30		3.22	
125	5	4.66	4.70	6.50	6.50				
150	6	6.45	10.50	12.70	12.70				
200	8	10.68	16.80	20.50	20.50				
250	10	17.73	20.90	38.60	38.60				



Threaded Fittings

(Unit: kg)

Nominal Pipe Size		90° Elbow		45° Elbow		Tee		Cross		F/Coupling		H/Coupling		Cap		Boss		Union	
DN	INCHES	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000	3000	6000
8	1/4	0.17	0.33	0.11	0.27	0.13	0.41	0.17	0.45	0.05	0.12	0.02	0.06	0.05	0.09	0.09	0.13	0.14	0.45
10	3/8	0.29	0.45	0.23	0.39	0.37	0.63	0.45	0.70	0.06	0.18	0.03	0.09	0.08	0.14	0.11	0.24	0.20	0.60
15	1/2	0.59	0.80	0.34	0.63	0.54	0.98	0.68	1.16	0.14	0.28	0.07	0.14	0.12	0.25	0.24	0.44	0.35	0.85
20	3/4	0.63	1.31	0.54	1.07	0.85	1.65	1.13	1.80	0.21	0.45	0.10	0.23	0.20	0.36	0.29	0.55	0.43	1.40
25	1	1.02	1.61	0.85	1.27	1.13	2.17	1.61	2.50	0.41	0.80	0.21	0.37	0.31	0.70	0.42	0.74	0.65	1.75
32	1 1/4	1.25	2.93	0.97	2.24	1.42	3.74	1.87	4.10	0.72	1.40	0.36	0.70	0.60	0.80	0.61	0.75	0.98	3.00
40	1 1/2	1.59	3.79	1.36	2.54	2.27	4.71	2.95	5.20	1.06	1.95	0.52	0.90	0.73	1.28	0.65	1.17	1.26	4.00
50	2	2.47	7.31	1.93	4.82	3.06	8.87	3.69	12.30	1.40	2.80	0.69	1.22	1.05	2.16	1.13	1.90	2.01	5.50
65	2 1/2	4.85	11.18	6.52	8.16	5.96	13.11	7.60	14.00	2.55	3.80	1.25	1.85	2.27	2.72			5.14	6.87
80	3	6.55	17.73	4.76	14.16	9.24	21.70	8.96	25.00	3.83	6.00	1.84	2.95	3.83	4.95			7.12	10.85
100	4	13.80	15.76	8.68		17.90	18.00	14.80	23.00	6.35	10.70	3.51	5.40	6.35	9.21			12.40	

Threaded Fittings

(Unit: kg)

Nominal Pipe Size		Nipple	S/H Plug	H/H Plug	R/H Plug	H/H Plug	Flush Bushing
DN	INCHES	0.04	0.01	0.03	0.05	0.03	0.03
8	1/4	0.04	0.01	0.03	0.05	0.03	0.03
10	3/8	0.05	0.03	0.06	0.08	0.03	0.03
15	1/2	0.09	0.06	0.09	0.17	0.03	0.03
20	3/4	0.15	0.09	0.14	0.17	0.09	0.06
25	1	0.27	0.14	0.23	0.34	0.09	0.06
32	1 1/4	0.45	0.25	0.51	0.34	0.17	0.06
40	1 1/2	0.62	0.40	0.63	0.71	0.31	0.09
50	2	1.03	0.68	1.02	1.36	0.74	0.17
65	2 1/2	1.51	1.02	1.76	2.15	1.08	0.29
80	3	2.22	1.31	2.67	3.45	1.59	0.45
100	4		3.26	5.90	5.83	3.77	0.91



Material Specifications

MATERIALS		PIPING COMPONENTS				RAW MATERIAL FOR WELDING FITTINGS		
		Pipe	Tubing	Welding Fittings	Flanges	Pipe	Plate	Forgings
Carbon Steel	Grade A	A53-A A106-A A135-A A139-A A155-C50, C55 API-5L-A	A192 A161 A178-A - - A226	A234-WPA	A105	A106-A	A285-C	A105
	Grade B	A53-B A106-B A135-B A139-B A155-KC65. KC70 API-5L-B	A178-C A210-A A178-C - - -	A234-WPB	A105	A106-B	A515-70	A105
	Grade C	A106-C	A210-C	A234-WPC	A105	A106-C	-	-
	Low Temperature	A333-6	A334-6	A420-WPL6	A350-LF2	A333-6	A516-65	A350-LF2
	High Yield	A381-35	-	Grade WPHY35	A105	A106-B	A515-65	A105
		API-5LX-X42, X46, X52	-	Grade WPHY42 Grade WPHY52	A694-F42 A694-F52	A381-42 A381-52	A242 A441	A694-F42 A694-F52
Carbon Moly Steel	½ Mo	A155-CM70	A209-T1 ^a A250-T1 ^a	A234-WP1	A182-F1	A335-P1	A204-B	A182-F1
		A335-P1 A369-FP1	A161-T1					
Chrome Moly Steel	½ Cr-½ Mo	A155 - ½ CR A335-P2 A369-FP2	A213-T2	Grade WP2	A182-F2	A335-P2	A387-A	A182-F2
	1Cr-½ Mo	A155-1CR A335-P12 A369-FP12	A213-T12	A234-WP12	A182-F12	A335-P12	A387-B	A182-F12
	1¼ Cr-½ Mo	A155 - 1¼ CR A335-P11 A369-FP11	A213-T11	A234-WP11	A182-F11	A335-P11	A387-C	A182-F11
	2¼ Cr-1Mo	A155-2¼CR A335-P22 A369-FP22	A213-T22	A234-WP22	A182-F22	A335-P22	A387-D	A182-F22
	5Cr-½ Mo	A155-5CR A335-P5 A369-FP5	A213-T5	A234-WP5	A182-F5	A335-P5	A357	A182-F5
	7Cr-½ Mo	A335-P7 A369-FP7	A213-T7	Grade WP7	A182-F7	A335-P7	-	A182-F7
	9Cr-1Mo	A335-P9 A369-FP9	A213-T9	Grade WP9	A182-F9	A335-P9	-	A182-F9
Low Temp. Ferritic Steel	3 ½ Ni	A333-3	A334-3	A420-WPL3	A350-LF3	A333-3	A203-D	A350-LF3
	Low Alloy Steel	A333-9	A334-9	A420-WPL9	A350-LF9	A333-9	-	A350-LF9
Austenitic Stainless Steel	18Cr-8Ni	A312-TP304L A358-TP304L	A213-TP304L A249-TP304L A409-TP304L	A774-TP304L A403-WP304L	A182-F304L	A312-TP304L	A240-TP304L A666-TP304L	A182-F304L
	18Cr-8Ni-Mo	A312-TP316L A358-TP316L	A213-TP316L A249-TP316L A409-TP316L	A774-TP316L A403-WP316L	A182-F316L	A312-TP316L	A240-T316L A666-TP316L	A182-F316L
	18Cr-8Ni Ni-Ti	A312-TP321 A358-TP321	A213-TP321 A249-TP321 A409-TP321	A774-TP321 A403-WP321	A182-F321	A312-TP321	A240-TP321	A182-F321
Duplex Stainless Steel	22Cr, 5Ni, 2.50Mo	A790/A928 UNS31803	A789 UNS31803	A815 UNS31803	A182F51	A790 UNS31803	A240 UNS31803	A182-F51
Super Duplex Stainless Steel	25Cr-7Ni-4Mo-N 25Cr-7Ni-3.5Mo-N-W	A790/A928 UNS32750 UNS32760	A789 UNS32750 UNS32760	A815 UNS32750 A182-F53 A182-F55	A182-F53 A182-F55	A790 UNS32750 UNS32760	A240 UNS32750 UNS32760	A182-F53 A182-F55
Nickel Alloy	*Incoloy 825	B423/B705 UNSNO8825	B423 B704 UNSN08825	B366 WPNiCMC	B564 UNSNO8825	B423/705 UNSNO8825	B424 UNSNO8825	B564 UNSNO8825
	*Inconel 625	B444/705 UNSNO6625	B704 UNSN06625	B366 WPNCMC	B564 UNSNO6625	B444 UNSNO6625	B443 UNSNO6625	B564 UNSNO6625
	*Monel 400	B165/725 UNSNO4400	B165/730 UNSNO4400	B366 WPNC	B564 UNSNO4400	B165/725 USNO4400	B127 UNSNO4400	B564 UNSNO4400
Titanium	Ti2	B337 Grade 2	B338 Grade 2	B363-WPT2	B381-F2	B337 Grade 2	B265 Grade 2	B381-F2
	Ti7(Pd)	B337 Grade 7	B338 Grade 7	B363-WPT7	B381-F7	B337 Grade 7	B265 Grade 7	B381-F7
	Ti12 (Mo+Ni)	B337 Grade 12	B338 Grade 12	B363-WPT12	B381-F12	B337 Grade 7	B265 Grade 12	B381-F12

* Inco Trade Mark

Metallurgical Terms

Alloy	Any metallic material containing two or more chemical elements.	Impact Test	A test for evaluating the resistance of a material to shock stresses.
Alloy Steel	A steel containing, in addition to carbon and normal impurities, some alloying element or elements intentionally added or permitted to remain for the purpose of modifying or enhancing its chemical, physical or mechanical properties.	Indication	In non-destructive inspection a response or evidence of a response that requires interpretation to determine its significance.
Alloying Element	Any element intentionally added to or allowed to remain in a metal, for the purpose of modifying chemical, physical or mechanical properties.	Magnetic Particle Inspection	A method of examination in which an object is magnetized and a magnetic powder is applied to the surface. Faults which cause discontinuities are revealed by the concentration of powder
Annealing	A process involving heating and cooling, applied usually to induce softening.	Mechanical Properties	Properties relating to the behaviour of materials under load in conventional mechanical tests, such as elastic moduli, tensile strength, elongation, hardness.
Billet	A semi-finished rolled or forged steel product, usually square or round in section, intended for re-rolling or forging.	Normalizing	Heating steel to, and if necessary holding at, a suitable temperature above the transformation range, followed by cooling in a still atmosphere at ambient temperature, in order to produce a medium-to-fine pearlitic microstructure.
Cladding	A process for covering one metal with another. Processes include hot rolling, explosive bonding, welding, casting, chemical deposition and heavy electro plating.	Phase	A homogeneous, physically distinct part of a system and which is confined to a definite region of space being separated from the other parts of the system by bounding interfaces.
Creep	The time-dependant part of plastic deformation in a material under stress.	Pickling	Removal of oxide films from metal by immersion in an acid.
Drop Forging	A forging produced by hot working metal with a drop hammer.	Plastic Deformation	Deformation that does or will remain permanent after removal of the load that caused it.
Ductility	That property of a material that permits plastic deformation before fracture.	Proof Stress	That stress at which a material exhibits a specified limiting permanent set. Synonymous with yield strength.
Duplex Structure	A microstructure containing two phases. Example of this is Austenite and Ferrite in Duplex Stainless Steels.	Reduction of Area	The fraction by which the original cross-sectional area of a tensile test specimen is reduced at the place of fracture.
Dye Penetrant Testing	Penetrant with dye added to make it more readily visible under ordinary or ultra violet light. Commonly used for detecting surface cracks.	Recrystallization	The replacement of the crystal grains of a metal or alloy by a new generation of grains.
Eddy Current	Non-destructive testing method in which eddy current flow is induced in the test component. Changes in the flow caused by structural variation in the component are detected by a nearby coil or coils and subsequently analysed by suitable instrumentation and other techniques.	Salt Bath	The term used in reference to the bath of molten salt that is used for the heating, hardening or tempering of various alloys.
Elongation	In tensile testing, the increase in the gauge length, measured after fracture of the test specimen within the gauge length, usually expressed as a percentage of the original gauge length.	Solution Heat Treatment	A treatment in which an alloy is heated to a suitable temperature and held at this temperature for a sufficient length of time to allow an element or elements to enter into solid solution.
Extrusion	The forcing of compressed material through an orifice or into a cavity.	Spheroidizing	A heat treatment process having as its object the production of a microstructure in which the dispersed phase occurs in a roughly spheroidal or globular form.
Fatigue	A condition in metals resulting from fluctuating stresses, leading to failure at a stress substantially below the normal tensile strength of the material.	Stainless Steel	Traditionally a stainless steel is considered to be an iron-based alloy containing more than 12% chromium.
Flare Test	A test applied to tubing, involving a tapered expansion over a cone.	Stress	The intensity of force acting on any plane within a body.
Flattening Test	A quality test for tubing in which a specimen is flattened between parallel plates that are closed to a specified gap.	Stress Relieving	Heating a metal to, and if necessary holding at, some temperature generally below the recrystallization range, followed by uniform cooling for the sole purpose of removing internal stresses.
Forging	The shaping of metal using a hammer or a press.	Tensile Strength	The maximum nominal stress reached during a tensile test on a material, ie the maximum load divided by the original crosssectional area.
Hardness	The resistance offered by a metallic material to plastic deformation by indentation or penetration.	Ultrasonic Test	A test to determine the presence of internal flaws involving the transmission of high frequency sound waves that are reflected by the defects.
Heat Treatment	An operation or combination of operations involving the heating or cooling of a metal or alloy in the solid state for the purpose of obtaining certain desired conditions or properties.	Work Hardening	An increase in the hardness and / or mechanical strength of a metal resulting from plastic deformation.
Heat Affected Zone	That portion of the base metal that is not melted during brazing, cutting or welding but whose microstructure and properties are altered by the heat generated by the process.	Yield Point	In mechanical testing of certain metals, notably annealed or normalized low-carbon steels, this is the point on the load-deformation curve at which macroscopic plastic deformation commences under a constant or reduced load.
High Frequency Furnace	A furnace in which currents at a frequency above 500 Hertz are used to induce eddy currents in a charge which in turn generate heat in a conducting material.	Young's Modulus	The ratio of axial stress to axial strain in the elastic region of a tensile test.

Chemical Elements, Physical Properties & Galvanic Series

OZLINC
PIPELINE SUPPLIES

CHEMICAL ELEMENTS								PHYSICAL PROPERTIES OF CERTAIN CHEMICAL ELEMENTS							
Chemical Element	Symbol	Atomic Number	Atomic Weight	Chemical Element	Symbol	Atomic Number	Atomic Weight	Chemical Element	Symbol	Chemical Element	Symbol	Melting Point °C	Boiling Point °C		
Actinium	Ac	89	227	Mercury	Hg	80	200,59	Aluminium	Al	2,70	23,7	219	660		
Aluminium	Al	13	26,98	Molybdenum	Mo	42	95,94	Antimony	Sb	6,68	9,4	19	631		
Americium	Am	95	243	Neodymium	Nd	60	144,24	Arsenic	As	5,78	4,7	-	817(28 atm) 613 (subl.)		
Antimony	Sb	51	121,75	Neon	Ne	10	20,18	Beryllium	Be	1,85	11,6	147	2970		
Argon	Ar	18	39,95	Neptunium	Np	93	237	Bismuth	Bi	9,78	13,4	8	1283 1560		
Arsenic	As	33	74,92	Nickel	Ni	28	58,71	Boron	B	3,33	8	-	2300 2250 (subl.)		
Astatine	At	85	210	Niobium	Nb	41	92,91	Calcium	Ca	1,54	19	126	845 1487		
Barium	Ba	56	137,34	Nitrogen	N	7	14,01	Carbon (diamond)	C	3,51	1,3	1,56	>3550		
Berkelium	Bk	97	247	Nobelium	No	102	254	Carbon (graphite)	C	3,26	2,0	0,49	>3550		
Beryllium	Be	4	9,01	Osmium	Os	76	190,2	Chromium	Cr	7,23	6,8	68	1890 4827		
Bismuth	Bi	83	208,98	Oxygen	O	8	16,00	Cobalt	Co	8,89	12,6	69	1492 2900		
Boron	B	5	10,81	Palladium	Pd	46	106,4	Copper	Cu	8,94	16,2	394	1083		
Bromine	Br	35	79,90	Phosphorus	P	15	30,97	Gold	Au	19,31	14,4	307	1063		
Cadmium	Cd	48	112,40	Platinum	Pt	78	195,09	Iron	Fe	7,87	12,3	79	1535		
Calcium	Ca	20	40,08	Plutonium	Pu	94	244	Lead	Pb	11,34	28,9	35	327		
Californium	Cf	98	251	Polonium	Po	84	209	Lithium	Li	0,53	60	71	1744 1371		
Carbon	C	6	12,01	Potassium	K	19	39,10	Magnesium	Mg	1,74	26,1	149	651		
Cerium	Ce	58	140,12	Praseodymium	Pr	59	140,91	Manganese	Mn	7,50	23	-	1244		
Cesium	Cs	55	132,91	Promethium	Pm	61	145	Mercury	Hg	13,55	182 ¹⁾	8	-39		
Chlorine	Cl	17	35,45	Protactinium	Pa	91	231	Molybdenum	Mo	10,2	5,2	144	357		
Chromium	Cr	24	52,00	Radium	Ra	88	226	Nickel	Ni	8,90	13,1	92	2610 5560		
Cobalt	Co	27	58,93	Radon	Rn	86	222	Niobium	Nb	8,56	8	55	1453 2732		
Copper	Cu	29	63,55	Rhenium	Re	75	186,2	Palladium	Pd	11,9	11,7	70	2468 4927		
Curium	Cm	96	247	Rhodium	Rh	45	102,91	Phosphorus (yell.)	P	1,83	125	-	1552 2927		
Dysprosium	Dy	66	162,50	Rubidium	Rb	37	85,47	Platinum	Pt	21,4	9,0	71	44 3830		
Einsteinium	Es	99	254	Ruthenium	Ru	44	101,07	Potassium	K	0,86	84	100	774		
Erbium	Er	68	167,26	Samarium	Sm	62	150,35	Selenium	Se	4,8	38	-	217		
Europium	Eu	63	151,96	Scandium	Sc	21	44,96	Silicon	Si	2,33	2,5	84	685		
Fermium	Fm	100	257	Selenium	Se	34	78,96	Silver	Ag	10,49	19,0	418	1410 2355		
Fluorine	F	9	19,00	Silicon	Si	14	28,09	Sodium	Na	0,96	70	134	961		
Francium	Fr	87	223	Silver	Ag	47	107,87	Sulphur	S	2,07	64	-	2212 445		
Gadolinium	Gd	64	157,25	Sodium	Na	11	22,99	Tantalum	Ta	16,7	6,5	55	2996		
Gallium	Ga	31	69,72	Strontium	Sr	38	87,62	Tin	Sn	7,31	23	62	5400		
Germanium	Ge	32	72,59	Sulphur	S	16	32,06	Titanium	Ti	4,50	8,9	19	2270 3260		
Gold	Au	79	196,97	Tantalum	Ta	73	180,95	Tungsten	W	19,3	4,3	168	1675 3380		
Hafnium	Hf	72	178,49	Technetium	Tc	43	97	Vanadium	V	6,11	8,3	31	5927 3380		
Helium	He	2	4,00	Tellurium	Te	52	127,60	Zinc	Zn	7,13	30	111	419		
Holmium	Ho	67	164,93	Terbium	Tb	65	158,92	Zirconium	Zr	6,50	6	21	907 1852		
Hydrogen	H	1	1,01	Thallium	Tl	81	204,37						3578		
Indium	In	49	114,82	Thorium	Th	90	232,04								
Iodine	I	53	126,90	Thulium	Tm	69	168,93								
Iridium	Ir	77	192,2	Tin	Sn	50	118,69								
Iron	Fe	26	55,85	Titanium	Ti	22	47,90								
Krypton	Kr	36	83,80	Tungsten	W	74	183,85								
Lanthanum	La	57	138,91	Uranium	U	92	238,03								
Lawrencium	Lr	103	257	Vanadium	V	23	50,94								
Lead	Pb	82	207,19	Xenon	Xe	54	131,30								
Lithium	Li	3	6,94	Ytterbium	Yb	70	173,04								
Lutecium	Lu	71	174,97	Yttrium	Y	39	88,91								
Magnesium	Mg	12	24,31	Zinc	Zn	30	65,37								
Manganese	Mn	25	54,94	Zirconium	Zr	40	91,22								
Mendelevium	Md	101	256												

1) Coefficient of cubical expansion

CORROSION SUSCEPTIBILITY OF METALS (GALVANIC SERIES)

Most susceptible to corrosive attack
(less noble)

- Magnesium and its alloys
- Zinc and its alloys
- Aluminium and its alloys
- Cadmium
- Mild steel
- Cast iron
- Stainless steel, 1% Cr, type 410 (active)
- Lead-tin solder, 50/50
- Stainless steel, 18/18 type 304 (active)
- Stainless steel, 18/18/3% Mo, type 316 (active)
- Lead
- Tin
- BRASSES**
- Gunmetals
- Aluminium bronzes
- Copper
- Copper-nickel alloys
- Monel
- Titanium and its alloys
- Stainless steel, 18/8, type 304 (passive)
- Stainless steel, 18/8/3% Mo, type 316 (passive)
- Silver
- Gold
- Platinum

Least susceptible to corrosive attack
(more noble)

Conversion Chart

Temperature

OZLINC
PIPELINE SUPPLIES

- (A) To use, locate "given temperature" in "given temperature" column (coloured YELLOW) whether °C or °F
- (B) If "given temperature" is in **degrees Celsius (°C)**, read **degrees Fahrenheit (°F)** in right hand column.
- (B) If "given temperature" is in **degrees Fahrenheit (°F)**, read **degrees Celsius (°C)** in left hand column.
- (D) **Example**
 - (i) Given temperature is **35°C = 95°F** from right hand column
 - (ii) Given temperature is **35°F = 1.7°C** from left hand column

-320 to 27			28 to 77			78 to 235			240 to 485			490 to 2400		
°C	Given Temp	°F	°C	Given Temp	°F	°C	Given Temp	°F	°C	Given Temp	°F	°C	Given Temp	°F
-196	-320	-	-2.2	28	82.4	25.6	78	172.4	116	240	464	254	490	914
-184	-300	-	-1.7	29	84.2	26.1	79	174.2	118	245	473	257	495	923
-173	-280	-	-1.1	30	86.0	26.7	80	176.0	121	250	482	260	500	932
-162	-260	-436	-0.6	31	87.8	27.2	81	177.8	124	255	491	266	510	950
-151	-240	-400	0.0	32	89.6	27.8	82	179.6	127	260	500	271	520	968
-140	-220	-364	0.6	33	91.4	28.3	83	181.4	129	265	509	277	530	986
-129	-200	-328	1.1	34	93.2	28.9	84	183.20	132	270	518	282	540	1004
-115	-175	-283	1.7	35	95.0	29.4	85	185.0	135	275	527	288	550	1022
-101	-150	-238	2.2	36	96.8	30.0	86	186.8	138	280	536	293	560	1040
-90	-130	-202	2.8	37	98.6	30.6	87	188.6	141	285	545	299	570	1058
-84	-120	-184	3.3	38	100.4	31.1	88	190.4	143	290	554	304	580	1076
-79	-110	-166	3.9	39	102.2	31.7	89	192.2	146	295	563	310	590	1094
-73	-100	-148	4.4	40	104.0	32.2	90	194.0	149	300	572	316	600	1112
-68	-90	-130	5.0	41	105.8	32.8	91	195.8	152	305	581	321	610	1130
-62	-80	-112	5.6	42	107.6	33.3	92	197.6	154	310	590	327	620	1148
-57	-70	-94	6.1	43	109.4	33.9	93	199.4	157	315	599	332	630	1166
-51	-60	-76	6.7	44	111.2	34.4	94	201.2	160	320	608	338	640	1184
-46	-50	-58	7.2	45	113.0	35.0	95	203.0	163	325	617	343	650	1202
-40	-40	-40	7.8	46	114.8	35.6	96	204.8	166	330	626	349	660	1220
-34	-30	-22	8.3	47	116.6	36.1	97	206.6	168	335	635	354	670	1238
-29	-20	-4	8.9	48	118.4	36.7	98	208.4	171	340	644	360	680	1256
-23	-10	14	9.4	49	120.2	37.2	99	210.2	174	345	653	366	690	1274
-17.8	0	32	10.0	50	122.0	37.8	100	212.0	177	350	662	371	700	1292
-17.2	1	33.8	10.6	51	123.8	41	105	221	179	355	671	377	710	1310
-16.7	2	35.6	11.1	52	125.6	43	110	230	182	360	680	382	720	1328
-16.1	3	37.4	11.7	53	127.4	46	115	239	185	365	689	388	730	1346
-15.6	4	39.2	12.2	54	129.2	49	120	248	188	370	698	393	740	1364
-15.0	5	41.0	12.8	55	131.0	52	125	257	191	375	707	399	750	1382
-14.4	6	42.8	13.3	56	132.8	54	130	266	193	380	716	404	760	1400
-13.9	7	44.6	13.9	57	134.6	57	135	275	196	385	725	410	770	1418
-13.3	8	46.4	14.4	58	136.4	60	140	284	199	390	734	416	780	1436
-12.8	9	48.2	15.0	59	138.2	63	145	293	202	395	743	421	790	1454
-12.2	10	50.0	15.6	60	140.0	66	150	302	204	400	752	427	800	1472
-11.7	11	51.8	16.1	61	141.8	68	155	311	207	405	761	432	810	1490
-11.1	12	53.6	16.7	62	143.6	71	160	320	210	410	770	438	820	1508
-10.6	13	55.4	17.2	63	145.4	74	165	329	213	415	779	443	830	1526
-10.0	14	57.2	17.8	64	147.2	77	170	338	216	420	788	454	850	1562
-9.4	15	59.0	18.3	65	149.0	79	175	347	218	425	797	468	875	1607
-8.9	16	60.8	18.9	66	150.8	82	180	356	221	430	806	482	900	1652
-8.3	17	62.6	19.4	67	152.6	85	185	365	224	435	815	510	950	1742
-7.8	18	64.4	20.0	68	154.4	88	190	374	227	440	824	538	1000	1832
-7.2	19	66.2	20.6	69	156.2	91	195	383	229	445	833	566	1050	1922
-6.7	20	68.0	21.1	70	158.0	93	200	392	232	450	842	593	1100	2012
-6.1	21	69.8	21.7	71	159.8	96	205	401	235	455	851	621	1150	2102
-5.6	22	71.6	22.2	72	161.6	99	210	410	238	460	860	649	1200	2192
-5.0	23	73.4	22.8	73	163.4	102	215	419	241	465	869	704	1300	2372
-4.4	24	75.2	23.3	74	165.2	104	220	428	243	470	878	760	1400	2552
-3.9	25	77.0	23.9	75	167.0	107	225	437	246	475	887	816	1500	2732
-3.3	26	78.8	24.4	76	168.8	110	230	446	249	480	896	1093	2000	3632
-2.8	27	80.6	25.0	77	170.6	113	235	455	252	485	905	1316	2400	4352

DEGREES: FAHRENHEIT TO CELCIUS

$$(\text{ }^{\circ}\text{F} - 32) \times \frac{5}{9} = \text{ }^{\circ}\text{C}$$

DEGREES: CELCIUS TO FAHRENHEIT

$$(\text{ }^{\circ}\text{C} \times \frac{9}{5}) + 32 = \text{ }^{\circ}\text{F}$$

Conversion Factors

"SI" – Denotes the INTERNATIONAL SYSTEM of Metric Units adopted in Australia

MULTIPLY COLUMN "A" BY COLUMN "B" TO OBTAIN COLUMN "C"							
THIS TABLE MAY BE USED IN TWO WAYS:				ALTERNATIVELY DIVIDE COLUMN "C" BY COLUMN "B" TO OBTAIN COLUMN "A"			
REMARKS	A MULTIPLY	B BY	C TO OBTAIN	REMARKS	A MULTIPLY	B BY	C TO OBTAIN
AREA: Symbol m ² The SI unit of AREA is the SQUARE METRE	Square inches Square feet Square yards acre hectare (ha)	645.16 .0929 0.836 4047 10000	mm ² m ² m ² m ² m ²	REMARKS POWER: Symbol W The SI unit of POWER is the WATT.	Btu per hour (Btu/hr) horsepower (hp) ton of refrigeration	0.2931 0.7457 3.517	W kW kW
DENSITY: Symbol kg/m ³ The SI unit of DENSITY is the kilogram per cubic metre.	lb/in ³ lb/ft ³ lb/yd ³	27.68 16.02 0.5933	t/m ³ kg/m ³ kg/m ³	PRESSURE: Symbol Pa The SI unit of PRESSURE or stress is the NEWTON PER SQUARE METRE which has been given the name PASCAL. 1 N/m ² = 1 Pa = 0.000145 lbf/in ²	lbf/in ² kip/in ² (1000 psi) lbf/ft ² kgf/cm ² bar	6.895 6.895 47.88 98.07 100	kPa MPa Pa kPa kPa
ENERGY: Symbol J The SI unit of energy is the joule. 1 J = 1 N.m A joule is the energy expended or the work done when a force of one newton moves the point of application a distance of one metre in the direction of that force.	1. ELECTRICAL ENERGY kilowatt hour (kW.h)	3.6	MJ	A pascal is the pressure or stress which arises when a force of one newton is applied uniformly over an area of one square metre.	Vertical column (head) of water. (H2Oat20°C) metres of water feet of water	9.79 2.984	kPa kPa
	2. HEAT ENERGY British thermal unit (Btu) Btu/gal Btu/ft ³	1.055 0.2321 37.26	kJ kJ/L tt kJ/m ³		orr (vacuum) 1 mm Hg. (mercury) 1 in. Hg. (mercury) atmosphere (atm) microns	0.1333 0.1333 3.386 101.325 0.133	kPa kPa kPa kPa Pa
	3. MECHANICAL ENERGY foot poundal ft.pdl inch pound-force in.lbf foot pound-force ft.lbf foot ton force ft.tonf metre kilogram force m.kgf	.04214 0.1130 1.356 3.037 9.807	J	TORQUE: Symbol N.m (Moment of force) The SI unit of TORQUE is the NEWTON METRE. The NEWTON METRE is the work done when a force of one newton moves the point of application a distance of one metre in the direction of that force.	Pound-foot pdl.ft pound-force inch lbf.inch lbf.inch pound-force feet lbf.ft lbf.ft ton-force feet tonft.ft kilogram-force kgf.m kgf.cm	.04214 0.1130 1.152 1.356 13.83 3.037	N.m N.m kgf.cm N.m kgf.cm N.m
	Poundal (pdl) Pound-force (lbf) ton-force (tonf) *kilogram-force (kgf)	0.1383 4.448 9.964 9.807	N	1 N.m = 1 J	tonft.ft kilogram-force kgf.m kgf.cm	9.807 0.09807	N.m N.m
	*also known as kilopond (kp)				VELOCITY: Symbol m/s The SI unit of VELOCITY is the METRE PER SECOND	ft. per second (ft/s) ft. per minute (ft/m in) miles per hour miles per hour	m/s m/s km/h
	FORCE PER UNIT LENGTH the SI unit is NEWTON PER METRE: Symbol N/m	pounds-force per inch (lbf/in) pounds-force per foot (lbf/ft) ton-force per foot (ton/ft)	175.1 14.59 32.69	N/m N/m kN/m	VOLUME: CAPACITY: Symbol m ³ The SI unit of VOLUME is the CUBIC METRE.	dry: cubic inch (in ³) cubic foot (ft ³) cubic yard (yd ³)	mm ³ m ³ m ³
LENGTH: Symbol m The SI unit of LENGTH is the METRE.	inches feet yards chain mile mile	25.4 0.3048 0.9144 20.12 1609 1.609	millimetres (mm) metres (m) metres (m) metres (m) metres (m) kilometres (km)	NOTE: tt Capital "L" is now the legal preferred symbol for litre in Australia.	litre (L) tt litre (L) tt gallons (Imp) IMPERIAL LIQUID fluid ounce pint (20fl.oz) quart (2 pints) gallon (Imp) gallon (US) litre (water 4°C) Imp. gallons (water 20°C)	1000000 0.001 0.004546 28.41 568.3 1.137 4.546 3.785 1.000 4.536	mm ³ m ³ m ³
MASS: Symbol kg The SI unit of MASS is the KILOGRAM.	ounce pound slug ton (2240 lb) short ton (2000 lb) ton (2240 lb) pounds per foot (lb/ft) pounds per yard (lb/yd)	28.35 0.4536 14.59 1016.05 907.2 1.016 1.488 0.4961	grams (g) kilograms (kg) kg kg tonne (t) kg/m kg/m	VOLUME: RATE OF FLOW: Symbol m ³ /s The SI unit of VOLUME RATE OF FLOW is the CUBIC METRE PER SECOND.	Imp. gal. per minute (gal/min) Imp. gal. per minute Imp. gal. per minute cubic ft. per minute cubic ft. per minute miles per gallon gallons per mile	.0000758 0.272765 .0758 .000472 0.472 0.3540 2.825	m ³ /s m ³ /hr. litre per second (L/s)
				SUNDRY ITEMS:			m ³ /s litre per second (L/s) 1 m ³ = 1 kL km per litre litres per km

TEMPERATURE

The SI unit of TEMPERATURE is the KELVIN – Symbol K

For most practical purposes of temperature measurement and most calculations involving temperatures, degree Celcius, symbol ° C will be used

DEGREES: FAHRENHEIT TO CELCIUS

$$(\text{°F} - 32) \times 5/9 = \text{°C}$$

DEGREES: CELCIUS TO FAHRENHEIT

$$(\text{°C} \times 9/5) + 32 = \text{°F}$$

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