Flanges are used as a method of joining pipes and tubes where access/disassembly may be required.

There are a number of Flange specifications commonly used in the UK as shown attached.

CONTACT

Web: www.dalsteel.com.au

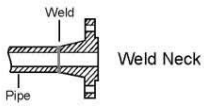
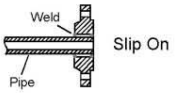
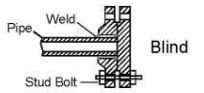
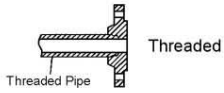
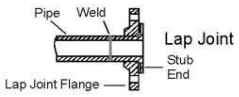
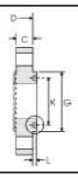
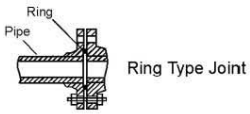
REVISION HISTORY

Datasheet Updated 18 July 2019

DISCLAIMER

Flanges

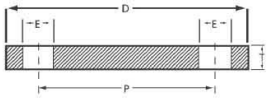
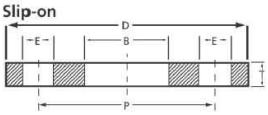
Introduction

Type	Jointing Method	General Description
Weld Neck 		Used in critical applications. These are circumferentially welded onto the system at their necks which means that the integrity of the butt-welded area can easily be examined by X-ray radiography. The bores of both pipe and flange match thus reducing turbulence and erosion.
Slip On 		This is slipped over the pipe and then fillet welded. Easy to use in fabricated applications.
Blind 		Sometimes called a blanking flange, this is used for blanking off pipelines, valves and pumps and as an inspection cover.
Socket Weld 		This is counter-bored to accept the pipe, which is then fillet welded. The bore of both the pipe and the flange are the same to ensure good flows.
Screwed/Threaded 		This requires no welding and is used to connect other threaded components in low pressure noncritical applications.
Lap Joint 		These are always used with either a stub end or a taft which is butt-welded to the pipe with the flange loose behind it. Thus the stub end or the taft always provides the sealing face. Easily assembled and aligned, it is favoured in low pressure applications. To reduce cost these 'backing' flanges can be supplied without a hub and/or made from coated carbon steel.
Ring Type Joint 		This can be employed on Weld Neck, Slip On or Blind Flanges for leak-proof connection at high pressures. The seal is made by a metal ring being compressed into a hexagonal groove on the flange face.

[2 OF 24] CONTINUED

Flanges

Introduction

Type	General Description
Plate or Table (BS 10:1962) **Standard BS10 Flanges** **Blind**  **Slip-on** 	These are produced to suit Nominal Bore/NPS Pipe Sizes. They are produced from bar or plate rather than forgings and are not pressure-rated. Blind and Slip-On, flat-faced, types are readily available in grades 304L and 316L in sizes from ½" to 6" as Table D and Table E, with larger sizes and other Tables (thicknesses) made to order. These economical flanges are used for light-duty applications where corrosion resistance is the primary consideration rather than high pressure or temperature.
BS EN 1092 Part 1 **Also referred to as PN Flanges** **(Formerly BS4504)**	These are not interchangeable with ANSI Flanges. They are readily available in types 304L and 316L with various pressure ratings of which 10 Bar & 16 Bar are the most commonly used.
Metric ND/DN	Please refer to information about the Metric ND product range in section 7.
Hygienic	Please refer to information about the Hygienics product range in section 6.

Flange faces

Of the four choices available the most common configurations are:

- For ANSI and BS EN 1092 – Raised Face
- BS 10 – Flat Face.

Note that this does not apply to Screwed or Lap Joint Flanges.

Type	General Description
Raised Face	To facilitate welding
Flat Face	
Ring Type Joint (RJT)	For leak-proof connection at high pressures
Tongue & Groove – Small or Large	

Finish

The finish is given as a surface roughness measured as Arithmetic Average Roundness Height (AARH). The finish requirements are stipulated by the standards, such as ANSI B16.5 and are within the range 125AARH to 500AARH, which is equivalent to 3.2 to 12.5 Ra.

[3 OF 24] CONTINUED

Flanges
Introduction

Pressure ratings

(The pressure rating will also determine the dimensions of the flange – Full details can be found in the relevant specification.)

Flange Type	ANSI B16.5	ANSI B16.47 Series A MSS SP-44	ASME B16.47 Series B API 605	BS EN 1092/ (BS4504)
	lbs	lbs*	lbs*	Bar
Weld Neck	150-2500	150-900	150-300	2.5-40
Weld Neck Ring Type Joint	300-2500	300-900	150-300	N/A
Slip On	150-1500	-	-	2.5-40
Slip On Ring Type Joint	300-1500	-	-	N/A
Threaded	150-2500	-	-	6-40
Lap Joint	150-2500	-	-	6-40
Blind	150-2500	-	-	2.5-40
Socket Weld	150-1500	-	-	N/A

Notes
* Flange sizes 26" and above.

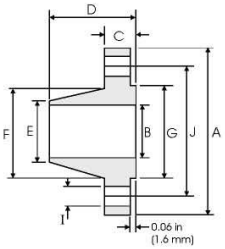
What semi-finished product are flanges made from?

	Forging A182	Plate ASTM A240	Bar	Casting
ANSI B16.5	✓	✓	-	-
BS 3293	✓	-	-	-
MSS SP-44	✓	-	-	-
API 605	✓	-	-	-
BS EN 1092/(BS4504)	✓	✓	-	✓
BS 10	✓	✓	✓	✓

Notes
- ASTM A240 plate can be used to manufacture ANSI B16.5 blind flanges, but this is not generally accepted in the UK.
- Most small BS 10 flanges are normally made from bar as this is the most economical manufacturing process.

Flanges

Range/Sizes - Weld Neck Flanges - ANSI B16.5



Class 150 lb

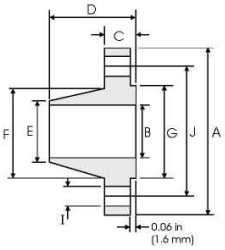
Pipe		Flange Data				Hub Data		Raised Face	Drilling Data			Weight
Nominal Pipe Size	Outside Diameter	A Overall Diameter	B Inside Diameter	C Flange Thickness min	D Overall Length	E Diameter at Weld Bevel	F Hub Diameter	G Face Diameter	H Number of Holes	I Bolt Hole Diameter	J Diameter of Circle of Holes	
	in mm	in mm	in mm	in mm	in mm	in mm	in mm	in mm		in mm	in mm	kg/ piece
½	0.840 21.30	3.500 88.90	0.620 15.70	0.440 11.20	1.880 47.80	0.840 21.30	1.190 30.20	1.380 35.00	4	0.620 15.70	2.380 60.45	0.48
¾	1.050 26.70	3.880 98.60	0.820 20.80	0.500 12.70	2.060 52.30	1.050 26.70	1.500 38.10	1.690 42.90	4	0.620 15.70	2.750 69.85	0.71
1	1.315 33.40	4.250 108.0	1.050 26.70	0.560 14.20	2.190 55.60	1.320 33.50	1.940 49.30	2.000 50.80	4	0.620 15.70	3.120 79.25	1.01
1¼	1.660 42.20	4.620 117.3	1.380 35.10	0.620 15.70	2.250 57.15	1.660 42.20	2.310 58.70	2.500 63.50	4	0.620 15.70	3.500 88.90	1.33
1½	1.900 48.30	5.000 127.0	1.610 40.90	0.690 17.50	2.440 62.00	1.900 48.30	2.560 65.00	2.880 73.15	4	0.620 15.70	3.880 98.60	1.72
2	2.375 60.30	6.000 152.4	2.070 52.60	0.750 19.10	2.500 63.50	2.380 60.45	3.060 77.70	3.620 91.90	4	0.750 19.10	4.750 120.7	2.58
2½	2.875 73.00	7.000 177.8	2.470 62.70	0.880 22.40	2.750 69.85	2.880 73.15	3.560 90.40	4.120 104.6	4	0.750 19.10	5.500 139.7	4.11
3	3.500 88.90	7.500 190.5	3.070 78.00	0.940 23.90	2.750 69.85	3.500 88.90	4.250 108.0	5.000 127.0	4	0.750 19.10	6.000 152.4	4.92
3½	4.000 101.6	8.500 215.9	3.550 90.20	0.940 23.90	2.810 71.40	4.000 101.6	4.810 122.2	5.500 139.7	8	0.750 19.10	7.000 177.8	6.08
4	4.500 114.3	9.000 228.6	4.030 102.4	0.940 23.90	3.000 76.20	4.500 114.3	5.310 134.9	6.190 157.2	8	0.750 19.10	7.500 190.5	6.84
5	5.563 141.3	10.00 254.0	5.050 128.3	0.940 23.90	3.500 88.90	5.560 141.2	6.440 163.6	7.310 185.7	8	0.880 22.40	8.500 215.9	8.56
6	6.625 168.3	11.00 279.4	6.070 154.2	1.000 25.40	3.500 88.90	6.630 168.4	7.560 192.0	8.500 215.9	8	0.880 22.40	9.500 241.3	10.6
8	8.625 219.1	13.50 342.9	7.980 202.7	1.120 28.40	4.000 101.6	8.630 219.2	9.690 246.1	10.62 269.7	8	0.880 22.40	11.75 298.5	17.6
10	10.75 273.0	16.00 406.4	10.02 254.5	1.190 30.20	4.000 101.6	10.75 273.0	12.00 304.8	12.75 323.8	12	1.000 25.40	14.25 362.0	24.0
12	12.75 323.8	19.00 482.6	12.00 304.8	1.250 31.75	4.500 114.3	12.75 323.8	14.38 365.3	15.00 381.0	12	1.000 25.40	17.00 431.8	36.5
14	14.00 355.6	21.00 533.4	To be specified by Purchaser	1.380 35.10	5.000 127.0	14.00 355.6	15.75 400.1	16.25 412.7	12	1.120 28.40	18.75 476.3	48.4
16	16.00 406.4	23.50 596.9		1.440 36.60	5.000 127.0	16.00 406.4	18.00 475.2	18.50 469.9	16	1.120 28.40	21.25 539.8	60.6
18	18.00 457.2	25.00 635.0		1.560 39.60	5.500 139.7	18.00 457.2	19.88 505.0	21.00 533.4	16	1.250 31.75	22.75 577.9	68.3
20	20.00 508.0	27.50 698.5		1.690 42.90	5.690 144.5	20.00 508.0	22.00 558.8	23.00 584.2	20	1.250 31.75	25.00 635.0	84.5
24	24.00 609.6	32.00 812.8		1.880 47.80	6.000 152.4	24.00 609.6	26.12 663.4	27.25 692.1	20	1.380 35.10	29.50 749.3	115

Notes
- Dimension B corresponds to the pipe inside diameter. Values quoted assume 40S/Standard wall thickness.
- Weights are based on manufacturer's data and are approximate.
- Flat face flanges may be provided at full thickness, C, or with raised face removed (the latter is nonstandard).
- For tolerances see page 5-12.

[5 OF 24] CONTINUED

Flanges

Range/Sizes - Weld Neck Flanges - ANSI B16.5



Class 300 lb

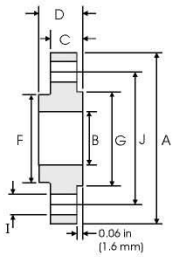
Pipe		Flange Data				Hub Data		Raised Face	Drilling Data			Weight
Nominal Pipe Size	Outside Diameter	A Overall Diameter	B Inside Diameter	C Flange Thickness min	D Overall Length	E Diameter at Weld Bevel	F Hub Diameter	G Face Diameter	H Number of Holes	I Bolt Hole Diameter	J Diameter of Circle of Holes	
	in mm	in mm	in mm	in mm	in mm	in mm	in mm	in mm		in mm	in mm	kg/ piece
½	0.840 21.30	3.750 95.20	0.620 15.70	0.560 14.20	2.060 52.30	0.840 21.30	1.500 38.10	1.380 35.00	4	0.620 15.70	2.620 66.55	0.75
¾	1.050 26.70	4.620 117.3	0.820 20.80	0.620 15.70	2.250 57.15	1.050 26.70	1.880 47.70	1.690 42.90	4	0.750 19.00	3.250 82.50	1.26
1	1.315 33.40	4.880 123.9	1.050 26.70	0.690 17.50	2.440 62.00	1.320 33.50	2.120 53.80	2.000 50.80	4	0.750 19.00	3.500 88.90	1.52
1¼	1.660 42.20	5.250 133.3	1.380 35.10	0.750 19.00	2.560 65.00	1.660 42.20	2.500 63.50	2.500 63.50	4	0.750 19.00	3.880 98.50	2.03
1½	1.900 48.30	6.120 155.4	1.610 40.90	0.810 20.60	2.690 68.30	1.900 48.30	2.750 69.85	2.880 73.15	4	0.880 22.30	4.500 114.3	2.89
2	2.375 60.30	6.500 165.1	2.070 52.60	0.880 22.30	2.750 69.85	2.380 60.45	3.310 84.00	3.620 91.90	8	0.750 19.00	5.000 127.0	3.40
2½	2.875 73.00	7.500 190.5	2.470 62.70	1.000 25.40	3.000 76.20	2.880 73.15	3.940 100.0	4.120 104.6	8	0.880 22.30	5.880 149.3	5.17
3	3.500 88.90	8.250 209.5	3.070 78.00	1.120 28.40	3.120 79.25	3.500 88.90	4.620 117.3	5.000 127.0	8	0.880 22.30	6.620 168.1	6.93
3½	4.000 101.6	9.000 228.6	3.550 90.20	1.190 30.20	3.190 81.00	4.000 101.6	5.250 133.3	5.500 139.7	8	0.880 22.30	7.250 184.1	8.67
4	4.500 114.3	10.00 254.0	4.030 102.4	1.250 31.70	3.380 85.80	4.500 114.3	5.750 146.0	6.190 157.2	8	0.880 22.30	7.880 200.1	11.2
5	5.563 141.3	11.00 279.4	5.050 128.3	1.380 35.00	3.880 98.50	5.560 141.2	7.000 177.8	7.310 185.7	8	0.880 22.30	9.250 234.9	15.1
6	6.625 168.3	12.50 317.5	6.070 154.2	1.440 36.50	3.880 98.50	6.630 168.4	8.120 206.2	8.500 215.9	12	0.880 22.30	10.62 269.7	19.1
8	8.625 219.1	15.00 381.0	7.980 202.7	1.620 41.10	4.380 111.2	8.630 219.2	10.25 260.3	10.62 269.7	12	1.000 25.40	13.00 330.2	29.9
10	10.75 273.0	17.50 444.5	10.02 254.5	1.880 47.70	4.620 117.3	10.75 273.0	12.62 320.5	12.75 323.8	16	1.120 28.40	15.25 387.3	42.7
12	12.75 323.8	20.50 520.7	12.00 304.8	2.000 50.80	5.120 130.0	12.75 323.8	14.75 374.6	15.00 381.0	16	1.250 31.70	17.75 450.8	61.8
14	14.00 355.6	23.00 584.2	To be specified by Purchaser	2.120 53.80	5.620 142.7	14.00 355.6	16.75 425.4	16.25 412.7	20	1.250 31.70	20.25 514.3	85.8
16	16.00 406.4	25.50 647.7		2.250 57.15	5.750 146.0	16.00 406.4	19.00 482.6	18.50 469.9	20	1.380 35.00	22.50 571.5	106
18	18.00 457.2	28.00 711.2		2.380 60.45	6.250 158.7	18.00 457.2	21.00 533.4	21.00 533.4	24	1.380 35.00	24.75 628.6	131
20	20.00 508.0	30.50 774.7		2.500 63.50	6.380 162.0	20.00 508.0	23.12 587.2	23.00 584.2	24	1.380 35.00	27.00 685.8	158
24	24.00 609.6	36.00 914.4		2.750 69.85	6.620 168.1	24.00 609.6	27.62 701.5	27.25 692.1	24	1.620 41.10	32.00 812.8	230

Notes
- Dimension B corresponds to the pipe inside diameter. Values quoted assume 40S/Standard wall thickness.
- Weights are based on manufacturer's data and are approximate.
- Flat face flanges may be provided at full thickness, C, or with raised face removed (the latter is nonstandard).
- For tolerances see page 5-12.

[6 OF 24] CONTINUED

Flanges

Range/Sizes - Slip On Flanges - ANSI B16.5



Class 150 lb

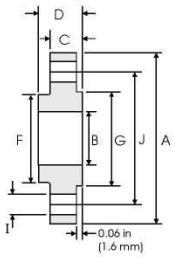
Pipe		Flange Data				Hub	Raised Face	Drilling Data			Weight
Nominal Pipe Size	Outside Diameter	A Overall Diameter	B Inside Diameter	C Flange Thickness min	D Overall Length	F Hub Diameter	G Face Diameter	H Number of Holes	I Bolt Hole Diameter	J Diameter of Circle of Holes	
	in mm	in mm	in mm	in mm	in mm	in mm	in mm		in mm	in mm	kg/ piece
½	0.840 21.30	3.500 88.90	0.880 22.40	0.440 11.20	0.620 15.70	1.190 30.20	1.380 35.10	4	0.620 15.70	2.380 60.45	0.39
¾	1.050 26.70	3.880 98.60	1.090 27.70	0.500 12.70	0.620 15.70	1.500 38.10	1.690 42.90	4	0.620 15.70	2.750 69.85	0.56
1	1.315 33.40	4.250 108.0	1.360 34.50	0.560 14.20	0.690 17.50	1.940 49.30	2.000 50.80	4	0.620 15.70	3.120 79.25	0.78
1¼	1.660 42.20	4.620 117.3	1.700 43.20	0.620 15.70	0.810 20.60	2.310 58.70	2.500 63.50	4	0.620 15.70	3.500 88.90	1.03
1½	1.900 48.30	5.000 127.0	1.950 49.50	0.690 17.50	0.880 22.40	2.560 65.00	2.880 73.15	4	0.620 15.70	3.880 98.60	1.32
2	2.375 60.30	6.000 152.4	2.440 62.00	0.750 19.10	1.000 25.40	3.060 77.70	3.620 91.90	4	0.750 19.10	4.750 120.7	2.06
2½	2.875 73.00	7.000 177.8	2.940 74.70	0.880 22.40	1.120 28.40	3.560 90.40	4.120 104.6	4	0.750 19.10	5.500 139.7	3.28
3	3.500 88.90	7.500 190.5	3.570 90.70	0.940 23.90	1.190 30.20	4.250 108.0	5.000 127.0	4	0.750 19.10	6.000 152.4	3.85
3½	4.000 101.6	8.500 215.9	4.070 103.4	0.940 23.90	1.250 31.75	4.810 122.2	5.500 139.7	8	0.750 19.10	7.000 177.8	4.81
4	4.500 114.3	9.000 228.6	4.570 116.1	0.940 23.90	1.310 33.30	5.310 134.9	6.190 157.2	8	0.750 19.10	7.500 190.5	5.30
5	5.563 141.3	10.00 254.0	5.660 143.8	0.940 23.90	1.440 36.60	6.440 163.6	7.310 185.7	8	0.880 22.40	8.500 215.9	6.07
6	6.625 168.3	11.00 279.4	6.720 170.7	1.000 25.40	1.560 39.60	7.560 192.0	8.500 215.9	8	0.880 22.40	9.500 241.3	7.45
8	8.625 219.1	13.50 342.9	8.720 221.5	1.120 28.40	1.750 44.50	9.690 246.1	10.62 269.7	8	0.880 22.40	11.75 298.5	12.1
10	10.75 273.0	16.00 406.4	10.88 276.3	1.190 30.20	1.940 49.30	12.00 304.8	12.75 323.9	12	1.000 25.40	14.25 362.0	16.5
12	12.75 323.8	19.00 482.6	12.88 327.1	1.250 31.75	2.190 55.60	14.38 365.3	15.00 381.0	12	1.000 25.40	17.00 431.8	26.2
14	14.00 355.6	21.00 533.4	14.14 359.1	1.380 35.10	2.250 57.15	15.75 400.1	16.25 412.8	12	1.120 28.40	18.75 476.3	34.6
16	16.00 406.4	23.50 596.9	16.16 410.5	1.440 36.60	2.500 63.50	18.00 457.2	18.50 469.9	16	1.120 28.40	21.25 539.8	44.8
18	18.00 457.2	25.00 635.0	18.18 461.8	1.560 39.60	2.690 68.30	19.88 505.0	21.00 533.4	16	1.250 31.75	22.75 577.9	48.9
20	20.00 508.0	27.50 698.5	20.20 513.1	1.690 42.90	2.880 73.15	22.00 558.8	23.00 584.2	20	1.250 31.75	25.00 635.0	61.9
24	24.00 609.6	32.00 812.8	24.25 616.0	1.880 47.80	3.250 82.60	26.12 663.4	27.25 692.2	20	1.380 35.10	29.50 749.3	86.9

Notes
- Weights are based on manufacturer's data and are approximate.
- Flat face flanges may be provided at full thickness, C, or with raised face removed (the latter is nonstandard).
- For tolerances see page 5-12.

[7 OF 24] CONTINUED

Flanges

Range/Sizes - Slip On Flanges - ANSI B16.5



Class 300 lb

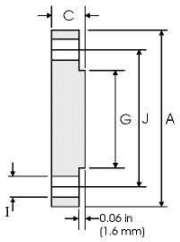
Pipe		Flange Data					Hub	Raised Face	Drilling Data			Weight
Nominal Pipe Size	Outside Diameter	A Overall Diameter	B Inside Diameter	C Flange Thickness min	D Overall Length	F Hub Diameter	G Face Diameter	H Number of Holes	I Bolt Hole Diameter	J Diameter of Circle of Holes	
	in mm	in mm	in mm	in mm	in mm	in mm	in mm		in mm	in mm	kg/ piece
½	0.840 21.30	3.750 95.20	0.880 22.40	0.560 14.20	0.880 22.40	1.500 38.10	1.380 35.10	4	0.620 15.70	2.620 66.55	0.64
¾	1.050 26.70	4.620 117.3	1.090 27.70	0.620 15.70	1.000 25.40	1.880 47.70	1.690 42.90	4	0.750 19.10	3.250 82.50	1.12
1	1.315 33.40	4.880 123.9	1.360 34.50	0.690 17.50	1.060 26.90	2.120 53.80	2.000 50.80	4	0.750 19.10	3.500 88.90	1.36
1¼	1.660 42.20	5.250 133.3	1.700 43.20	0.750 19.00	1.060 26.90	2.500 63.50	2.500 63.50	4	0.750 19.10	3.880 98.60	1.68
1½	1.900 48.30	6.120 155.4	1.950 49.50	0.810 20.60	1.190 30.20	2.750 69.85	2.880 73.15	4	0.880 22.40	4.500 114.3	2.49
2	2.375 60.30	6.500 165.1	2.440 62.00	0.880 22.30	1.310 33.20	3.310 84.00	3.620 91.90	8	0.750 19.10	5.000 127.0	2.87
2½	2.875 73.00	7.500 190.5	2.940 74.70	1.000 25.40	1.500 38.10	3.940 100.0	4.120 104.6	8	0.880 22.40	5.880 149.4	4.32
3	3.500 88.90	8.250 209.5	3.570 90.70	1.120 28.40	1.690 42.90	4.620 117.3	5.000 127.0	8	0.880 22.40	6.620 168.1	5.85
3½	4.000 101.6	9.000 228.6	4.070 103.4	1.190 30.20	1.750 44.40	5.250 133.3	5.500 139.7	8	0.880 22.40	7.250 184.2	7.34
4	4.500 114.3	10.00 254.0	4.570 116.1	1.250 31.70	1.880 47.70	5.750 146.0	6.190 157.2	8	0.880 22.40	7.880 200.1	9.61
5	5.563 141.3	11.00 279.4	5.660 143.8	1.380 35.00	2.000 50.80	7.000 177.8	7.310 185.7	8	0.880 22.40	9.250 234.9	12.3
6	6.625 168.3	12.50 317.5	6.720 170.7	1.440 36.50	2.060 52.30	8.120 206.2	8.500 215.9	12	0.880 22.40	10.62 269.7	15.6
8	8.625 219.1	15.00 381.0	8.720 221.5	1.620 41.10	2.440 61.90	10.25 260.3	10.62 269.7	12	1.000 25.40	13.00 330.2	24.2
10	10.75 273.0	17.50 444.5	10.88 276.3	1.880 47.70	2.620 66.55	12.62 320.5	12.75 323.9	16	1.120 28.40	15.25 387.3	34.1
12	12.75 323.8	20.50 520.7	12.88 327.1	2.000 50.80	2.880 73.15	14.75 374.6	15.00 381.0	16	1.250 31.70	17.75 450.8	49.8
14	14.00 355.6	23.00 584.2	14.14 359.1	2.120 53.80	3.000 76.20	16.75 425.4	16.25 412.8	20	1.250 31.70	20.25 514.4	69.9
16	16.00 406.4	25.50 647.7	16.16 410.5	2.250 57.15	3.250 82.50	19.00 482.6	18.50 469.9	20	1.380 35.00	22.50 571.5	88.1
18	18.00 457.2	28.00 711.2	18.18 461.8	2.380 60.45	3.500 88.90	21.00 533.4	21.00 533.4	24	1.380 35.00	24.75 628.7	109
20	20.00 508.0	30.50 774.7	20.20 513.1	2.500 63.50	3.750 95.20	23.12 587.2	23.00 584.2	24	1.380 35.00	27.00 685.8	134
24	24.00 609.6	36.00 914.4	24.25 616.0	2.750 69.85	4.190 106.4	27.62 701.5	27.25 692.2	24	1.620 41.00	32.00 812.8	201

Notes
- Weights are based on manufacturer's data and are approximate.
- Flat face flanges may be provided at full thickness, C, or with raised face removed (the latter is nonstandard).
- For tolerances see page 5-12.

[8 OF 24] CONTINUED

Flanges

Range/Sizes - Blind Flanges - ANSI B16.5



Class 150 lb

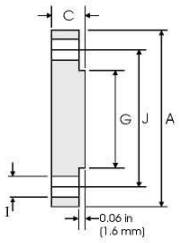
Pipe		Flange Data		Raised Face	Drilling Data			Weight
Nominal Pipe Size	Outside Diameter	A Overall Diameter	C Flange Thickness min	G Face Diameter	H Number of Holes	I Bolt Hole Diameter	J Diameter of Circle of Holes	
	in mm	in mm	in mm	in mm		in mm	in mm	kg/ piece
½	0.840 21.30	3.500 88.90	0.440 11.20	1.380 35.10	4	0.620 15.70	2.380 60.45	0.42
¾	1.050 26.70	3.880 98.60	0.500 12.70	1.690 42.90	4	0.620 15.70	2.750 69.85	0.61
1	1.315 33.40	4.250 108.0	0.560 14.20	2.000 50.80	4	0.620 15.70	3.120 79.25	0.86
1¼	1.660 42.20	4.620 117.3	0.620 15.70	2.500 63.50	4	0.620 15.70	3.500 88.90	1.17
1½	1.900 48.30	5.000 127.0	0.690 17.50	2.880 73.15	4	0.620 15.70	3.880 98.60	1.53
2	2.375 60.30	6.000 152.4	0.750 19.10	3.620 91.90	4	0.750 19.10	4.750 120.7	2.42
2½	2.875 73.00	7.000 177.8	0.880 22.40	4.120 104.6	4	0.750 19.10	5.500 139.7	3.94
3	3.500 88.90	7.500 190.5	0.940 23.90	5.000 127.0	4	0.750 19.10	6.000 152.4	4.93
3½	4.000 101.6	8.500 215.9	0.940 23.90	5.500 139.7	8	0.750 19.10	7.000 177.8	6.17
4	4.500 114.3	9.000 228.6	0.940 23.90	6.190 157.2	8	0.750 19.10	7.500 190.5	7.00
5	5.563 141.3	10.00 254.0	0.940 23.90	7.310 185.7	8	0.880 22.40	8.500 215.9	8.63
6	6.625 168.3	11.00 279.4	1.000 25.40	8.500 215.9	8	0.880 22.40	9.500 241.3	11.3
8	8.625 219.1	13.50 342.9	1.120 28.40	10.62 269.7	8	0.880 22.40	11.75 298.5	19.6
10	10.75 273.0	16.00 406.4	1.190 30.20	12.75 323.9	12	1.000 25.40	14.25 362.0	28.8
12	12.75 323.8	19.00 482.6	1.250 31.75	15.00 381.0	12	1.000 25.40	17.00 431.8	43.2
14	14.00 355.6	21.00 533.4	1.380 35.10	16.25 412.8	12	1.120 28.40	18.75 476.3	58.1
16	16.00 406.4	23.50 596.9	1.440 36.60	18.50 469.9	16	1.120 28.40	21.25 539.8	76.0
18	18.00 457.2	25.00 635.0	1.560 39.60	21.00 533.4	16	1.250 31.75	22.75 577.9	93.7
20	20.00 508.0	27.50 698.5	1.690 42.90	23.00 584.2	20	1.250 31.75	25.00 635.0	122
24	24.00 609.6	32.00 812.8	1.880 47.80	27.25 692.2	20	1.380 35.10	29.50 749.3	185

Notes
- Weights are based on manufacturer's data and are approximate.
- Flat face flanges may be provided at full thickness, C, or with raised face removed (the latter is nonstandard).
- For tolerances see page 5-12.

[9 OF 24] CONTINUED

Flanges

Range/Sizes - Blind Flanges - ANSI B16.5



Class 300 lb

Pipe		Flange Data		Raised Face	Drilling Data			Weight
Nominal Pipe Size	Outside Diameter	A Overall Diameter	C Flange Thickness min	G Face Diameter	H Number of Holes	I Bolt Hole Diameter	J Diameter of Circle of Holes	
	in mm	in mm	in mm	in mm		in mm	in mm	kg/ piece
½	0.840 21.30	3.750 95.20	0.560 14.20	1.380 35.10	4	0.620 15.70	2.620 66.55	0.64
¾	1.050 26.70	4.620 117.3	0.620 15.70	1.690 42.90	4	0.750 19.00	3.250 82.50	1.11
1	1.315 33.40	4.880 123.9	0.690 17.50	2.000 50.80	4	0.750 19.00	3.500 88.90	1.39
1¼	1.660 42.20	5.250 133.3	0.750 19.00	2.500 63.50	4	0.750 19.00	3.880 98.50	1.79
1½	1.900 48.30	6.120 155.4	0.810 20.60	2.880 73.15	4	0.880 22.3	4.500 114.3	2.66
2	2.375 60.30	6.500 165.1	0.880 22.30	3.620 91.90	8	0.750 19.10	5.000 127.0	3.18
2½	2.875 73.00	7.500 190.5	1.000 25.40	4.120 104.6	8	0.880 22.30	5.880 1.493	4.85
3	3.500 88.90	8.250 209.5	1.120 28.40	5.000 127.0	8	0.880 22.30	6.620 168.1	6.81
3½	4.000 101.6	9.000 228.6	1.190 30.20	5.500 139.7	8	0.880 22.30	7.250 184.1	8.71
4	4.500 114.3	10.00 254.0	1.250 31.70	6.190 157.2	8	0.880 22.30	7.800 200.1	11.5
5	5.563 141.3	11.00 279.4	1.380 35.00	7.310 185.7	8	0.880 22.30	9.250 234.9	15.6
6	6.625 168.3	12.50 317.5	1.440 36.50	8.500 215.9	12	0.880 22.30	10.62 269.7	20.9
8	8.625 219.1	15.00 381.0	1.620 41.10	10.62 269.7	12	1.000 25.40	13.00 330.2	34.3
10	10.75 273.0	17.50 444.5	1.880 47.70	12.75 323.9	16	1.120 28.40	15.25 387.3	53.3
12	12.75 323.8	20.50 520.7	2.000 50.80	15.00 381.0	16	1.250 31.70	17.75 450.8	78.8
14	14.00 355.6	23.00 584.2	2.120 53.80	16.25 412.8	20	1.250 31.70	20.25 514.3	105
16	16.00 406.4	25.50 647.7	2.250 57.15	18.50 469.9	20	1.380 35.00	22.50 571.5	137
18	18.00 457.2	28.00 711.2	2.380 60.45	21.00 533.4	24	1.380 35.00	24.75 628.6	175
20	20.00 508.0	30.50 774.7	2.500 63.50	23.00 584.2	24	1.380 35.00	27.00 685.8	221
24	24.00 609.6	36.00 914.4	2.750 69.85	27.25 692.2	24	1.620 41.10	32.00 812.8	339

Notes
- Weights are based on manufacturer's data and are approximate.
- Flat face flanges may be provided at full thickness, C, or with raised face removed (the latter is nonstandard).
- For tolerances see page 5-12.

[10 OF 24] CONTINUED

Flanges

Specifications - ASTM A182/A182M

Forged or rolled alloy – steel pipe flanges, forged fittings, and valves and parts for high temperature service

This specification covers forged low alloy and stainless steel piping components for use in pressure systems. These include flanges, fittings, valves and similar parts manufactured to dimensional standards such as ASME/ANSI. Products made to this specification are limited to a maximum weight of 10,000 lb (4,540 kg).

Note
- Although low allow steels are covered by this standard, only stainless steels (martensitic, ferritic, austenitic and duplex) are included in this summary.

Dimensions and tolerances

- **Dimensions and tolerances**. ASME/ANSI specifications B16.5 and B16.11 are referenced.
  Flange dimensions and tolerances (see page 5-12).

Manufacture

- **Materials**. Refer to chemical composition table (stainless steel grades only shown). Elements not specified in the table are not permitted, specifically selenium or other elements added for free-machining properties.
- **The steel** may be melted by electric-furnace, or vacuum-furnace, or by either of these followed by vacuum or electroslag-consumable remelting. Vacuum melting or remelting is not suitable for grades containing or modified by nitrogen. Grade F XM-27Cb may be electron-beam melted.
- **Manufacture**. The steel is forged or rolled as near as possible to size and shape of the product. Small cylindrical parts (excluding flanges) may be machined directly from forged or rolled bar without additional hot working (limits defined in ASTM A234 apply for martensitic steels, in A403 for austenitic steels and A815 for duplex steels). Elbows, returns and tees are not machined directly from bar.
- **Heat treatment**. Refer to heat treatment table. Heat treatment of forgings may be performed before machining. For martensitic and ferritic grades, liquid quench followed by tempering is permitted, subject to purchaser agreement. Small cylindrical parts (excluding flanges) machined directly from forged or rolled austenitic steel may be furnished annealed to this specification with subsequent light cold drawing or straightening permitted.
- **Marking**. Each forging is marked with manufacturers name, heat number (or heat identification), designation of service rating, specification number, grade (e.g. F304) and size.
  Additionally: QT = Liquid quenched and tempered
  W = Welded
  WNS = Not post repair weld heat treated.

Finish and repair

- **Appearance**. Forgings have a workmanlike finish and shall be free of scale, machining burns and injurous, imperfections (i.e. those that encroach on minimum wall thickness).
- **Defect repair by grinding or machining**. The following may be removed:
  - Surface discontinuity as above.
  - Mechanical marks, abrasions or pits deeper than 1/16 in (1.6mm).
- **Defect repair by welding:**
  - Permitted unless purchaser prohibits.
  - Defect removal by chipping or grinding is verified by magnetic particle inspection.
  - Repair is limited to 10% of surface area and 33⅓% of nominal wall thickness.
  - Repair welding electrodes and post weld repair heat treatments are defined in A182 but are not detailed in this summary.

[11 OF 24] CONTINUED

Flanges

Specifications - ASTM A182/A182M

Tensile and hardness requirements

Grade	UNS	Tensile Strength min		Yield Strength[1] min		Elongation in 2 in (50 mm) or 4D, min	Reduction of area, min	Brinell Hardness HB
		ksi	MPa	ksi	MPa	%	%	
Martensitic Stainless Steels:								
F6a Class 1	S41000	70	485	40	275	18	35	143-187
F6a Class 2	S41000	85	585	55	380	18	35	167-229
F6a Class 3	S41000	110	760	85	585	15	35	235-302
F6a Class 4	S41000	130	895	110	760	12	35	263-321
F6b	S41026	110-135	760-930	90	620	16	45	235-285
F6NM	S41500	115	790	90	620	15	45	295 max
Ferritic Stainless Steels:								
FXM-27Cb	S44627	60	415	35	240	20	45	190 max
F429	S42900	60	415	35	240	20	45	190 max
F430	S43000	60	415	35	240	20	45	190 max
Austenitic Stainless Steels:								
All	All	75[2]	515[2]	30	205	30	50	-
F304L	S30403	70[3]	485[3]	25	170	30	50	-
F304N	S30451	80	550	35	240	30[4]	50[5]	-
F316L	S31603	70	485	25	170	30	50	-
F316N	S31651	80	550	35	240	30[4]	50[5]	-
F317L	S31703	70	485	25	170	30	50	-
FXM-11	S21904	90	620	50	345	45	60	-
FXM-19	S20910	100	690	55	380	35	55	-
F10	S33100	80	550	30	205	30	50	-
F44	S31254	94	650	44	300	35	50	-
F45	S30815	87	600	45	310	40	50	-
F46	S30600	78	540	35	240	40	50	-
F47	S31725	75	525	30	205	40	50	-
F48	S31726	80	550	35	240	40	50	-
F49	S34565	115	795	60	415	35	40	-
F56	S33228	73	500	27	185	30	35	-
Duplex Stainless Steels								
F50	S31200	100-130	690-895	65	450	25	50	-
F51	S31803	90	620	65	450	25	45	-
F52	S32950	100	690	70	485	15	-	-
F53	S32750	116[6]	800[6]	80[6]	550[6]	15	-	310 max
F54	S32740	116	800	80	550	15	30	310 max
F55	S32760	109-130	750-895	80	550	25	45	-
F57	S39277	118	820	85	585	25	50	-

Notes
1 Determined by the 0.2% offset method. For ferritic steels only, the 0.5% extension-under-load method may also be used.
2 For sections over 5 in. [130mm] in thickness, the minimum tensile strength shall be 70 ksi [485 MPa].
3 For sections over 5 in. [130mm] in thickness, the minimum tensile strength shall be 65 ksi [450 MPa].
4 Longitudinal. The transverse elongation shall be 25% in 2 in. or 50mm, min.
5 Longitudinal. The transverse reduction of area shall be 45% min.
6 For sections over 2 in. [50mm] in thickness, the minimum tensile strength shall be 109 ksi [750 MPa]; the minimum yield strength shall be 75 ksi [515 MPa].
- All = All austenitic grades as listed in the chemical composition table except as identified in this table.

[12 OF 24] CONTINUED

Flanges

Specifications - ASME/ANSI B16.5

American national standards ASME/ANSI B16.5 and B16.47 together cover pipe flanges up to NPS 60 (NPS 48 is the largest detailed in this summary). ASME/ANSI B16.47 covers two series of flanges, Series A which is equivalent to MSS SP-44 (the 1996 Edition of MSS SP-44 complies with B16.47 tolerances), and Series B which is equivalent to API 605 (API 605 is now cancelled).

Dimensions and tolerances

Tolerances on flange dimensions (ASME/ANSI B16.5)

Dimension	Range	Tolerance	
		in	mm
General and Blind Flanges (For blind flange dimensions see pages 5-8/9):			
G (raised face diameter)	≤ NPS 24	±0.03	±0.76
	≥ NPS 26, with 0.06 in raised face	±0.08	±2.03
	≥ NPS 26, with 0.25 in raised face	±0.04	±1.02
I (bolt hole diameter)	All	No tolerance in B16.5 or B16.47	
J (bolt circle diameter)	All	±0.06	±1.52
Centre to centre of adjacent bolt holes	All	±0.03	±0.76
Eccenticity of bolt circle and machined facing diameters	≤ NPS 2½	±0.03	±0.76
	≥ NPS 3	±0.06	±1.52
Weld Neck Flanges[1] (For dimensions see pages 5-4/5):			
D (overall length)	≤ NPS 4	+0.06	+1.52
	NPS 5 to 10	+0.06, -0.12	+1.52, -3.05
	NPS 12 to 24	+0.12, -0.18	+3.05, -4.57
	≥ NPS 26	±0.19	±4.83
Thickness of hub	All	> 87.5% of pipe nominal wall thickness	
Slip on (see page 5-6/7), Lap Joint and Socket Welding Flanges:			
B (inside diameter, or bore)	≤ NPS 10	+0.03, -0.0	+0.76, -0.0
	≥ NPS 12	+0.06, -0.0	+1.52, -0.0
Threaded Flanges:			
B (counterbore) (Not applicable for Class 150 lb)	≤ NPS 10	+0.03, -0.0	+0.76, -0.0
	≥ NPS 12	+0.06, -0.0	+1.52, -0.0

[13 OF 24] CONTINUED

Flanges

Range/Sizes - EN 1092 / (BS4504)

BS4504 is now obsolete and has been replaced by EN 1092. However the dimensions and tolerances have not changed.

Flange types and methods of manufacture

ISO EN	BS	Type of Flange and Collar	Forged[a]	Cast	Made from flat products (plates)	Machined from rolled or forged bars and forged sectional steel	Bent and electric welded from bars, sectional steel or strip [b,c,d,e]
01	101	Plate flange for welding	yes	no	yes	yes	yes
05	105	Blind flange	yes	no	yes	yes	no
11	111	Weld-neck flange	yes	no	no	yes	yes, for ≥ DN 700
12	112	Hubbed slip-on flange for welding	yes	no	no	yes	no

a Seamless rolled, pressed, forged.
b Only one radial weld is allowed under DN 1800.
c Welded flanges allowed only for an application up to 370°C in conformance with EN 13480-3:2002, D.4.4.
d In case flanges are made by cold forming of a base material e.g. flat product, some mechanical properties, like elongation after fracture (A) and impact energy (KV), will be impaired due to cold forming without subsequent heat treatment.

Repairs by welding

With the exception of weld repairs carried out according to BSEN 1092-1:2007 (E) clause 5.11, repairs by welding are permitted only by written agreement of the purchaser.

Within the certificate for material or component relevant documents shall be noted, that approved welding procedure and welders qualification have been applied.

Bolting

Flanges shall be suitable for use with the number and size of bolting as specified in the Tables on pages 5-14 to 5-18. The bolting shall be chosen by the equipment manufacturer according to the pressure, temperature, flange material and gasket so that the flanged joint remains tight under the expected operating conditions. For selection of bolting, see EN 1515-1, for combination of the materials of flanges and bolting see EN 1515-2, for information.

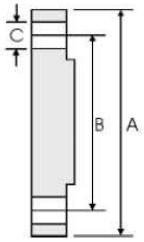
Gaskets

The various gasket types, dimensions, design characteristics and materials used are not within the scope of this European Standard, Dimensions of gaskets are given in the series of standards EN 1514.

[14 OF 24] CONTINUED

Flanges

Range/Sizes - EN 1092 / (BS4504)



Flange drilling details

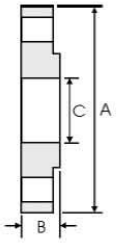
DN	PN	A	B	C	Bolt holes	
		mm	mm	mm	No.	Size
10	10 & 16	90	60	14	4	M12
15	10 & 16	95	65	14	4	M12
20	10 & 16	105	75	14	4	M12
25	10 & 16	115	85	14	4	M12
32	10 & 16	140	100	18	4	M16
40	10 & 16	150	110	18	4	M16
50	10 & 16	165	125	18	4	M16
65	10 & 16	185	145	18	4/8	M16
80	10 & 16	200	160	18	8	M16
100	10 & 16	220	180	18	8	M16
125	10 & 16	250	210	18	8	M16
150	10 & 16	285	240	22	8	M20
200	10 & 16	340	295	22	8/12	M20
250	10	395	350	22	12	M20
	16	405	355	26	12	M24
300	10	445	400	22	12	M20
	16	460	410	26	12	M24
350	10	505	460	22	16	M20
	16	520	470	26	16	M24
400	10	565	515	26	16	M24
	16	580	525	30	16	M27
450	10	615	565	26	20	M24
	16	640	585	30	20	M27

DN	PN	A	B	C	Bolt holes	
		mm	mm	mm	No.	Size
500	10	670	620	26	20	M24
	16	715	650	33	20	M30
600	10	780	725	30	20	M27
	16	840	770	36	20	M33
700	10	895	840	30	24	M27
	16	910	840	36	24	M33
800	10	1015	950	33	24	M30
	16	1025	950	39	24	M36
900	10	1115	1050	33	28	M30
	16	1125	1050	39	28	M36
1000	10	1230	1160	36	28	M33
	16	1255	1170	42	28	M39
1200	10	1455	1380	39	32	M36
	16	1485	1390	48	32	M45
1400	10	1675	1590	42	36	M39
	16	1685	1590	48	36	M45
1600	10	1915	1820	48	40	M45
	16	1930	1820	56	40	M52
1800	10	2115	2020	48	44	M45
	16	2130	2020	56	44	M52
2000	10	2325	2230	48	48	M45
	16	2345	2230	62	48	M56

[15 OF 24] CONTINUED

Flanges

Range/Sizes - Plate Flanges Code 01 (101) - EN 1092 / (BS4504)



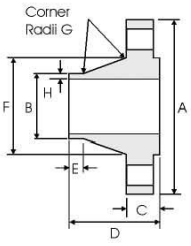
DN	PN	A	B	C
		mm	mm	mm
10	10 & 16	90	14	18.0
15	10 & 16	95	14	22.0
20	10 & 16	105	16	27.5
25	10 & 16	115	16	34.5
32	10 & 16	140	18	43.5
40	10 & 16	150	18	49.5
50	10 & 16	165	20	61.5
65	10 & 16	185	20	77.5
80	10 & 16	200	20	90.5
100	10 & 16	220	22	116.0
125	10 & 16	250	22	141.5
150	10 & 16	285	24	170.5
200	10 & 16	340	24	221.5
250	10	395	26	276.5
	16	405	29	

DN	PN	A	B	C
		mm	mm	mm
300	10	445	26	327.5
	16	460	32	
350	10	505	28	359.5
	16	520	35	359.0
400	10	565	32	411.0
	16	580	38	
450	10	615	36	462.0
	16	640	42	
500	10	670	38	513.5
	16	715	46	
600	10	780	42	616.5
	16	840	52	

Notes
- Dimension B is the flange thickness with or without a raised face.
- For drilling details see page 5-14.
- For tolerances see page 5-19.
- For facing types and dimensions see page 5-20 and 5-21.

Flanges

Range/Sizes - Weld Neck Flanges Code 11 (111) - EN 1092 / (BS4504)



DN	PN	A	B	C	D	E	F	G	H
		mm	mm	mm	mm	mm	mm	mm	mm
10	10	90	17.2	14	35	6	28	3	1.8
	16	90		14	35		28		1.8
15	10	95	21.3	14	35	6	32	3	2
	16	95		14	35		32		2
20	10	105	26.9	16	38	6	39	4	2.3
	16	105		16	38		39		2.3
25	10	115	33.7	16	38	6	46	4	2.6
	16	115		16	38		46		2.6
32	10	140	42.4	16	40	6	56	5	2.6
	16	140		16	40		56		2.6
40	10	150	48.3	16	42	7	64	5	2.6
	16	150		16	42		64		2.6
50	10	165	60.3	18	45	8	74	5	2.9
	16	165		18	45		74		2.9
65	10	185	76.1	18	45	10	92	6	2.9
	16	185		18	45		92		2.9
80	10	200	88.9	20	50	10	110	6	3.2
	16	200		20	50		110		3.2
100	10	220	114.3	20	52	12	130	6	3.6
	16	220		20	52		130		3.6
125	10	250	139.7	22	55	12	158	6	4
	16	250		22	55		158		4
150	10	285	168.3	22	55	12	184	8	4.5
	16	285		22	55		184		4.5
200	10	340	219.1	24	62	16	234	8	5.6
	16	340		24	62		234		5.6
250	10	395	273	26	68	16	288	10	6.3
	16	405		26	70		288		6.3
300	10	445	323.9	26	68	16	342	10	7.1
	16	460		28	78		342		7.1

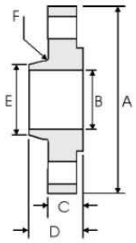
DN	PN	A	B	C	D	E	F	G	H
		mm	mm	mm	mm	mm	mm	mm	mm
350	10	505	355.6	26	68	16	390	10	7.1
	16	520		30	82		390		8
400	10	565	406.4	26	72	16	440	10	7.1
	16	580		32	85		444		8
450	10	615	457	28	72	16	488	12	7.1
	16	640		34	87		490		8
500	10	670	508	28	75	16	540	12	7.1
	16	715		34	90		546		8
600	10	780	610	28	80	18	640	12	7.1
	16	840		36	95		650		8.8
700	10	895	711	30	80	18	746	12	8
	16	910		36	100		750		8.8
800	10	1015	813	32	90	18	848	12	8
	16	1025		38	105	20	848		10
900	10	1115	914	34	95	20	948	12	10
	16	1125		40	110		948		10
1000	10	1230	1016	34	95	20	1050	12	10
	16	1255		42	120	22	1056		10
1200	10	1455	1220	38	115	25	1256	12	11
	16	1485		48	130	30	1260		12.5
1400	10	1675	1420	42	120	25	1460	12	12
	16	1685		52	145	30	1465		14.2
1600	10	1915	1620	46	130	25	1666	12	14
	16	1930		58	160	35	1668		16
1800	10	2115	1820	50	140	30	1866	15	15
	16	2130		62	170	35	1870		17.5
2000	10	2325	2020	54	150	30	2070	15	16
	16	2345		66	190	40	2072		20

Notes
- For drilling details see page 5-14.
- For tolerances see page 5-19.
- For facing types and dimensions see pages 5-20 and 5-21.

[17 OF 24] CONTINUED

Flanges

Range/Sizes - Slip On Flanges Code 12 (112) - EN 1092 / (BS4504)



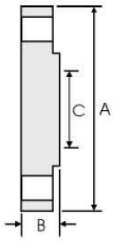
DN	PN	A	B	C	D	E	F
		mm	mm	mm	mm	mm	mm
10	10 & 16	90	18.0	14	20	30	3
15	10 & 16	95	22	14	20	35	3
20	10 & 16	105	27.5	16	24	45	4
25	10 & 16	115	34.5	16	24	52	4
32	10 & 16	140	43.5	16	26	60	5
40	10 & 16	150	49.5	16	26	70	5
50	10 & 16	165	61.5	18	28	84	5
65	10 & 16	185	77.5	18	32	104	6
80	10 & 16	200	90.5	20	34	118	6
100	10 & 16	220	116.0	20	40	140	6
125	10 & 16	250	141.5	22	44	168	6
150	10 & 16	285	170.5	22	44	195	8
200	10 & 16	340	221.5	24	44	246	8
250	10	395	276.5	26	46	298	10
	16	405		26	46	298	

DN	PN	A	B	C	D	E	F
		mm	mm	mm	mm	mm	mm
300	10	445	327.5	26	46	350	10
	16	460		28	46	350	
350	10	505	359.5	26	53	400	10
	16	520	359.0	30	57	400	
400	10	565	411.0	26	57	456	10
	16	580		32	63	456	
450	10	615	462.0	28	63	502	12
	16	640		34	68	502	
500	10	670	513.5	28	67	559	12
	16	715		34	73	559	
600	10	780	616.5	28	75	658	12
	16	840		36	83	658	

Notes
- The hubs of slip on (Code 12) flanges are parallel or have a draft <7 degrees.
- For drilling details see page 5-14.
- For tolerances see page 5-19.
- For facing types and dimensions see pages 5-20 and 5-21.

Flanges

Range/Sizes - Blank/Blind Flanges Code 05 (105) - EN 1092 / (BS4504)



DN	PN	A	B	C
		mm	mm	mm
10	10 & 16	90	14	-
15	10 & 16	95	14	-
20	10 & 16	105	16	-
25	10 & 16	115	16	-
32	10 & 16	140	16	-
40	10 & 16	150	16	-
50	10 & 16	165	18	-
65	10 & 16	185	18	55
80	10 & 16	200	20	70
100	10 & 16	220	20	90
125	10 & 16	250	22	115
150	10 & 16	285	22	140
200	10 & 16	340	24	190
250	10	395	26	235
	16	405	26	235
300	10	445	26	285
	16	460	28	285
350	10	505	26	325
	16	520	30	325

DN	PN	A	B	C
		mm	mm	mm
400	10	565	26	375
	16	580	32	375
450	10	615	28	425
	16	640	34	425
500	10	670	28	475
	16	715	36	475
600	10	780	34	575
	16	840	44	575
700	10	895	38	670
	16	910	48	670
800	10	1015	42	770
	16	1025	52	770
900	10	1115	46	860
	16	1125	58	860
1000	10	1230	52	960
	16	1255	64	960
1200	10	1455	60	1160
	16	1485	76	1160

Notes
- Dimension B is the range thickness with or without a raised face.
- Dimension C is the maximum diameter of the centre portion of a blank flange face which need not be machined.
- For drilling details see page 5-14.
- For tolerances see page 5-19.
- For facing types and dimensions see pages 5-20 and 5-21.

[19 OF 24] CONTINUED

Flanges

Specifications - EN 1092 (BS4504)

Dimensions and tolerances

Dimension		Range	Tolerance mm
Flange Facings (see page 5-20 and 5-21)	Eccentricity of machined facing diameters	≤ DN 100	1.0
		> DN 100	2.0
	a (type B facing height)	2mm	+0, -1.0
		3mm	+0, -2.0
		4mm	+0, -3.0
		5mm	+0, -4.0
		6mm	+0, -5.0
	b (type C and E facing height)	All	+0.5, -0
	b (type G facing height)	All	+0, -0.5
	b (type H facing height, outer)	All	+0.2, -0
	c (type D and F facing height)	All	+0, -0.5
	d (type H facing height, inner)	All	+0.5, -0
	B and E (facing diameters)	All	+0, -0.5
	C and D (facing diameters)	All	+0.5, -0
Surface Finish	Facing types A, B, E and F	All, turning	Ra = 3.2 µm min, 12.5 µm max
		All, other than turning	Ra = 3.2 µm min, 6.3 µm max
	Facing types C, D, G and H	All	Ra = 0.8 µm min, 3.2 µm max
Flange Drilling Details (see page 5-14)	B (diameter of bolt circle)	Bolt sizes M10 to M24	±0.9
		Bolt sizes M27 to M45	±1.4
	Centre to centre of adjacent bolt holes	Bolt sizes M10 to M24	±0.45
		Bolt sizes M27 to M45	±0.7
All	A (outside diameter)	≤ DN 150	±2.0
		> DN 150 ≤ DN 500	±3.0
		> DN 500 ≤ DN 1200	±5.0
		> DN 1200 ≤ DN 1800	±7.0
		> DN 1800	±10.0
	C (flange thickness, machined on both faces)	≤ 18mm thickness	±1.0
		> 18mm ≤ 50mm thickness	±1.0
		> 50mm thickness	±1.0
	C (flange thickness, machined on front face)	≤ 18mm thickness	+2.0, -1.0
		> 18mm ≤ 50mm thickness	+4.0, -1.5
		> 50mm thickness	+7.0, -2.0
Weld Neck Flanges, Code 11 (see page 5-16)	B (outside diameter of hub at welding end)	≤ DN 125	+3.0, -0
		> DN 125 ≤ DN 1200	+4.5, -0
		> DN 1200	+6.0, -0
	F (hub diameter)	≤ DN 50	+0, -2.0
		> DN 50 ≤ DN 150	+0, -4.0
		> DN 150 ≤ DN 300	+0, -6.0
		> DN 300 ≤ DN 600	+0, -8.0
		> DN 600 ≤ DN 1200	+0, -10.0
	D (length through hub)	≤ DN 80	±1.5
		> DN 80 ≤ DN 250	±2.0
		> DN 250	±3.0
Slip on, Code 12 (see page 5-17) and Threaded, Code 13 Flanges	E (slip on flange hub diameter) B (threaded flange hub diameter)	≤ DN 50	+1.0, -0
		> DN 50 ≤ DN 150	+2.0, -0
		> DN 150 ≤ DN 300	+4.0, -.0
		> DN 300 ≤ DN 600	+8.0, -0
		> DN 600 ≤ DN 1200	+12.0, -0
		> DN 1200 ≤ DN 1800	+16.0, -0
		> DN 1800	+20.0, -0
	B (slip on bore diameter)	< DN 100	+0.5, -0
		> DN 100 ≤ DN 400	+1.0, -0
		> DN 400 ≤ DN 600	+1.5, -0
		> DN 600	+3.0, -0
	D (length through hub)	Same as Weld Neck D	
Blank Flanges, Code 05 (see page 5-18)	B (flange thickness)	Same as C for all other flanges	
	C (unmachined centre portion)	Maximum specified	

[20 OF 24] CONTINUED

Flanges

Specifications - EN 1092 (BS4504)

Flange facings

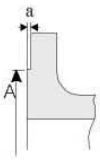
EN 1092 (BS4504) flange facing types A to H are defined below. The dimensions vary with pipe size (DN) and pressure rating (PN) as detailed in the table on page 5-21.

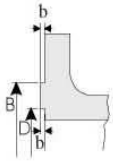
Type A
Flat face

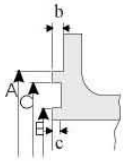
Type B
Raised face

Type C
Tongue face

Type D
Groove face





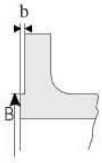


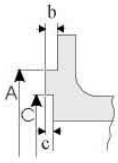
Type E
Spigot

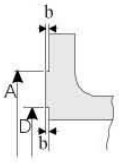
Type F
Recess

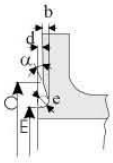
Type G
'O' Ring recess

Type H
'O' Ring groove









[21 OF 24] CONTINUED

Flanges

Specifications - EN 1092 (BS4504)

Flange facing dimensions

DN	PN 10	PN 16	Face Dimensions									
	A		B	C	D	E	a	b	c	d	α	e
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
10	40	40	34	35	24	23	2	4	3	2	-	5
15	45	45	39	40	29	28	2	4	3	2	-	5
20	58	58	50	51	36	35	2	4	3	2	41°16′	5
25	68	68	57	58	43	42	2	4	3	2	41°16′	5
32	78	78	65	66	51	50	2	4	3	2	41°16′	5
40	88	88	75	76	61	60	3	4	3	2	41°16′	5
50	102	102	87	88	73	72	3	4	3	2	41°16′	5
65	122	122	109	110	95	94	3	4	3	2	41°16′	5
80	138	138	120	121	106	105	3	4	3	2	41°16′	5
100	158	158	149	150	129	128	3	4.5	3.5	2.5	32°15′	6
125	188	188	175	176	155	154	3	4.5	3.5	2.5	32°15′	6
150	212	212	203	204	183	182	3	4.5	3.5	2.5	32°15′	6
200	268	268	259	260	239	238	3	4.5	3.5	2.5	32°15′	6
250	320	320	312	313	292	291	3	4.5	3.5	2.5	32°15′	6
300	370	378	363	364	343	342	4	4.5	3.5	2.5	32°15′	6
350	430	438	421	422	395	394	4	5	4	3	27°24′	7
400	482	490	473	474	447	446	4	5	4	3	27°24′	7
450	532	550	523	524	497	496	4	5	4	3	27°24′	7
500	585	610	575	576	549	548	4	5	4	3	27°24′	7
600	685	725	675	676	649	648	5	5	4	3	27°24′	7
700	800	795	777	778	751	750	5	5	4	3	27°24′	7
800	905	900	882	883	856	855	5	5	4	3	27°24′	7
900	1005	1000	987	988	961	960	5	5	4	3	27°24′	7
1000	1110	1115	1092	1094	1062	1060	5	6	5	4	28°39′	8
1200	1330	1330	1292	1294	1262	1260	5	6	5	4	28°39′	8
1400	1535	1530	1492	1494	1462	1460	5	6	5	4	28°39′	8
1600	1760	1750	1692	1694	1662	1660	5	6	5	4	28°39′	8
1800	1960	1950	1982	1894	1862	1860	5	6	5	4	28°39′	8
2000	2170	2150	2092	2094	2062	2060	5	6	5	4	28°39′	8

Flanges

Range/Sizes/Specifications - EN 1092 (BS4504)

Masses of flanges PN 16

DN	Type 01	Type 05	Type 11	Type 12
	kg	kg	kg	kg
10	0.604	0.722	0.678	0.646
15	0.670	0.813	0.768	0.722
20	0.936	1.14	1.09	1.04
25	1.11	1.38	1.30	1.25
32	1.82	2.03	1.91	1.81
40	2.08	2.35	2.15	2.06
50	2.73	2.88	2.53	2.39
65	3.16[1]	3.51[1]	3.03[1]	2.97[1]
80	3.60	4.61	3.92	3.78
100	4.39	5.65	4.62	4.38
125	5.41	8.13	6.30	6.07
150	7.14	10.5	7.81	7.24
200	9.73	16.2	11.5	9.80
250	14.2	25.0	16.7	13.6
300	19.0	35.1	22.1	17.2
350	28.2	48.0	32.8	27.9
400	35.9	63.5	41.1	35.7
450	46.1	96.6	50.6	45.0
500	64.0	133	66.2	60.4
600	102	226	96.5	94.0
700	-	285	104	-
800	-	388	122	-
900	-	483	155	-
1000	-	640	233	-
1200	-	-	390	-
1400	-	-	495	-
1600	-	-	760	-
1800	-	-	929	-
2000	-	-	1185	-

1 With 8 bolt holes.

[23 OF 24] CONTINUED

Flanges

Range/Sizes/Specifications - BS10 Plate Flanges

British Standard BS 10 : 1962 - Specification for Flanges and Bolting for Pipes, Valves, and Fittings. This covers plain, boss, integrally cast or forged, and welding neck type flanges, in ten tables. Although BS 10 is obsolescent, it remains in use for the dimensions of light duty, economy stainless steel flanges in applications where corrosion resistance and/or hygiene, rather than high pressures and temperatures, are the primary considerations. The following tables detail the applicable standard dimensions from Tables D, E, F and H of BS 10.

Flange dimensions based on tables D and E of BS 10 : 1962

Common	BS 10 Table D Dimensions					BS 10 Table E Dimensions				
Flange Size Designation (Nominal Bore of Pipe)	Overall Diameter of Flange	Flange Thickness	Bolt Circle Diameter	Number of Bolts	Diameter of Bolts	Overall Diameter of Flange	Flange Thickness	Bolt Circle Diameter	Number of Bolts	Diameter of Bolts
in	in	in	in		in	in	in	in		in
1/2	3 3/4	3/16	2 5/8	4	1/2	3 3/4	1/4	2 5/8	4	1/2
3/4	4	3/16	2 7/8	4	1/2	4	1/4	2 7/8	4	1/2
1	4 1/2	3/16	3 1/4	4	1/2	4 1/2	9/32	3 1/4	4	1/2
1 1/4	4 3/4	1/4	3 7/16	4	1/2	4 3/4	5/16	3 7/16	4	1/2
1 1/2	5 1/4	1/4	3 7/8	4	1/2	5 1/4	11/32	3 7/8	4	1/2
2	6	5/16	4 1/2	4	5/8	6	3/8	4 1/2	4	5/8
2 1/2	6 1/2	5/16	5	4	5/8	6 1/2	13/32	5	4	5/8
3	7 1/4	3/8	5 3/4	4	5/8	7 1/4	7/16	5 3/4	4	5/8
3 1/2	8	3/8	6 1/2	4	5/8	8	15/32	6 1/2	8	5/8
4	8 1/2	3/8	7	4	5/8	8 1/2	1/2	7	8	5/8
5	10	1/2	8 1/4	8	5/8	10	9/16	8 1/4	8	5/8
6	11	1/2	9 1/4	8	5/8	11	11/16	9 1/4	8	3/4
7	12	1/2	10 1/4	8	5/8	12	3/4	10 1/4	8	3/4
8	13 1/4	1/2	11 1/2	8	5/8	13 1/4	3/4	11 1/2	8	3/4
9	14 1/2	5/8	12 3/4	8	5/8	14 1/2	13/16	12 3/4	12	3/4
10	16	5/8	14	8	3/4	16	7/8	14	12	3/4
12	18	3/4	16	12	3/4	18	1	16	12	7/8
13	19 1/4	3/4	17 1/4	12	3/4	19 1/4	1	17 1/4	12	7/8
14	20 3/4	7/8	18 1/2	12	7/8	20 3/4	1 1/8	18 1/2	12	7/8
15	21 3/4	7/8	19 1/2	12	7/8	21 3/4	1 1/4	19 1/2	12	7/8
16	22 3/4	7/8	20 1/2	12	7/8	22 3/4	1 1/4	20 1/2	12	7/8
17	24	1	21 3/4	12	7/8	24	1 3/8	21 3/4	12	7/8
18	25 1/4	1	23	12	7/8	25 1/4	1 3/8	23	16	7/8
19	26 1/2	1	24	12	7/8	26 1/2	1 1/2	24	16	7/8
20	27 3/4	1 1/8	25 1/4	16	7/8	27 3/4	1 1/2	25 1/4	16	7/8
21	29	1 1/8	26 1/2	16	7/8	29	1 5/8	26 1/2	16	1
22	30	1 1/8	27 1/2	16	1	30	1 3/4	27 1/2	16	1
23	31	1 1/8	28 1/2	16	1	31	1 3/4	28 1/2	16	1
24	32 1/2	1 1/4	29 3/4	16	1	32 1/2	1 7/8	29 3/4	16	1 1/8

Notes
- Bolt hole diameters are as follows:
  For 1/2 in and 5/8 in bolts, the bolt hole shall be 1/16 in larger than the bolt diameter.
  For 3/4 in bolts and larger, the bolt hole shall be not more than 1/8 in larger than the bolt diameter.