

Technical Literature of Flanges

Hebei Xinqi Pipeline Equipment Co., Ltd



信奇管道
XINQI PIPELINE



No.107 Xiwang Ave, Xiwang New Industry Zone, Mengcun, Cangzhou, Hebei, China
P.O. Box: 061400
Tel: +86 317 6856613 Fax: +86 317 6856612
Website: www.hbxinqi.cn

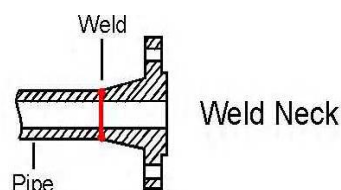
Flanges - General Information

A Flange is a method of connecting pipes, valves, pumps and other equipment to form a pipework 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

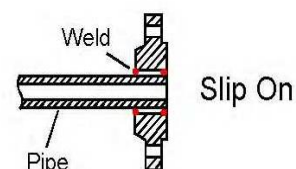
Weld Neck

This flange is circumferentially welded into the system at its neck which means that the integrity of the butt welded 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



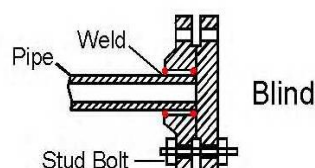
Slip-on

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



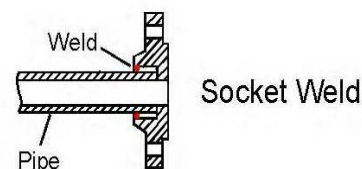
Blind

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.



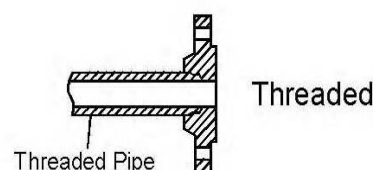
Socket Weld

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.



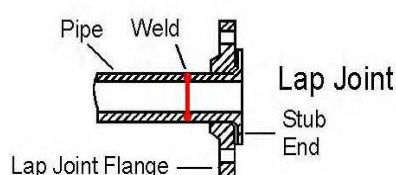
Threaded

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.



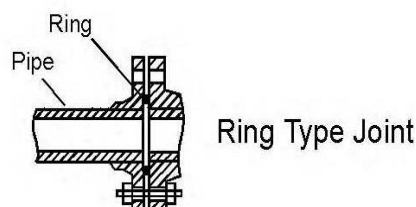
Lap Joint

These flanges are always used with either a stub end or taft which is butt welded 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. To reduce cost these flanges can be supplied without a hub and/or in treated, coated carbon steel.



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.



Flanges - General Information

Specifications

ASME B16.5 ASME B16.47 BS 4504 BS 3293 BS 10

Manufacture

Summary of materials used for flanges

	ASME/ ANSI B16.5	ASME B16.47 Series A (or MSS SP-44 ¹)	ASME B16.47 Series B (or API 605 ²)	BS 4504	BS 3293	BS 10 ³
Forging (ASTM A 182)	✓	✓	✓	✓	✓	✓
Plate (ASTM A 240) ⁴	✓			✓		✓
Bar ⁵						✓
Casting ⁶	✓			✓		✓

Notes

- 1 MSS SP-44 flanges are designated Series A flanges in ASME B16.47.
- 2 API 605 has been cancelled. API 605 flanges are designated Series B flanges in ASME B16.47.
- 3 BS 10, although obsolete, remains in use for light weight economy stainless steel flanges.
- 4 Within specification ANSI B16.5, plate can only be used to provide blind flanges.
- 5 Most small BS 10 flanges are made from bar.
- 6 Castings are not included in this manual.

- Materials. Most standards specify the material from which the flange is produced. The purchaser should specify the exact requirements.
- Flange Sizes. All sizes and grades compatible to standard pipe ranges and wall thicknesses (pressure ratings) are available. The table below provides a summary.
- Flange Face. There are various face configurations for flanges. Typically: flat face, raised face, tongue and groove, ring joint.
- Face Finish. The finish on the face of a flange is measured as an Arithmetical Average Roughness Height (AARH). The finish is determined by the standard used. For example, ANSI B16.5 specifies face finishes within a range 125AARH - 500AARH (3.2 Ra to 12.5 Ra). Other finishes are available on request, for example 1.6 Ra max, 1.6/3.2 Ra, 3.2/6.3 Ra or 6.3/12.5 Ra. The range 3.2/6.3 Ra is most common.

Summary of flange sizes specified by common standards

Flange Type	Specifications				
	ASME/ANSI B16.5	ASME B16.47 Series A (or MSS SP-44 ¹)	ASME B16.47 Series B (or API 605 ²)	BS 4504 (ISO 7005-1)	BS 3293
	Nominal Pipe Sizes				
	< NPS 26	≥NPS 26	≥NPS 26	DN 10 to DN 4000	≥ NPS 26
	Nominal Pressure (Class)				
	Class (lb)	Class (lb)	Class (lb)	PN (bar)	Class (lb)
Weld Neck	150-2500	150-900	75-900	2.5-40	150-600
Slip-on	150-1500	-	-	2.5-40	150-600
Blind	150-2500	300-900	300-900	2.5-40	-
Lap Joint	150-2500	-	-	6-40 ³	-
Socket Weld	150-1500	-	-	N/A	-
Threaded	150-2500	-	-	6-40	-
Flat/Raised Facings	As above	As above	As above	As above	As above
Ring Joint Facings	150-2500	300-900	300-900	2.5-40	300-600
Other Facings	150-2500 ³	-	-	2.5-40	-

Notes

- 1 MSS SP-44 flanges are designated Series A flanges in ASME B16.47. It also covers flanges in the range NPS 12 to 24, these being equivalent to ASME/ANSI B16.5 flanges in the same range (except for the addition of NPS 22 in MSS SP-44).
- 2 API 605 has been cancelled. API 605 flanges are designated Series B flanges in ASME B16.47. Ranges quoted are based on ASME B16.47 Series B.
- 3 Dimensions not covered in this summary.

BS 10 : 1962

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 Flange Size Designation (Nominal Bore of Pipe)	BS 10 Table D Dimensions					BS 10 Table E Dimensions				
	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
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 / ₈	18 ¹ / ₂	12	⁷ / ₈
15	21 ³ / ₄	⁷ / ₈	19 ¹ / ₂	12	⁷ / ₈	21 ³ / ₄	¹ / ₄	19 ¹ / ₂	12	⁷ / ₈
16	22 ³ / ₄	⁷ / ₈	20 ¹ / ₂	12	⁷ / ₈	22 ³ / ₄	¹ / ₄	20 ¹ / ₂	12	⁷ / ₈
17	24	1	21 ³ / ₄	12	⁷ / ₈	24	¹³ / ₈	21 ³ / ₄	12	⁷ / ₈
18	25 ¹ / ₄	1	23	12	⁷ / ₈	25 ¹ / ₄	¹³ / ₈	23	16	⁷ / ₈
19	26 ¹ / ₂	1	24	12	⁷ / ₈	26 ¹ / ₂	¹ / ₂	24	16	⁷ / ₈
20	27 ³ / ₄	¹ / ₈	25 ¹ / ₄	16	⁷ / ₈	27 ³ / ₄	¹ / ₂	25 ¹ / ₄	16	⁷ / ₈
21	29	¹ / ₈	26 ¹ / ₂	16	⁷ / ₈	29	¹⁵ / ₈	26 ¹ / ₂	16	1
22	30	¹ / ₈	27 ¹ / ₂	16	1	30	¹³ / ₄	27 ¹ / ₂	16	1
23	31	¹ / ₈	28 ¹ / ₂	16	1	31	¹³ / ₄	28 ¹ / ₂	16	1
24	32 ¹ / ₂	¹ / ₄	29 ³ / ₄	16	1	32 ¹ / ₂	¹⁷ / ₈	29 ³ / ₄	16	¹ / ₈

Note

- 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.

BS 10 : 1962

Flange Dimensions Based on Tables F and H of BS 10 : 1962

Common Flange Size Designation (Nominal Bore of Pipe)	BS 10 Table F Dimensions					BS 10 Table H Dimensions				
	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
1/2	3 3/4	3/8	2 5/8	4	1/2	4 1/2	1/2	3 1/4	4	5/8
3/4	4	3/8	2 7/8	4	1/2	4 1/2	1/2	3 1/4	4	5/8
1	4 3/4	3/8	3 7/16	4	5/8	4 3/4	9/16	3 7/16	4	5/8
1 1/4	5 1/4	1/2	3 7/8	4	5/8	5 1/4	1 1/16	3 7/8	4	5/8
1 1/2	5 1/2	1/2	4 1/8	4	5/8	5 1/2	1 1/16	4 1/8	4	5/8
2	6 1/2	5/8	5	4	5/8	6 1/2	3/4	5	4	5/8
2 1/2	7 1/4	5/8	5 3/4	8	5/8	7 1/4	3/4	5 3/4	8	5/8
3	8	5/8	6 1/2	8	5/8	8	7/8	6 1/2	8	5/8
3 1/2	8 1/2	3/4	7	8	5/8	8 1/2	7/8	7	8	5/8
4	9	3/4	7 1/2	8	5/8	9	1	7 1/2	8	5/8
5	11	7/8	9 1/4	8	3/4	11	1 1/8	9 1/4	8	3/4
6	12	7/8	10 1/4	12	3/4	12	1 1/8	10 1/4	12	3/4
7	13 1/4	7/8	11 1/2	12	3/4	13 1/4	1 1/4	11 1/2	12	3/4
8	14 1/2	1	12 3/4	12	3/4	14 1/2	1 1/4	12 3/4	12	3/4
9	16	1 1/8	14	12	7/8	16	1 3/8	14	12	7/8
10	17	1 1/8	15	12	7/8	17	1 3/8	15	12	7/8
12	19 1/4	1 1/4	17 1/4	16	7/8	19 1/4	1 5/8	17 1/4	16	7/8
13	20 3/4	1 3/8	18 1/2	16	1	20 3/4	1 3/4	18 1/2	16	1
14	21 3/4	1 3/8	19 1/2	16	1	21 3/4	1 7/8	19 1/2	16	1
15	22 3/4	1 1/2	20 1/2	16	1	22 3/4	2	20 1/2	16	1
16	24	1 5/8	21 3/4	20	1	24	2 1/8	21 3/4	20	1
17	25 1/4	1 3/4	23	20	1	25 1/4	2 1/4	23	20	1
18	26 1/2	1 3/4	24	20	1 1/8	26 1/2	2 3/8	24	20	1 1/8
19	27 3/4	1 3/4	25 1/4	20	1 1/8	27 3/4	2 1/2	25 1/4	20	1 1/8
20	29	2	26 1/2	24	1 1/8	29	2 5/8	26 1/2	24	1 1/8
21	30	2	27 1/2	24	1 1/8	30	2 3/4	27 1/2	24	1 1/8
22	31	2 1/8	28 1/2	24	1 1/8	31	2 3/4	28 1/2	24	1 1/8
23	32 1/2	2 1/4	29 3/4	24	1 1/4	32 1/2	3	29 3/4	24	1 1/4
24	33 1/2	2 1/4	30 3/4	24	1 1/4	33 1/2	3	30 3/4	24	1 1/4

Note

- 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.