



Installation guidelines for ductile iron flanged joints

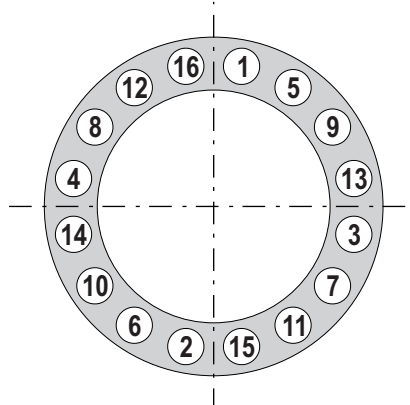
Notes

- Grade 4.6 galvanised mild steel or Grade 316 property class 50 stainless steel bolts are proposed for joining Class 16 flanges except for DN900.
- Grade 8.8 galvanised steel or Grade 316 property class 70 stainless steel stud bolts are proposed for joining Class 35 flanges & DN900 Class 16 flanges.
- Bolt tensions have been calculated to counter the force due to expected internal pressure and to provide adequate sealing stress on the nominated gasket material, without exceeding the maximum allowable gasket stress at the time of installation. The necessary torques to induce these tensions are estimated for raised face ductile iron flanges with common surface finishes used in the Water Industry.
- The application of excessive torque at the time of installation may overstress the gasket causing crushing or extrusion, which can lead to leakage at operating pressures.
- The surface conditions of the threads as a result of rust, plating, coating and lubrication are the predominant factors influencing the torque/tension relationship. However there are many others including thread fit, surface texture and the speed and continuity of tightening.
- The flange faces are assumed to have a surface roughness of $Ra = 10 - 12\mu m$.
- A torque wrench is most commonly utilised to achieve the required bolt tension, however in critical applications a hydraulic tensioner should be used.
- Special care should be taken when joining screw-on flanges as excessive torques can cause damage to the epoxy seal.

Installation Guidelines - Flanged Joints

1. Thoroughly clean the flange faces to be joined, ensuring there is no dirt, particles of foreign matter, protrusions or coating build-up on the mating surfaces. Use a scraper or wire brush to remove any irregularities.
2. Ensure that the mating threads of all nuts and bolts are clean and in good condition.
3. Evenly apply a suitable lubricant (e.g. molybdenum disulphide) to all mating threads, including the nut load bearing face.
4. Align the flanges to be joined and ensure that the components are satisfactorily supported to avoid bending stress on the flanged joint during and after assembly.
5. Insert four bolts in locations 1 to 4 as indicated on the diagram below and position the insertion gasket on the bolts, taking care not to damage the gasket surface.
6. Offer the adjoining flange to the bolts, taking care to maintain alignment and support of the components.
7. Tighten nuts to finger tight and check alignment of flange faces and gasket.
8. Insert the remaining bolts and tighten nuts to finger tight.
9. Determine the required bolt tension and the estimated torque from the Estimated Tightening Torque Values Tables.
10. Tighten nuts to 30% of estimated torque using the star pattern detailed on the diagram below.
11. Tighten to 60% of estimated torque using the same tightening sequence.
12. Tighten to 100% of estimated torque using the same tightening sequence.
13. Finish with one final pass, torquing in a clockwise direction.

Star Pattern Tightening Sequence



Installation Guidelines - DI Flanged Joints

Standard Pressure Flanges AS 4087 Figure B5 Class 16

Note: Grade 4.6 Galvanised Steel Bolts & Nuts or Grade 316 Class 50 Stainless Steel Bolts & Nuts. Full Face Gasket 3mm, EPDM Seal-16.

Nominal Size DN	Bolt Size	Number of Bolts	Length of Bolts mm	Bolt Tension KN	Estimated Torque Nm		
					Lightly Oiled Gal $\mu = 0.22$	Well Lubricated Gal $\mu = 0.15$	Well Lubricated S/S $\mu = 0.20$
80	M16	4	65	20	70	50	65
100	M16	4	75	20	70	50	65
150	M16	8	75	20	70	50	65
200	M16	8	75	20	70	50	65
225	M16	8	75	25	90	60	80
250	M20	8	90	35	160	110	140
300	M20	12	100	35	160	110	140
375	M24	12	120	50	270	180	240
450	M24	12	120	55	290	200	270
500	M24	16	120	55	290	200	270
600	M27	16	130	70	420	290	380
750	M30	20	140	80	530	360	480
*900	M33	24	195	200	1460	990	1320

* Grade 8.8 Galvanised Steel Studs & Nuts or Grade 316 Class 70 Stainless Steel Studs & Nuts. Full Face Gasket 1.5mm, TEADIT NA1000 Compressed Fibre used for DN900 Class 16 flanges.

High Pressure Flanges AS 4087 Figure B6 Class 35

Note: Grade 8.8 Galvanised Steel Studs & Nuts or Grade 316 Class 70 Stainless Steel Studs & Nuts. Full Face Gasket 1.5mm, TEADIT NA1000 Compressed Fibre.

Nominal Size DN	Stud Size	Number of Studs	Length of Studs mm	Stud Tension KN	Estimated Torque Nm		
					Lightly Oiled Gal $\mu = 0.22$	Well Lubricated Gal $\mu = 0.15$	Well Lubricated S/S $\mu = 0.20$
80	M16	8	110	50	180	120	160
100	M16	8	110	50	180	120	160
150	M20	12	130	80	350	240	320
200	M20	12	130	80	350	240	320
225	M24	12	150	115	610	420	550
250	M24	12	150	115	610	420	550
300	M24	16	150	115	610	420	550
375	M27	16	170	150	900	610	810
450	M30	20	190	180	1190	810	1080
500	M30	24	190	180	1190	810	1080
600	M33	24	210	230	1670	1140	1520
750	M33	28	210	230	1670	1140	1520
900	M36	32	230	270	2140	1460	1950

- "Lightly Oiled" refers to the application of a good quality lubricating oil and is the usual as received condition of fasteners.
- "Well lubricated" refers to the application of molybdenum disulphide grease, or equivalent antiseize compound.
- The estimated torques provided in the tables above are based on the coefficients of friction (μ) indicated. Where other coefficients apply, alternative torques should be calculated.
- Required bolt tensions and estimated torques have been assessed using established engineering principles, however, variation in installation procedures may result in different requirements.
- It is commonly accepted that the use of a torque wrench to measure bolt tension has an accuracy of $\pm 25\%$

Disclaimer: The information provided within is based on established engineering principles and is offered by Tyco Water in good faith as a source of information for its customers. Successful installation depends on numerous factors outside the Company's control and installers should be aware that these guidelines might not be successful for every installation. Tyco Water disclaims any liability to any person who solely relies on this information for the purposes of making a flange joint.