

## Fitting guide for InsoLion® - Flange Isolation Kits

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Please note that this product and therefore installation procedure is not suitable for use with the following flange types and sizes:

ASME B16.5 RTJ (Ring Type Joint Flanges) <1.1/2" N.B. Class 150, <1" N.B.  
Classes 300 to 1500

### Method of Assembly

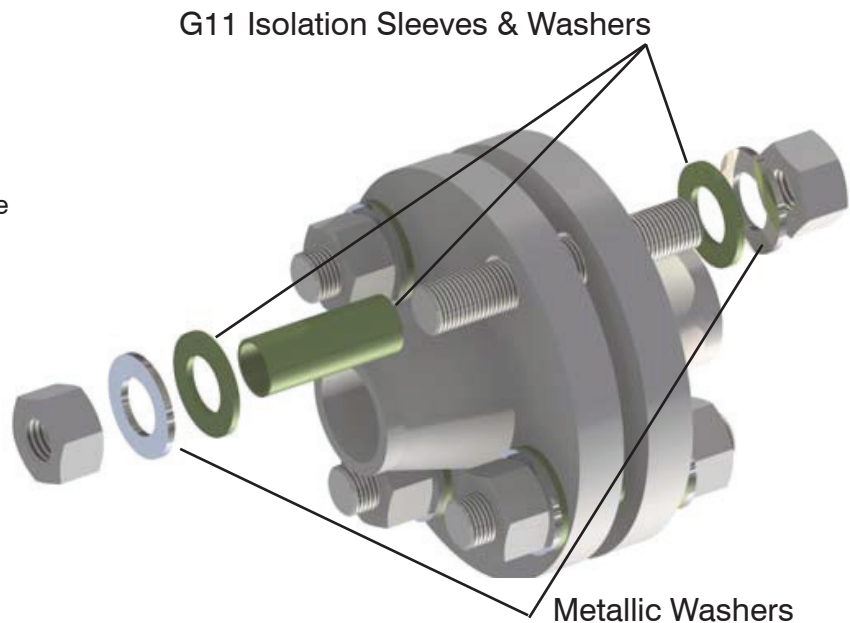
- 1 Ensure all components in the kit are present, undamaged, and are correct for the joint to be assembled. Along with the main central gasket there should be one isolation sleeve per bolt together with two isolation washers and two metal washers per bolt.
- 2 Flange faces should be thoroughly cleaned and examined. Care should be taken to ensure that the sealing surfaces are free from scratches, pitting, corrosion, and debris. Repairs should be made as necessary. Flange face surface roughness should be within the range of 3.2 – 6.3  $\mu\text{m Ra}$ .
- 3 Use the isolation sleeves supplied to check the alignment of the two flanges for concentricity and parallelism, and adjust accordingly. The isolation sleeves should freely slide all the way through the two opposing bolt holes once the flanges are properly aligned.
- 4 Clean and inspect all nuts, studs or bolts ensuring that they are free of corrosion, damage and debris prior to assembly, and that the nuts run freely on the threads. Check that the fasteners are the correct length to allow for gasket thickness and the use of washers. New fasteners of the correct grade may be required if existing nuts, studs or bolts are damaged.
- 5 Apply a non-metallic based bolt lubricant to the bolt and nut contact faces ensuring that all bolt operational faces are coated liberally.
- 6 Install one steel washer and one isolating washer, so that the steel washer is in contact with the bolt head (or nut if studs are used). **The isolation washer must not be located against the nut or bolt head.** Slide the isolating sleeve over the stud and through the two fitted washers. Ensure that the flat face of the nut is in contact with the washer. See Figure 1.

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7 Insert the bolt assembly into the bolt holes around the lower half of the bolt pattern. The bolt assembly should slide freely through the opposing flanges bolt holes. If the bolt assembly does not slide freely, recheck the flange alignment before continuing.

8 Lubricate the exposed bolt threads using a non-metallic based lubricant and install the washers as per instructions in step 6. The isolation washers should now be contacting the flanges.



**Figure 1- Washer, Bolt and Stud Assembly Order**

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9 Thread the lubricated nuts onto the bolts or studs, ensuring full thread engagement between the nut and the bolt or stud. Only screw down two threads until all bolts are located.

10 Ensure all gasket elements including the PTFE insert are present and the face of the GRE gasket is clean and undamaged. Insert the gasket between the flanges and ensure that it is resting centrally on the isolation sleeves. Check the concentricity of the gasket to the centre of the flange bolting arrangement.

11 Install the remaining, top half of the bolt assemblies as detailed in steps 4 – 9

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### Method for bolt torque tensioning of standard assembly

The following procedure shall be used for the correct bolt tightening of the flange assembly. Other alternative tightening patterns are given in documents such as ASME PCC-1, but in all cases the purpose is to load the gasket evenly and in stages.

1. Number the bolts sequentially, starting with number 1 and working round the flange in a clockwise manner.
2. Select the correct bolt torque, for the appropriate nominal bore and flange pressure class, as given in the torque tables in Table 2. (Note; If the size and the pressure class of the jointed flange assembly is not listed please contact James Walker for further advice).
3. Following the torque pattern corresponding to the number of bolts in the flange assembly, given in Table 1. Complete the following steps;
  - a. Hand tighten each fastener assembly
  - b. “Snug-up” each bolt at a light applied torque (each bolt to approx. 13 - 27 N.m. for example).
  - c. Tighten to 30% of the target torque value
  - d. Tighten each bolt to 60% of the target torque value as per ESA/FSA No.009/98
  - e. Tighten each bolt to 100% of the target torque value
  - f. Tighten in a clockwise manner to 100% of the target torque value
  - g. Continue to check-tighten the nut and bolt combinations to 100% of the target torque value until no further nut rotation occurs.
4. If time permits, wait a minimum of 4 hours and then repeat step g. This will restore any drop in bolt load lost due to creep compression on the gasket; and mating losses between the mating stud and the nut threads.

### Notes

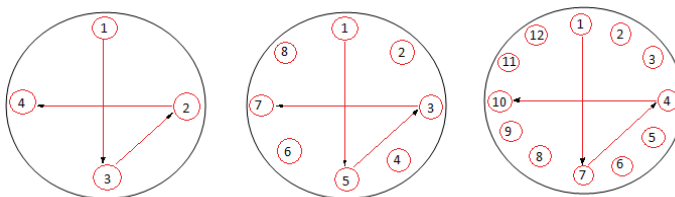
Bolt torques listed in Table 2 assume a lubricated bolt and nut resulting in a 0.2 “K” factor / approximate 0.155 coefficient of friction.

No. of Bolts	Sequential Tightening Pattern
4	1-3-2-4
8	1-5-3-7-2-6-4-8
12	1-7-4-10-2-8-5-11-3-9-6-12
16	1-9-5-13-3-11-7-15-2-10-6-14-4-12-8-16
20	1-11-6-16-3-13-8-18-5-15-10-20-2-12-7-17-4-14-9-19
24	1-13-7-19-4-16-10-22-2-14-8-20-5-17-11-23-3-15-9-21-6-18-12-24
28	1-15-8-22-4-18-11-25-6-20-13-27-2-16-9-23-5-19-12-26-7-21-14-28-3-17-10-24

**Table 1-** Sequential tightening pattern to follow based on the number of bolts

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**Figure 2** - Typical numbering sequence for flanges with 4, 8 and 12 bolt holes, indicating tightening sequence. For flanges with more than 4 bolts this sequence should be repeated but with the starting bolt position moved from bolt 1 to bolt 2.



Nominal Pipe Size	Bolt Torque Values per Flange Pressure Class (ft-lbs)					
	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
1/2	30	30	30	105	105	105
3/4	30	60	60	116	116	115
1	30	60	60	180	180	180
1 1/4	40	70	70	199	200	300
1 1/2	40	115	115	283	285	440
2	80	70	70	180	200	300
2 1/2	85	115	115	255	285	440
3	100	135	160	255	450	690
3 1/2	80	135	225			
4	80	135	275	475	715	1,200
5	125	165	405	710	1,155	1,865
6	130	165	365	545	910	2,800
8	180	255	560	970	1,550	2,800
10	215	325	690	970	2,440	4,870
12	245	455	690	1,010	2,650	6,970
14	330	455	860	1,270	3,400	
16	330	645	1,210	1,730	4,780	
18	450	645	1,560	2,620	6,770	
20	450	690	1,610	3,230	8,490	
24	640	1,100	2,480	5,330	13,380	

**Table 2** - Table for torque values for each nominal pipe size and flange pressure class. Torque values are for standard weld neck raised face and RTJ flanges, per flange specifications ASME B16.5. Please contact James Walker for torque values on all other flange types.

Safety Data Sheets are available on request  
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