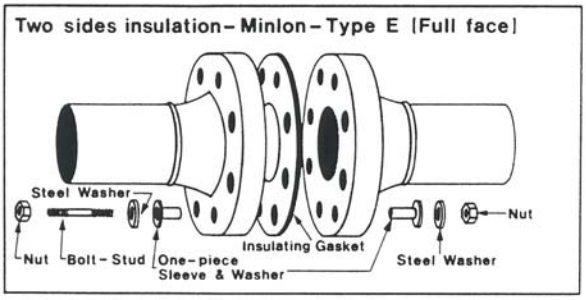
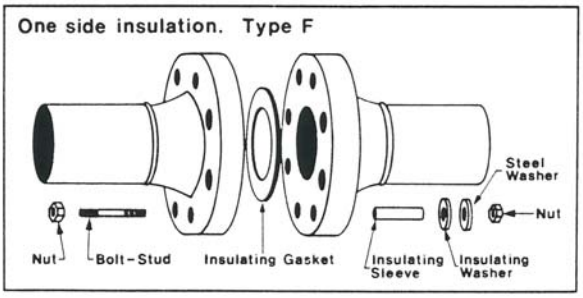
Central Plastics Company
39605 Independence
Shawnee, OK 74801
PH: 800.654.3872
FX: 800.733.5993
www.centralplastics.com

Flange Insulation

Recommended Procedure For Installation Of Electrical Insulation Materials





All piping and piping components to be installed should be free of foreign materials and construction debris.

The gasket seating surface should be free from tool marks, scratches, pits, deposits or gouges greater than the regular machining marks in a circular pattern (excepted of the specified surface finish typically 125-200 AARH). If the seating surface is damaged, it should be machined within the tolerance of the flange specification. If re-machining is not possible, the flange should be replaced.

Stud tensioning can be achieved using a torque wrench and other tensioning devices such as hand wrench, Impact wrench and hydraulic wrenches. Raymond Bolt Gage PDX934 or Stres Mike may be used to measure the stresses in the studs rather than torque values. A uniformity in tensioning is more important than a particular stress or torque level.

Installation Procedures

1. Inspect the gasket kits and verify that the material is as specified and that the material is not damaged.

2. Clean the bolting materials. Apply lubricant or anti-seizing compound to all threads required for engagement with nuts and nut facings.

3. Align flange faces so that they are parallel and concentric with each other within 0.010 inch without external loading or springing.

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4. Install new gasket. DO NOT REUSE OLD GASKET OR USE MULTIPLE GASKETS.

5. Line up bolt holes by driving two tapered drift pins in opposite directions to each other into two diametrically opposite bolt holes.

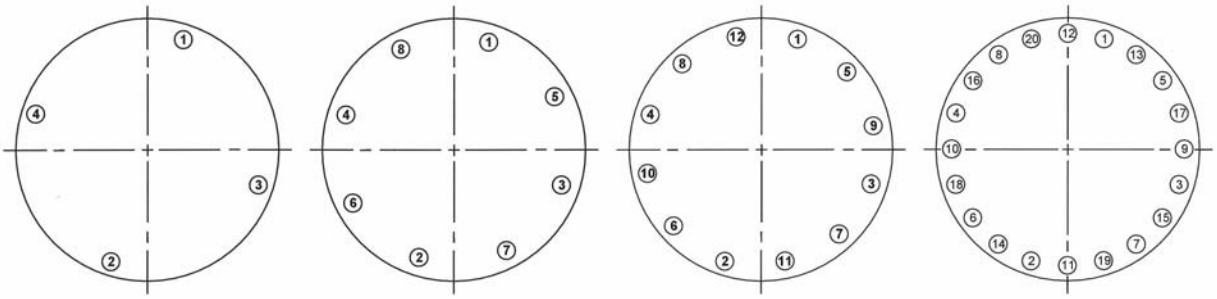
6. Insert insulating sleeves into the bolt holes. If they do not slide in easily, the flanges are not lined up properly. Do not force sleeves into bolt holes as damage to sleeve material could occur.

7. Assemble the studs (or bolts) as follows:

    a. Run one nut on each stud so that two full threads are showing beyond the nut.
    b. Slide a steel washer onto stud and insert into bolt hole. (If flange requires two side insulation, add an insulating washer after the steel washer).
    c. From the opposite end of the stud, place an insulating washer, a steel washer and a nut.

8. Hand tighten

9. Torque the first two studs at diametrically opposite locations (1 and 2 in Fig. 1) to a maximum of 30% of the final appropriate torque value. Replace the two drift pins with stud assemblies. Torque the remaining studs to 30% of the final appropriate torque value in the sequence (a star pattern) illustrated in Figure 1.



4 Bolt Flange 8 Bolt Flange 12 Bolt Flanges and Above

Figure 1 – Bolt Tightening Sequence

10. Repeat steps in procedure (9) increasing the torque to approximately 50% to 60 % of the final appropriate torque value.

11. Continue torquing all studs in the sequence of Figure 1, using the specified appropriate torque setting (100%), until there is no further rotation of nuts.

12. For high-pressure, high temperature applications, retorquing may be necessary after startup to compensate for any relaxation or creep in the bolting assemblies.

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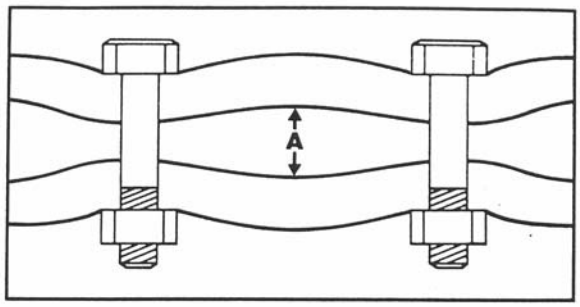
Typical satisfactory rms or AA readings should be from 125 to 250. Finer finishes of 64 or even 32 rms are normally suitable, but not necessary. Very fine finishes, such as polished surfaces, should be avoided, since adequate "tooth" in the surface is required to develop enough friction to prevent the gasket from blowing out or from extruding or creeping excessively. The lay of the finish should follow the midline of the gasket if possible - for example, concentric circles on a round flange or , next best, a phonographic spiral. Every effort should be made to avoid lines across the face, such as linear surface grinding, which at 180° points will cross the seal area at right angle to the gasket.



A—Bowing of flanges due to too high a bolt load for the flange design.

Load on Machine Bolts and Cold-Rolled Steel Stud Bolts under Torque

Nominal Diameter of Stud (inches)	Number of Threads Per Inch	Diameter at Root of Thread (inches)	Area at Root of Thread (sq. inch)	STRESS 7,500 psi Torque (ft.-lbs.)	7,500 psi Compression (lbs.)	15,000 psi Torque (ft.-lbs.)	15,000 psi Compression (lbs.)	30,000 psi Torque (ft.-lbs.)	30,000 psi Compression (lbs.)
¼	20	.185	.027	1	203	2	405	4	810
⅜	18	.240	.045	2	338	4	675	8	1,350
⅜	16	.294	.068	3	510	6	1,020	12	2,040
7/16	14	.345	.093	5	698	10	1,395	20	2,790
½	13	.400	.126	8	945	15	1,890	30	3,780
9/16	12	.454	.162	12	1,215	23	2,430	45	4,860
⅝	11	.507	.202	15	1,515	30	3,030	60	6,060
¾	10	.620	.302	25	2,265	50	4,530	100	9,060
⅞	9	.731	.419	40	3,143	80	6,285	160	12,570
1	8	.838	.551	62	4,133	123	8,265	245	16,530
1⅛	7	.939	.693	98	5,190	195	10,380	390	20,760
1¼	7	1.064	.890	137	6,675	273	13,350	545	26,700
1⅜	6	1.158	1.054	183	7,905	365	15,810	730	31,620
1½	6	1.283	1.294	219	9,705	437	19,410	875	38,820
1⅝	5½	1.389	1.515	300	11,363	600	22,725	1,200	45,450
1¾	5	1.490	1.744	390	13,080	775	26,160	1,550	52,320
1⅞	5	1.615	2.049	525	15,368	1,050	30,735	2,100	61,470
2	4½	1.711	2.300	563	17,250	1,125	34,500	2,250	69,000

Load on Alloy Steel Stud Bolts under Torque

Nominal Diameter of Bolt (inches)	Number of Threads Per Inch	Diameter at Root of Thread (inches)	Area at Root of Thread (sq. inch)	STRESS 30,000 psi Torque (ft.-lbs.)	30,000 psi Compression (lbs.)	45,000 psi Torque (ft.-lbs.)	45,000 psi Compression (lbs.)	60,000 psi Torque (ft.-lbs.)	60,000 psi Compression (lbs.)
¼	20	.185	.027	4	810	6	1,215	8	1,620
5/16	18	.240	.045	8	1,350	12	2,025	16	2,700
⅜	16	.294	.068	12	2,040	18	3,060	24	4,080
7/16	14	.345	.093	20	2,790	30	4,185	40	5,580
½	13	.400	.126	30	3,780	45	5,670	60	7,560
9/16	12	.454	.162	45	4,860	68	7,290	90	9,720
⅝	11	.507	.202	60	6,060	90	9,090	120	12,120
¾	10	.620	.302	100	9,060	150	13,590	200	18,120
⅞	9	.731	.419	160	12,570	240	18,855	320	25,140
1	8	.838	.551	245	16,530	368	24,795	490	33,060
1⅛	8	.963	.728	355	21,840	533	32,760	710	43,680
1¼	8	1.088	.929	500	27,870	750	41,805	1,000	55,740
1⅜	8	1.213	1.155	680	34,650	1,020	51,975	1,360	69,300
1½	8	1.388	1.405	800	42,150	1,200	63,225	1,600	84,300
1⅝	8	1.463	1.680	1,100	50,400	1,650	75,600	2,200	100,800
1¾	8	1.588	1.980	1,500	59,400	2,250	89,100	3,000	118,800
1⅞	8	1.713	2.304	2,000	69,120	3,000	103,680	4,000	138,240
2	8	1.838	2.652	2,200	79,560	3,300	119,340	4,400	159,120
2¼	8	2.088	3.423	3,180	102,690	4,770	154,035	6,360	205,380
2½	8	2.338	4.292	4,400	128,760	6,600	193,140	8,800	257,520
2¾	8	2.588	5.259	5,920	157,770	8,880	236,655	11,840	315,540
3	8	2.838	6.324	7,720	189,720	11,580	284,580	15,440	379,440