

Installation Guide for Metallic Gaskets (FLEXSEAL®, Kammprofile, Corrugated Metal & Double Jacketed Gaskets)



Factors Affecting Gasket Performance

A gasket has one basic function: to create a positive seal between two relatively stationary parts. The gasket must do several different jobs well to function properly - first, create an initial seal; second, maintain the seal over a desired length of time; third, be easily removed and replaced. Varying degrees of success are dependent on how well the gasket does the following:

1. Seals system fluid.
2. Chemically resists the system fluid to prevent serious impairment of its physical properties.
3. Deforms enough to flow into the imperfections on the gasket seating surfaces to provide intimate contact between the gasket and the sealing surfaces.
4. Withstands system temperatures without serious impairments of its performance properties.
5. Is resilient and creep resistant enough to maintain an adequate portion of the applied load.
6. Has enough strength to resist crushing under the applied load and maintain its integrity when being handled and installed.
7. Does not contaminate the system fluid.
8. Does not promote corrosion of the gasket seating surfaces.
9. Is easily and cleanly removable at the time of replacement.

During the gasket selection process that follows, we recommend that these nine (9) factors be used as a checklist from the viewpoint of the user's degree of need for each factor and the manufacturer's degree of compliance.

Installation

A few simple steps must be followed during installation to ensure optimum performance:

1. Verify the flange faces are clean, free of debris/fluids, and in good working condition (flat, aligned, no major defects, etc.).
 2. Check to ensure the facing on the metal core (kammprofiles or corrugate metal gaskets) and/or windings (spiral wound gaskets) are not damaged.
 3. Center the gasket on the flange. This is extremely vital where raised faces are involved.
 4. NOTE: When using spiral wound gaskets make sure the windings are fully contacted by the flange faces (especially at the ID). Failure to do so could result in windings being “sprung or buckled” when compression is applied.
 5. Bolts/studs and nuts should be in good working order (ideally new) and turn together freely.
 6. Bolt/stud threads should be lubricated with a good quality thread lubricant and installed with at least one hardened flat washer under each nut being turned to reduce friction and optimize load translation.
 7. Finger-tighten and lightly snug all bolts/studs and nuts using a crossing pattern (see Figure 1) prior to beginning the torqueing process.
 8. Using a calibrated torque wrench, tighten the nuts in multiple steps using a crossing pattern (see Figure 1) to evenly compress the gasket.
 9. Once the final torque is achieved make a final pass at the final torque moving consecutively from bolt to bolt (see Figure 2).
 10. Retorque 12-24 hours after initial installation when possible (see Figure 2). For safety reasons, Garlock does not recommend retightening a flange connection once it is brought up to temperature and/or pressure. All applicable safety standards including lockout/tagout procedures should be observed.
- NOTE: Never use liquid or metallic based anti-stick or lubricating compounds on the gaskets. Premature failure could occur as a result.

Correct Bolting Pattern

Figure 1 – Crossing Pattern

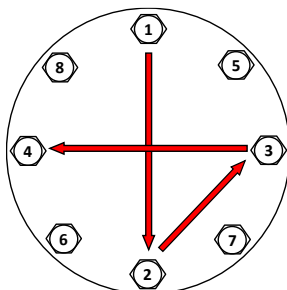
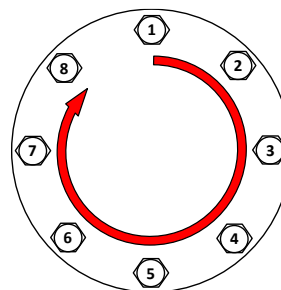


Figure 2 – Final Pass / Retorque



Bolt Torque Values for **Metallic Gaskets** in ASME B16.5 Raised Face Flanges with A193 Grade B7 Bolts

150# Raised Face Flanges

Nominal Pipe Size (inches)	Number of Bolts	Size of Bolts (inches)	FLEXSEAL®		EDGE®		Kammprofile		CMG*		Jacketed Gasket	
			Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)
0.5	4	0.50	16	47	9	52	8	42	7	37	18	53
0.75	4	0.50	22	60	12	60	11	54	10	60	25	60
1	4	0.50	30	60	15	60	13	60	13	60	27	60
1.25	4	0.50	33	60	16	60	24	60	20	60	42	60
1.5	4	0.50	47	60	23	60	31	60	26	60	59	60
2	4	0.63	74	120	36	120	55	120	52	120	94	120
2.5	4	0.63	87	120	43	120	63	120	61	120	108	120
3	4	0.63	120	120	63	120	102	120	89	120	120	120
4	8	0.63	92	120	47	120	76	120	63	120	111	120
5	8	0.75	124	200	63	200	106	200	88	200	189	200
6	8	0.75	178	200	89	200	137	200	111	200	173	200
8	8	0.75	200	200	128	200	190	200	150	200	200	200
10	12	0.88	236	320	120	320	178	320	141	320	300	320
12	12	0.88	320	320	163	320	178	320	187	320	320	320
14	12	1.00	408	490	209	490	268	490	238	490	451	490
16	16	1.00	412	490	210	490	267	490	226	490	449	490
18	16	1.13	649	710	328	710	381	710	336	710	562	710
20	20	1.13	572	710	289	710	335	710	296	710	562	710
24	20	1.25	820	1000	415	1000	438	1000	422	1000	740	1000

Based on ASTM A193 B7 bolts - 60,000 psi maximum bolt stress

*Applicable for GRAPHONIC®, TEPHONIC® and G.E.T.

300# Raised Face Flanges

Nominal Pipe Size (inches)	Number of Bolts	Size of Bolts (inches)	FLEXSEAL®		EDGE®		Kammprofile		CMG*		Jacketed Gasket	
			Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)
0.5	4	0.50	16	47	9	52	8	42	9	37	18	53
0.75	4	0.63	28	84	15	88	14	68	16	67	31	92
1	4	0.63	38	114	19	115	17	84	21	89	34	102
1.25	4	0.63	41	120	20	120	30	120	33	120	53	120
1.5	4	0.75	66	198	32	191	43	200	48	200	81	200
2	8	0.63	37	112	18	109	27	120	35	120	47	120
2.5	8	0.75	48	145	24	144	35	177	45	188	60	180
3	8	0.75	71	200	35	200	57	200	66	200	75	200
4	8	0.75	103	200	52	200	84	200	94	200	123	200
5	8	0.75	124	200	63	200	106	200	117	200	189	200
6	12	0.75	118	200	60	200	92	200	99	200	116	200
8	12	0.88	194	320	98	320	146	320	154	320	207	320
10	16	1.00	206	490	105	490	155	490	164	490	262	490
12	16	1.13	309	710	156	710	171	710	239	710	341	710
14	20	1.13	269	710	138	710	177	710	209	710	297	710
16	20	1.25	399	1000	203	1000	259	1000	292	1000	435	1000
18	24	1.25	478	1000	241	1000	280	1000	330	1000	414	1000
20	24	1.25	526	1000	266	1000	308	1000	364	1000	517	1000
24	24	1.50	723	1600	366	1600	386	1600	497	1600	652	1600

Based on ASTM A193 B7 bolts - 60,000 psi maximum bolt stress

*Applicable for GRAPHONIC®, TEPHONIC® and G.E.T.



Bolt Torque Values for **Metallic Gaskets** in ASME B16.5 Raised Face Flanges with A193 Grade B7 Bolts

400# Raised Face Flanges

Nominal Pipe Size (inches)	Number of Bolts	Size of Bolts (inches)	FLEXSEAL®		EDGE®		Kammprofile		CMG*		Jacketed Gasket	
			Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)
0.5	4	0.50	16	47	17	52	8	42	Contact Engineering		18	53
0.75	4	0.63	28	84	29	88	14	68			31	92
1	4	0.63	38	114	38	115	17	84			34	102
1.25	4	0.63	41	120	40	120	30	120			53	120
1.5	4	0.75	66	198	64	191	43	200			81	200
2	8	0.63	37	112	36	109	27	120			47	120
2.5	8	0.75	48	145	48	144	35	177			60	180
3	8	0.75	71	200	71	200	57	200			75	200
4	8	0.88	149	320	120	320	97	320			142	320
5	8	0.88	190	320	146	320	123	320			218	320
6	12	0.88	173	320	138	320	106	320			133	320
8	12	1.00	280	490	229	490	170	490			241	490
10	16	1.13	314	710	230	691	170	710			287	710
12	16	1.25	456	1000	345	1000	188	941			376	1000
14	20	1.25	373	1000	304	911	195	975			328	983
16	20	1.38	532	1360	445	1335	283	1360			475	1360
18	24	1.38	567	1360	527	1360	306	1360			452	1357
20	24	1.50	604	1600	563	1600	326	1600			547	1600
24	24	1.75	962	2887	975	2924	513	2566			868	2603

Based on ASTM A193 B7 bolts - 60,000 psi maximum bolt stress

*Applicable for GRAPHONIC®, TEPHONIC® and G.E.T.™

600# Raised Face Flanges

Nominal Pipe Size (inches)	Number of Bolts	Size of Bolts (inches)	FLEXSEAL®		EDGE®		Kammprofile		CMG*		Jacketed Gasket	
			Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)
0.5	4	0.50	16	47	17	52	8	42	Contact Engineering		18	53
0.75	4	0.63	28	84	29	88	14	68			31	92
1	4	0.63	38	114	38	115	17	84			34	102
1.25	4	0.63	41	120	40	120	30	120			53	120
1.5	4	0.75	66	198	64	191	43	200			81	200
2	8	0.63	37	112	36	109	27	120			47	120
2.5	8	0.75	48	145	48	144	35	177			60	180
3	8	0.75	71	200	71	200	57	200			75	200
4	8	0.88	149	320	120	320	97	320			142	320
5	8	1.00	221	490	170	490	143	490			254	490
6	12	1.00	202	490	160	480	123	490			155	466
8	12	1.13	307	710	251	710	187	710			264	710
10	16	1.25	346	1000	254	763	188	938			317	951
12	20	1.25	365	1000	276	829	151	753			301	904
14	20	1.38	408	1224	332	996	213	1066			358	1075
16	20	1.50	514	1543	430	1291	274	1370			460	1379
18	20	1.63	757	2200	704	2112	409	2044			604	1811
20	24	1.63	695	2085	647	1941	375	1875			629	1886
24	24	1.88	1103	3308	1117	3350	588	2940			994	2983

Based on ASTM A193 B7 bolts - 60,000 psi maximum bolt stress

*Applicable for GRAPHONIC®, TEPHONIC® and G.E.T.™

Bolt Torque Values for **Metallic Gaskets** in ASME B16.5 Raised Face Flanges with A193 Grade B7 Bolts

900# Raised Face Flanges

Nominal Pipe Size (inches)	Number of Bolts	Size of Bolts (inches)	FLEXSEAL®		EDGE®		Kammprofile		CMG*		Jacketed Gasket	
			Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)
0.5	4	0.75	22	100	24	100	12	100	Contact Engineering		24	73
0.75	4	0.75	31	100	33	100	15	100			34	103
1	4	0.88	49	160	49	160	22	160			44	131
1.25	4	0.88	53	160	52	160	39	193			68	204
1.5	4	1.00	89	266	85	256	58	289			109	328
2	8	0.88	48	160	47	160	35	176			60	180
2.5	8	1.00	65	245	65	245	47	245			81	242
3	8	0.88	106	319	81	244	66	328			87	260
4	8	1.13	191	572	153	458	124	622			182	545
5	8	1.25	268	804	206	617	173	865			307	921
6	12	1.13	221	664	176	527	135	675			170	511
8	12	1.38	333	1000	303	909	225	1127			319	956
10	16	1.38	306	919	278	835	205	1026			347	1040
12	20	1.38	368	1103	302	907	165	824			329	988
14	20	1.50	388	1164	321	963	206	1031			347	1040
16	20	1.63	514	1541	495	1485	315	1575			529	1586
18	20	1.88	991	2972	933	2800	542	2710			800	2401
20	20	2.00	934	2802	984	2952	570	2850			956	2867
24	20	2.50	1382	4400	1582	4747	833	4400			1409	4227

Based on ASTM A193 B7 bolts - 60,000 psi maximum bolt stress

*Applicable for GRAPHONIC®, TEPHONIC® and G.E.T.™

1500# Raised Face Flanges

Nominal Pipe Size (inches)	Number of Bolts	Size of Bolts (inches)	FLEXSEAL®		EDGE®		Kammprofile		CMG*		Jacketed Gasket	
			Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)
0.5	4	0.75	22	100	24	100	20	100	Contact Engineering		24	73
0.75	4	0.75	31	100	33	100	25	100			34	103
1	4	0.88	49	160	49	160	36	160			44	131
1.25	4	0.88	80	240	52	160	64	193			68	204
1.5	4	1.00	118	353	85	256	96	289			109	328
2	8	0.88	76	227	47	160	59	176			60	180
2.5	8	1.00	108	325	65	245	79	245			81	242
3	8	1.13	150	451	104	355	140	419			111	332
4	8	1.25	231	694	169	506	229	686			200	601
5	8	1.50	323	970	218	800	305	915			325	975
6	12	1.38	289	867	212	680	272	815			206	617
8	12	1.63	432	1297	337	1100	418	1253			354	1063
10	12	1.88	754	2262	547	2000	673	2018			682	2045
12	16	2.00	647	2200	532	2200	484	2200			580	1741
14	16	2.25	684	3180	655	3180	701	3180			707	2121
16	16	2.50	1141	4400	969	4400	1027	4400			1035	3104
18	16	2.75	1606	5920	1513	5920	1464	5920			1297	3892
20	16	3.00	1921	7720	1810	7720	1748	7720			1758	5273
24	16	3.50	3100	13000	2867	13000	2516	13000			2553	7658

Based on ASTM A193 B7 bolts - 60,000 psi maximum bolt stress

*Applicable for GRAPHONIC®, TEPHONIC® and G.E.T.™

Bolt Torque Values for **Metallic Gaskets** in ASME B16.5 Raised Face Flanges with A193 Grade B7 Bolts

2500# Raised Face Flanges

Nominal Pipe Size (inches)	Number of Bolts	Size of Bolts (inches)	FLEXSEAL®		EDGE®		Kammprofile		CMG*		Jacketed Gasket	
			Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)	Minimum Torque (ft.lbs.)	Preferred Torque (ft.lbs.)
0.5	4	0.75	22	100	24	100	20	100	Contact Engineering		24	73
0.75	4	0.75	31	100	33	100	25	100			34	103
1	4	0.88	49	160	49	160	36	160			44	131
1.25	4	1.00	93	279	60	245	75	245			79	237
1.5	4	1.13	129	387	94	355	106	355			120	360
2	8	1.00	88	264	55	245	68	245			70	210
2.5	8	1.13	119	357	71	355	87	355			89	266
3	8	1.25	166	500	115	500	154	500			122	367
4	8	1.50	245	800	178	800	242	800			212	636
5	8	1.75	430	1500	289	1500	406	1500			432	1297
6	8	2.00	611	2200	448	2200	574	2200			434	1303
8	12	2.00	548	2200	427	2200	529	2200			449	1347
10	12	2.50	831	4400	646	4400	794	4400			805	2415
12	12	2.75	1326	5920	963	5920	875	5920			1050	3150

Based on ASTM A193 B7 bolts - 60,000 psi maximum bolt stress

*Applicable for GRAPHONIC®, TEPHONIC® and G.E.T.™

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