

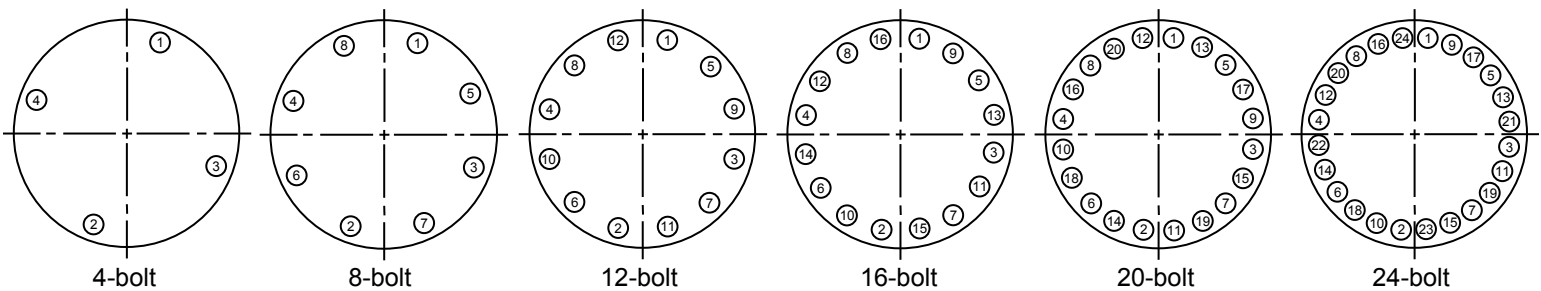
## DURLON® GASKETING - BOLT TIGHTENING WORK SHEET

Location/Identification: \_\_\_\_\_ Nominal Bolt Size: \_\_\_\_\_

Gasket Contact Surface Finish on Flange: \_\_\_\_\_; Lubricant Used: \_\_\_\_\_

*(Initial each step.)*

- \_\_\_ 1. Be sure system is at ambient temperature and depressurized. Follow local safety rules.
- \_\_\_ 2. Visually examine and clean flanges, bolts, nuts and washers. Replace components if necessary.
- \_\_\_ 3. **Lubricate bolts, nuts, and nut bearing surfaces.** Use of hardened steel washers are recommended.
- \_\_\_ 4. Install new gasket. **DO NOT REUSE OLD GASKET, OR USE MULTIPLE GASKETS.**
- \_\_\_ 5. Number bolts in cross-pattern sequence according to the appropriate sketch below.
- \_\_\_ 6. **IMPORTANT! HAND TIGHTEN NUTS, then using a hand wrench SNUG BOLTS 1/8 to 1/4 turn, following the appropriate cross pattern tightening sequence for the number of bolts below.**
- \_\_\_ 7. Starting at the #1 bolt, use the appropriate cross-pattern tightening sequence in the sketch below for Rounds 1, 2, and 3 (each sequence constitutes a "Round").



**Final Torque:** \_\_\_\_\_ ft-lbs

**LUBRICATE, HAND TIGHTEN, PRE-TIGHTEN BOLTS**

**Round 1** - Tighten to \_\_\_\_\_ ft-lbs - **1st torque** value in torque chart\* (30% of final torque)

**Round 2** - Tighten to \_\_\_\_\_ ft-lbs – **2nd torque** value in torque chart (60% of final torque)

**Round 3** - Tighten to \_\_\_\_\_ ft-lbs - **Final torque** value in torque chart (100% of final torque)

\*Refer to torque chart on next page

Check gap at 90° intervals around the flange between each of these rounds. Larger flanges may require checking the gap in smaller intervals. If the gap is not reasonably uniform, make the appropriate adjustments by selective bolt tightening before proceeding.

\_\_\_ **Rotational Round** - 100% of Final Torque (same as Round 3). Use ROTATIONAL, clockwise tightening sequence, starting with Bolt No. 1, for at least two complete rounds and continue until no further nut rotation occurs at 100% of the Final Torque value for any nut.

\_\_\_ **Retorque** - Short-term bolt preload loss can occur between four to twenty-four hours after initial tightening due to bolt relaxation and/or gasket creep. Repeating the Rotational Round recovers this loss. This is especially important for PTFE gaskets.

Joint Assembler: \_\_\_\_\_ Date: \_\_\_\_\_

**For torque questions, or tightening patterns for large diameter flanges, contact TFC Technical Services: (613) 968-1100, or tech@trianglefluid.com**

**\*\* This page can be copied for use in the field \*\***

## TORQUE VALUES FOR ANSI B16.21 CUT GASKETS

1/16" & 1/8" DURLON® Gasket Material - Torque: ft-lbs

Flange Size	B16.5 Class 150 RF/ Ring Gaskets					B16.5 Class 150 FF/ Full Face Gaskets				
	Torque / Round (ft-lbs)			Bolt Tighten Seq*		Torque / Round (ft-lbs)			Bolt Tighten Seq*	
	1st	2nd	Final	Dwg*/No.	Size	1st	2nd	Final	Dwg*/No.	Size
1/2"	10	20	30	4-bolt	1/2"	20	40	60	4-bolt	1/2"
3/4"	13	27	40	4-bolt	1/2"	20	40	60	4-bolt	1/2"
1"	15	30	50	4-bolt	1/2"	20	40	60	4-bolt	1/2"
1-1/4"	20	40	60	4-bolt	1/2"	20	40	60	4-bolt	1/2"
1-1/2"	20	40	60	4-bolt	1/2"	20	40	60	4-bolt	1/2"
2"	40	80	120	4-bolt	5/8"	40	80	120	4-bolt	5/8"
2-1/2"	40	80	120	4-bolt	5/8"	40	80	120	4-bolt	5/8"
3"	40	80	120	4-bolt	5/8"	40	80	120	4-bolt	5/8"
3-1/2"	40	80	120	8-bolt	5/8"	40	80	120	8-bolt	5/8"
4"	40	80	120	8-bolt	5/8"	40	80	120	8-bolt	5/8"
5"	60	120	200	8-bolt	3/4"	60	120	200	8-bolt	3/4"
6"	60	120	200	8-bolt	3/4"	60	120	200	8-bolt	3/4"
8"	60	120	200	8-bolt	3/4"	60	120	200	8-bolt	3/4"
10"	95	190	320	12-bolt	7/8"	95	190	320	12-bolt	7/8"
12"	95	190	320	12-bolt	7/8"	95	190	320	12-bolt	7/8"
14"	147	294	490	12-bolt	1"	147	294	490	12-bolt	1"
16"	147	294	490	16-bolt	1"	147	294	490	16-bolt	1"
18"	213	426	710	16-bolt	1-1/8"	213	426	710	16-bolt	1-1/8"
20"	213	426	710	20-bolt	1-1/8"	213	426	710	20-bolt	1-1/8"
24"	300	600	1,000	20-bolt	1-1/4"	300	600	1,000	20-bolt	1-1/4"

Flange Size	B16.5 Class 300 RF/ Ring Gaskets				
	Torque / Round (ft-lbs)			Bolt Tighten Seq*	
	1st	2nd	Final	Dwg*/No.	Size
1/2"	10	20	30	4-bolt	1/2"
3/4"	15	30	50	4-bolt	5/8"
1"	21	42	70	4-bolt	5/8"
1-1/4"	30	60	100	4-bolt	5/8"
1-1/2"	45	90	150	4-bolt	3/4"
2"	33	66	110	8-bolt	5/8"
2-1/2"	42	84	140	8-bolt	3/4"
3"	60	120	200	8-bolt	3/4"
3-1/2"	60	120	200	8-bolt	3/4"
4"	60	120	200	8-bolt	3/4"
5"	60	120	200	8-bolt	3/4"
6"	60	120	200	12-bolt	3/4"
8"	95	190	320	12-bolt	7/8"
10"	147	294	490	16-bolt	1"
12"	213	426	710	16-bolt	1-1/8"
14"	195	390	650	20-bolt	1-1/8"
16"	273	546	910	20-bolt	1-1/4"
18"	300	600	1,000	24-bolt	1-1/4"
20"	300	600	1,000	24-bolt	1-1/4"
24"	465	930	1,550	24-bolt	1-1/2"

### THE EFFECT OF BOLT LUBRICATION

Bolt lubrication greatly affects the torque values used when installing gaskets. To achieve the same gasket compression, a much higher torque value is required for a dry bolt versus using a lubricant.

In a dry bolt up, or where an inefficient lubricant is used such as a light oil, the effort used in tightening is overcome by the frictional forces between the bolts and nuts and to a greater extent between the nuts and nut facings.

This can result in a lower gasket load and inadequate stress on the bolts, which can result in torque loss and eventual leakage in service.

Note: This is a general guide only and Triangle Fluid Controls Ltd. does not accept responsibility for negligence or misuse of this information. Torque Values are in ft.-lbs. and assume new A193 Gr. B7 studs with 2H heavy hex nuts; with studs, nuts and the nut bearing surfaces lubricated with a never-seize type paste (k = 0.17) using the installation and bolt tightening practices outlined in this handbook. Lubricant should not be applied to the gasket or flange faces as a release agent. Hardened steel washers are also recommended to reduce friction. \* Refer to the appropriate bolt tightening sequence drawing under gasket installation in this handbook for the number of bolts listed.

DURLON® SPIRAL WOUND GASKETS – Torque: ft-lbs

Pipe Size (in)	Class 150		Class 300		Class 600		Class 900		Class 1500		Class 2500	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1/2	16	50	16	50	16	50	25	65	25	65	40	65
3/4	22	60	30	85	30	85	30	95	35	95	60	95
1	30	60	40	115	40	115	50	150	60	150	100	165
1 1/4	33	60	40	120	40	120	80	240	95	240	186	282
1 1/2	50	60	65	200	65	200	120	350	145	350	265	385
2	75	120	40	110	40	110	75	230	95	230	185	265
2 1/2	90	120	50	145	50	145	110	330	140	327	260	360
3	120	120	70	200	70	200	105	320	215	450	400	495
4	92	120	105	200	150	320	190	575	355	695	630	810
5	125	200	125	200	220	490	280	805	525	970	1160	1440
6	180	200	120	200	200	490	235	660	490	865	1730	2140
8	200	200	195	320	305	710	405	1000	800	1300	1685	1925
10	235	320	205	490	345	1000	422	915	1500	2260	2885	3315
12	320	320	310	710	365	1000	486	1100	1445	2200	4525	5870
14	410	490	270	710	410	1220	545	1165	1795	2325		
16	410	490	400	1000	515	1545	792	1540	2700	3880		
18	650	710	480	1000	755	2200	1410	2970	3860	5470		
20	570	710	525	1000	717	2085	1546	2800	4930	7700		
24	820	1000	725	1600	1291	3305	2610	4145	8032	11902		

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\* Refer to the appropriate bolt tightening sequence drawing under the gasket installation section in this handbook for the number of bolts listed. Extreme operating conditions such as high temperature may reduce bolt yield strength and caution should be used in these applications. For critical or extreme applications (high temperature/pressure) consult with TFC Technical Services.

\* Caution, if no inner ring is used, gasket may buckle on the ID.

This revision supersedes all previous versions. 11.30.2017

DURLON® KAMMPROFILE GASKETS – Torque: ft-lbs

Pipe Size (in)	Class 150		Class 300		Class 600		Class 900		Class 1500		Class 2500	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1/2	15	40	15	40	15	40	20	60	25	60	40	60
3/4	20	55	20	70	20	70	25	75	35	75	55	75
1	20	60	30	85	30	85	35	105	50	110	85	115
1 1/4	40	60	50	120	50	120	65	190	90	190	170	225
1 1/2	50	60	70	200	70	200	100	290	135	290	245	320
2	90	120	45	120	45	120	60	175	90	175	170	205
2 1/2	105	120	60	180	60	180	80	235	130	235	235	260
3	120	120	95	200	95	200	110	320	215	425	400	465
4	120	120	140	200	165	320	210	630	370	695	655	805
5	180	200	180	200	240	490	300	865	530	915	1175	1365
6	200	200	150	200	205	490	240	675	490	810	1725	2005
8	200	200	245	320	310	710	440	1130	830	1255	1750	1855
10	300	320	260	490	315	950	460	1035	1515	2040	2985	3210
12	320	320	340	710	300	895	490	980	1450	1,955	4376	4,605
14	450	490	295	710	380	1,065	550	1,030	1875	2,385		
16	445	490	430	1,000	480	1,370	825	1,575	2715	3,495		
18	640	710	470	1,000	705	2,055	1415	2,725	3875	5,015		
20	560	710	515	1,000	1250	1,875	1595	2,850	4945	7,010		
24	730	1000	645	1,600	980	2,940	2635	4,170	7720	9,665		

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**Warning:** These materials should never be recommended when both temperature and pressure are at the maximum listed. Properties and applications shown are typical. No application should be undertaken by anyone without independent study and evaluation for suitability. Never use more than one gasket in one flange joint, and never reuse a gasket. Improper use or gasket selection could cause property damage and/or serious personal injury. Data reported in this brochure is a compilation of field testing, field service reports and/or in-house testing. While the utmost care has gone into publishing the information contained herein, we assume no responsibility for errors. Specifications and information contained in this brochure are subject to change without notice. This edition cancels and obsoletes all previous editions.