

DURLON®

Torque Values



Durlon® Sheet Gasket Material							
Pipe Size	ASME B16.21 Ring Gasket, Ft-Lbs (N-M) - Includes Compressed Non-Asbestos, PTFE, and Graphite sheets						
	Fasteners: A193-B7 or B16 lubricated with a never seize type lubricant, k=0.17						
	Class 150			Pipe Size	Class 300		
	Min. [1, 2]	Optimal [1, 3]	Max. [4, 5]		Min. [1, 2]	Optimal [1, 3]	Max. [4, 5]
½”	10 (14)	25 (33)	25 (33)	½”	10 (14)	25 (34)	25 (34)
¾”	15 (20)	30 (41)	35 (48)	¾”	15 (20)	45 (61)	45 (61)
1”	15 (20)	35 (48)	50 (68)	1”	20 (27)	55 (75)	60 (81)
1¼”	25 (34)	45 (61)	75 (102)	1¼”	35 (47)	80 (108)	90 (122)
1 ½”	30 (41)	60 (82)	80 (109)	1 ½”	50 (68)	140 (190)	145 (197)
2”	65 (88)	120 (163)	160 (217)	2”	35 (47)	80 (108)	100 (136)
2 ½”	80 (108)	120 (163)	160 (217)	2 ½”	50 (68)	125 (169)	135 (183)
3”	115 (156)	150 (203)	160 (217)	3”	75 (102)	180 (244)	200 (271)
3 ½”	65 (88)	120 (163)	160 (217)	3 ½”	85 (115)	180 (244)	225 (305)
4”	80 (109)	120 (163)	160 (217)	4”	105 (142)	215 (292)	285 (386)
5”	120 (163)	215 (292)	280 (380)	5”	140 (190)	215 (292)	285 (386)
6”	155 (211)	230 (312)	285 (386)	6”	120 (163)	195 (264)	285 (386)
8”	215 (291)	285 (386)	285 (386)	8”	195 (264)	315 (427)	460 (624)
10”	210 (284)	345 (468)	460 (624)	10”	215 (292)	385 (522)	490 (664)
12”	280 (380)	400 (542)	460 (624)	12”	330 (447)	570 (773)	735 (997)
14”	355 (481)	515 (698)	685 (929)	14”	295 (400)	570 (773)	640 (868)
16”	340 (461)	515 (698)	675 (915)	16”	420 (569)	795 (1078)	900 (1220)
18”	500 (678)	755 (1024)	1010 (1369)	18”	465 (630)	885 (1200)	1020 (1383)
20”	160 (217)	755 (1024)	1010 (1369)	20”	530 (719)	885 (1200)	1120 (1519)
22”	610 (827)	1060 (1437)	1415 (1918)	22”	760 (1030)	1425 (1932)	1600 (2169)
24”	670 (909)	1060 (1437)	1415 (1918)	24”	850 (1152)	1425 (1932)	1740 (2359)

Gasket Installation Instructions

1

DEPRESSURIZE

Make sure system is at ambient temperature and depressurize

2

EXAMINE

Visually examine and clean flanges, bolts nuts and washers. Replace defective components if necessary.

3

LUBRICATE

Lubricate bolt threads, nut threads & facing, and washers.

4

INSTALL A NEW GASKET

Install a new gasket. Do not reuse old gaskets or multiple gaskets.

5

NUMBER BOLTS

Number bolts in a cross-pattern sequence according to this diagram. Pre-tightening: Hand tighten all nuts and if possible snug nuts with a hand wrench.

6

PRE-TIGHTEN

Use the appropriate cross pattern tightening sequence.

7

TORQUE IN SEQUENCE

ROUND 1: 30% of target torque.
ROUND 2: 60% of target torque.
ROUND 3: 100% of target torque.

8

CHECK GAP

Check gap between each of these rounds, measured at every other bolt. If the gap is not reasonably uniform, make the appropriate adjustments by selective bolt tightening before proceeding.

9

ROTATIONAL ROUND

Use a rotational clockwise tightening sequence starting with bolt 1 for one complete round and continue until no further nut rotation occurs at 100% of the target torque value for any nut.

10

RE-TORQUE AFTER 4-24 HRS

Final-round is to re-torque after 4-24 hours at ambient temperature if possible. A large percentage of short-term preload loss occurs within 24 hours after initial tightening. Repeat rotational round to recover this loss. This re-torquing round covers this loss and is especially important for PTFE gaskets.

Durlon® BOLT TIGHTENING WORKSHEET

We recommend the completion of any installation assembly worksheet with the details, including the installer signature and date for verification. You can use the Durlon worksheet for easy adoption into your QC program.

Note: If unsure about flange finish, defects, alignment or alternative tightening procedure, please refer to ASME PCC-1 Guideline for pressure boundary bolted flange joint assembly.

For other specific applications or general procedures please contact the Durlon technical department at tech@durlon.com

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Disclaimer: This is a general guide only and TFC/GRI, does not accept responsibility for negligence or misuse of this information.

General Notes:

a) Torque Values are in ft.-lbs. and assume new A193 Gr. B7 or B16 fasteners with 2H heavy hex nuts; with studs, nuts and the nut bearing surfaces lubricated with a never-seize type lubricant (k = 0.17).

b) A193 Gr. B7 & B16 fasteners have the same yield strength up to 4” diameter. There are “no” fasteners above 4” diameter in this chart.

c) All torque values are based on using a “calibrated” torque wrench.

d) All torque values in the chart above are based on using the tensile area of the fastener.

e) All torque values in chart are rounded to nearest 5 ft.-lbs.

Footnotes:

⁽¹⁾ Torque values are based using ASME B16.5-2017 MAWP (Maximum Allowable Working Pressure) at ambient in the gasket stress calculation.

Min. Torque Values:

⁽²⁾ Min. torque values are based achieving 4,800 psi gasket stress without exceeding 80,000 psi bolt stress or PCC-1 2019 FEA SA105 Max. Stud Stress Before Flange Yielding.

Optimal Torque Values:

⁽³⁾ Optimal torque values are based on a target of 7,000 to 12,000 psi optimum gasket stress without exceeding 80,000 psi bolt stress or PCC-1 2019 FEA SA105 Max. Stud Stress Before Flange Yielding.

Cases where torque equals < 60,000 bolts stress

Cases where torque equals > 60,000 < 75,000 bolts stress

Cases where torque equals > 75,000 < 80,000 bolts stress

Max. Torque Values:

⁽⁴⁾ Max. torque values are based on: max allowable 15,000 psi gasket stress; PCC-1 2019 FEA SA105 Max. Stud Stress Before Flange Yielding, or 80,000 psi bolt stress, whichever occurs 1st. Note: In some cases the max. torque values may be equal to the optimal torque values in order to optimize gasket stress levels.

⁽⁵⁾ ½” through 1 ½” NPS & 3 ½” NPS due to “No Data” on flange yielding; Max. torque values are set to achieve max gasket stress of 15,000 or 80,000 psi bolt stress, whichever occurs 1st.

Cases where torque is based on 80,000 bolts stress.

Cases where torque is based on PCC-1 2019 FEA SA105 Max. Stud Stress Before Flange Yielding.

Cases where torque is based on max. allowable 15,000 psi gasket stress.

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Torque Values

Durlon® Spiral Wound Gaskets – Class 150, 300, 600, 900, 1500 & 2500

Pipe Size	ASME B16.20 Ring Gasket, Ft-Lbs (N-M) - Fasteners: A193-B7 or B16 lubricated with a never seize type lubricant, k=0.17																						
	Class 150			Pipe Size	Class 300			Pipe Size	Class 600			Pipe Size	Class 900			Pipe Size	Class 1500			Pipe Size	Class 2500		
	Min. [1, 2]	Optimal [1, 3]	Max. [4, 5]		Min. [1, 2]	Optimal [1, 3]	Max. [4, 5]		Min. [1, 2]	Optimal [1, 3]	Max. [4, 5]		Min. [1, 2]	Optimal [1, 3]	Max. [4, 5]		Min. [1, 2]	Optimal [1, 3]	Max. [4, 5]		Min. [1, 2]	Optimal [1, 3]	Max. [4, 5]
½"	20 (27)	35 (47)	55 (75)	½"	20 (27)	35 (47)	55 (75)	½"	20 (27)	35 (47)	55 (75)	½"	30 (41)	55 (75)	85 (115)	½"	30 (41)	55 (75)	85 (115)	½"	35 (47)	60 (81)	85 (115)
¾"	25 (34)	50 (68)	80 (109)	¾"	30 (41)	65 (88)	100 (136)	¾"	35 (47)	65 (88)	100 (136)	¾"	40 (54)	80 (108)	120 (163)	¾"	45 (61)	85 (115)	120 (163)	¾"	50 (68)	90 (122)	120 (163)
1"	35 (47)	70 (95)	80 (109)	1"	45 (61)	90 (122)	135 (183)	1"	45 (61)	90 (122)	135 (183)	1"	70 (95)	130 (176)	190 (258)	1"	75 (102)	135 (183)	190 (258)	1"	85 (115)	145 (197)	190 (258)
1¼"	40 (54)	*75 (102)	80 (109)	1¼"	50 (68)	100 (136)	150 (203)	1¼"	55 (75)	100 (136)	150 (203)	1¼"	110 (149)	210 (285)	315 (427)	1¼"	120 (163)	220 (298)	315 (427)	1¼"	155 (210)	270 (366)	360 (488)
1 ½"	55 (75)	*75 (102)	80 (109)	1 ½"	85 (115)	165 (224)	250 (339)	1 ½"	95 (129)	170 (230)	250 (339)	1 ½"	160 (217)	305 (414)	450 (610)	1 ½"	175 (237)	315 (427)	450 (610)	1 ½"	225 (305)	385 (522)	505 (685)
2"	90 (122)	*150 (203)	160 (217)	2"	45 (61)	90 (122)	115 (156)	2"	50 (68)	95 (129)	135 (183)	2"	105 (142)	200 (271)	295 (400)	2"	115 (156)	210 (285)	295 (400)	2"	150 (203)	260 (353)	340 (461)
2 ½"	105 (142)	*150 (203)	160 (217)	2 ½"	65 (88)	125 (169)	170 (230)	2 ½"	75 (102)	135 (183)	185 (251)	2 ½"	155 (210)	290 (393)	415 (563)	2 ½"	170 (230)	300 (407)	415 (563)	2 ½"	220 (298)	370 (502)	470 (637)
3"	150 (203)	**150 (203)	160 (217)	3"	100 (136)	185 (251)	225 (305)	3"	110 (149)	195 (264)	275 (373)	3"	165 (224)	295 (400)	415 (563)	3"	260 (353)	445 (603)	585 (793)	3"	345 (468)	555 (752)	655 (888)
3 ½"	85 (116)	*150 (203)	160 (217)	3 ½"	110 (149)	210 (285)	285 (386)	3 ½"	190 (258)	355 (481)	455 (617)	3 ½"	-	-	-	3 ½"	-	-	-	3 ½"	-	-	-
4"	110 (150)	*150 (203)	160 (217)	4"	145 (197)	*265 (359)	285 (386)	4"	225 (305)	410 (556)	455 (617)	4"	315 (427)	555 (752)	750 (1017)	4"	425 (576)	715 (969)	915 (1241)	4"	620 (841)	965 (1308)	1095 (1485)
5"	160 (218)	*265 (359)	280 (380)	5"	180 (244)	*265 (359)	285 (386)	5"	335 (454)	600 (813)	685 (929)	5"	460 (624)	795 (1078)	1060 (1437)	5"	695 (942)	1155 (1566)	1445 (1959)	5"	1000 (1356)	1550 (2102)	1685 (2285)
6"	230 (313)	**265 (359)	285 (386)	6"	170 (230)	*265 (359)	285 (386)	6"	305 (414)	550 (746)	685 (929)	6"	380 (515)	655 (888)	865 (1173)	6"	575 (780)	935 (1268)	1145 (1552)	6"	1565 (2122)	2355 (3193)	2505 (3396)
8"	285 (386)	***285 (386)	285 (386)	8"	285 (386)	*430 (583)	460 (624)	8"	500 (678)	880 (1193)	1005 (1363)	8"	630 (854)	1055 (1430)	1330 (1803)	8"	975 (1322)	1550 (2102)	1830 (2481)	8"	1530 (2074)	*2120 (2874)	2255 (3057)
10"	315 (427)	*430 (583)	460 (624)	10"	310 (420)	560 (759)	675 (915)	10"	580 (786)	1010 (1369)	1370 (1857)	10"	630 (854)	1010 (1369)	1210 (1641)	10"	1575 (2135)	2470 (3349)	2770 (3756)	10"	2690 (3647)	*3225 (4373)	3435 (4657)
12"	430 (583)	**435 (590)	460 (624)	12"	480 (651)	865 (1173)	990 (1342)	12"	620 (841)	1070 (1451)	1300 (1763)	12"	730 (900)	1190 (1613)	1460 (1979)	12"	1665 (2257)	2510 (3403)	2655 (3600)	12"	4180 (5667)	*5175 (7016)	5510 (7471)
14"	545 (739)	*645 (875)	685 (929)	14"	425 (576)	760 (1030)	795 (1078)	14"	735 (997)	1250 (1695)	1620 (2196)	14"	905 (1227)	1455 (1973)	1740 (2359)	14"	2055 (2786)	*2665 (3613)	2815 (3817)	14"	-	-	-
16"	545 (739)	**645 (875)	675 (915)	16"	635 (861)	*1105 (1498)	1115 (1512)	16"	1045 (1417)	1775 (2407)	2165 (2935)	16"	1205 (1634)	1900 (2576)	2165 (2935)	16"	3125 (4237)	*4480 (6074)	4730 (6413)	16"	-	-	-
18"	870 (1180)	**945 (1281)	1005 (1363)	18"	740 (1003)	*1200 (1627)	1210 (1641)	18"	1455 (1973)	2470 (3349)	3195 (4332)	18"	1910 (2590)	3075 (4169)	3640 (4935)	18"	4445 (6027)	*6230 (8447)	6670 (9043)	18"	-	-	-
20"	775 (1051)	*945 (1281)	1005 (1363)	20"	830 (1125)	*1290 (1749)	1300 (1763)	20"	1385 (1878)	2305 (3125)	2930 (3973)	20"	2235 (3030)	3450 (4678)	3830 (5193)	20"	5680 (7701)	*7600 (10304)	8025 (10880)	20"	-	-	-
22"	635 (861)	*930 (1261)	1415 (1918)	22"	1050 (1424)	*1830 (2481)	2330 (3159)	22"	1535 (2081)	*2450 (3322)	2905 (3939)	22"	-	-	-	22"	-	-	-	22"	-	-	-
24"	1135 (1539)	**1325 (1796)	1415 (1918)	24"	1325 (1796)	*2150 (2915)	2165 (2935)	24"	2055 (2786)	3335 (4522)	4050 (5491)	24"	3680 (4989)	*5425 (7354)	5730 (7769)	24"	9180 (12446)	*11770 (15958)	12415 (16833)	24"	-	-	-

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GENERAL NOTES:

a) Torque Values are in ft.-lbs. and assume new A193 Gr. B7 or B16 fasteners with 2H heavy hex nuts: with studs, nuts and the nut bearing surfaces lubricated with a never-seize type lubricant (k = 0.17).

b) A193 Gr. B7 & B16 fasteners have the same yield strength up to 4" diameter. There are "no" fasteners above 4" diameter in this chart.

c) All torque values are based on using a "calibrated" torque wrench.

d) All torque values in the chart above are based on the use of a inner/outer ring style (DRI) spiral wound gasket.

e) All torque values in the chart above are based on using the tensile area of the fastener.

f) All torque values in chart are rounded to nearest 5 ft.-lbs.

FOOTNOTES:

⁽¹⁾ Torque values are based using ASME B16.5-2017 MAWP (Maximum Allowable Working Pressure) at ambient in the gasket stress calculation.

MIN. TORQUE VALUES:

⁽²⁾ Min. torque values are based achieving 12,500 psi gasket stress or at minimum above 10,000 psi gasket stress without exceeding 80,000 psi bolt stress or PCC-1 2019 FEA SA105 Max. Stud Stress Before Flange Yielding.

Cases where gasket stress is >10,000 < 12,500 psi

OPTIMAL TORQUE VALUES:

⁽³⁾ Optimal torque values are based on 25,000 psi optimum gasket stress without exceeding 80,000 psi bolt stress or 500 psi below PCC-1 2019 FEA SA105 Max. Stud Stress Before Flange Yielding.

Cases where torque equals ≤ 60,000 bolts stress

Cases where torque equals > 60,000 ≤ 75,000 bolts stress

Cases where torque equals > 75,000 ≤ 80,000 bolts stress

*Cases where gasket stress is ≥ 15,000 < 25,000 psi, **Cases where gasket stress is ≥ 12,500 < 15,000 psi, ***Cases where gasket stress is ≥ 10,000 < 12,500 psi

MAX. TORQUE VALUES:

⁽⁴⁾ Max. torque values are based on: max allowable 40,000 psi gasket stress; PCC-1 2019 FEA SA105 Max. Stud Stress Before Flange Yielding, or 80,000 psi bolt stress, whichever occurs 1st. Note: In some cases the max. torque values may be equal to the optimal torque values in order to optimize gasket stress levels.

⁽⁵⁾ ½" through 1 ½" NPS & 3 ½" NPS due to "No Data" on flange yielding: Max. torque values are set to achieve max gasket stress of 40,000 or 80,000 psi bolt stress, whichever occurs 1st.

Cases where torque is based on 80,000 bolts stress.

Cases where torque is based on PCC-1 2019 FEA SA105 Max. Stud Stress Before Flange Yielding.

Cases where torque is based on max. allowable 40,000 psi gasket stress.

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Gasket Installation Instructions

Note: If unsure about flange finish, defects, alignment or alternative tightening procedure, please refer to ASME PCC-1 Guideline for pressure boundary bolted flange joint assembly.

1

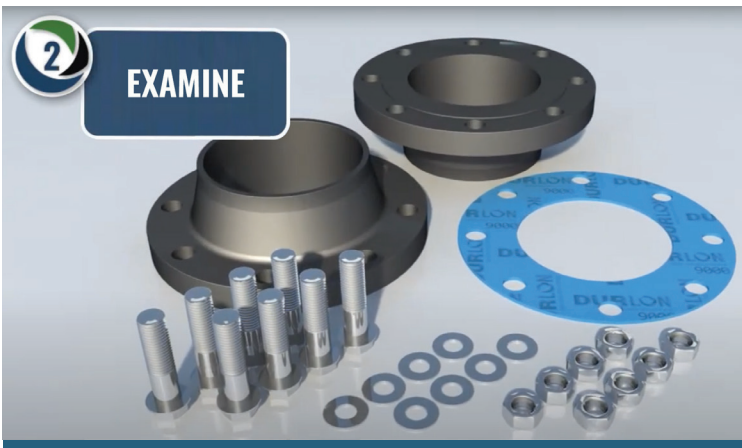
DEPRESSURIZE



Make sure system is at ambient temperature and depressurize

2

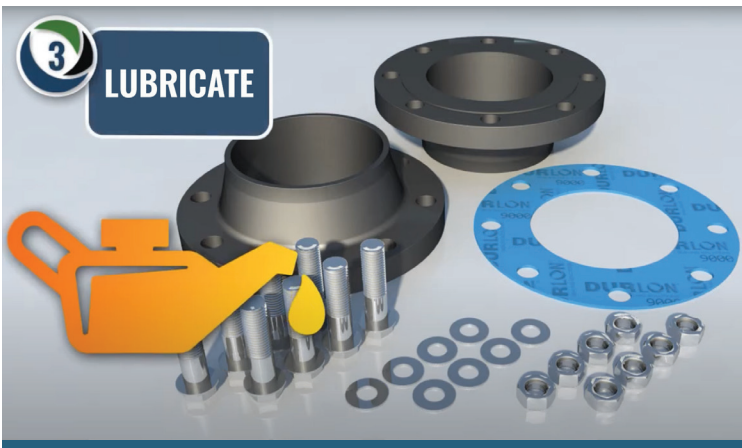
EXAMINE



Visually examine and clean flanges, bolts nuts and washers. Replace defective components if necessary.

3

LUBRICATE



Lubricate bolt threads, nut threads & facing, and washers.

4

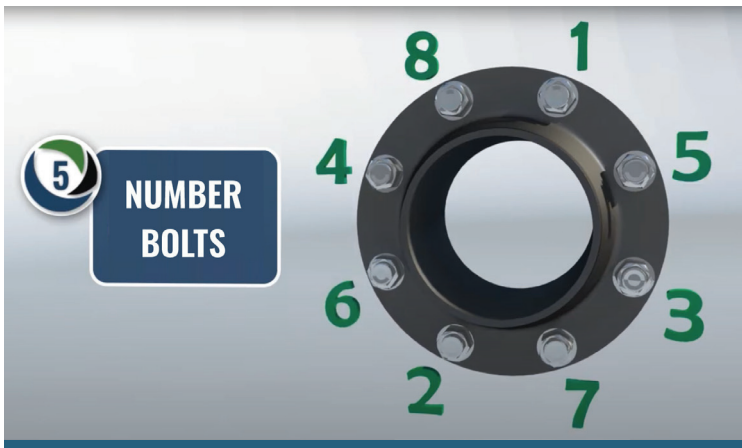
INSTALL A NEW GASKET



Install a new gasket. Do not reuse old gaskets or multiple gaskets.

5

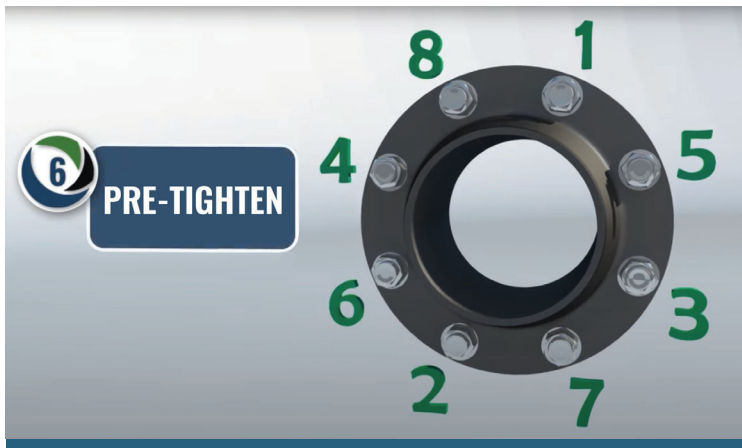
NUMBER BOLTS



Number bolts in a cross-pattern sequence according to this diagram. Pre-tightening: Hand tighten all nuts and if possible snug nuts with a hand wrench.

6

PRE-TIGHTEN

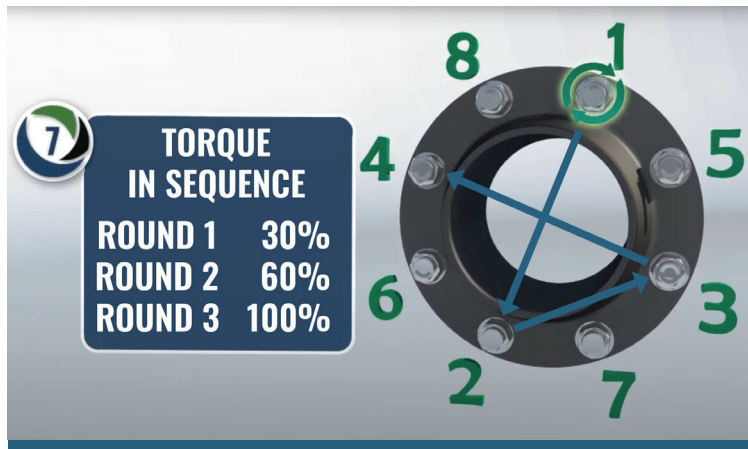


Use the appropriate cross pattern tightening sequence.

7

TORQUE IN SEQUENCE

ROUND 1 30%
ROUND 2 60%
ROUND 3 100%



Round 1: 30% of target torque.
Round 2: 60% of target torque.
Round 3: 100% of target torque.

8

CHECK GAP



Check gap between each of these rounds, measured at every other bolt. If the gap is not reasonably uniform, make the appropriate adjustments by selective bolt tightening before proceeding.

9

ROTATIONAL ROUND



Use a rotational clockwise tightening sequence starting with bolt 1 for one complete round and continue until no further nut rotation occurs at 100% of the target torque value for any nut.

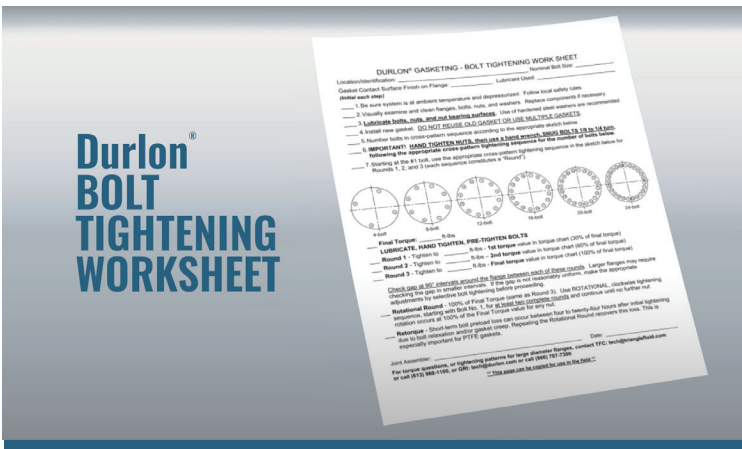
10

RE-TORQUE AFTER 4-24 HRS



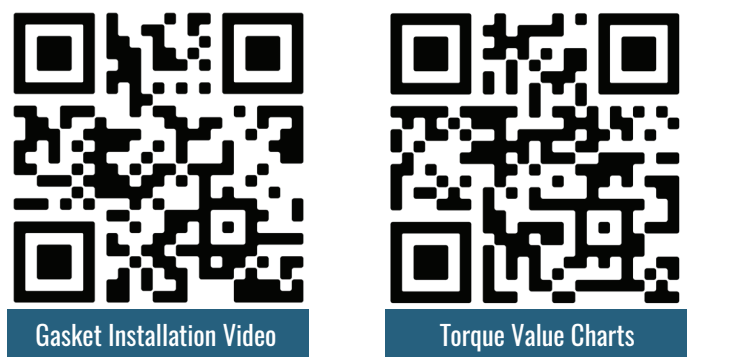
Final-round is to re-torque after 4-24 hours at ambient temperature if possible. A large percentage of short-term preload loss occurs within 24 hours after initial tightening. Repeat rotational round to recover this loss. This re-torquing round covers this loss and is especially important for PTFE gaskets.

Durlon® BOLT TIGHTENING WORKSHEET



We recommend the completion of any installation assembly worksheet with the details, including the installer signature and date for verification. You can use the Durlon worksheet for easy adoption into your QC program.

Gasket Installation Video



Torque Value Charts



Bolt Tightening Worksheet



iGasket App

