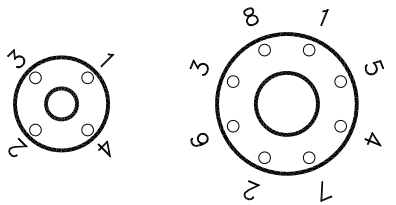
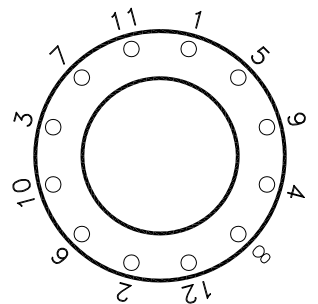


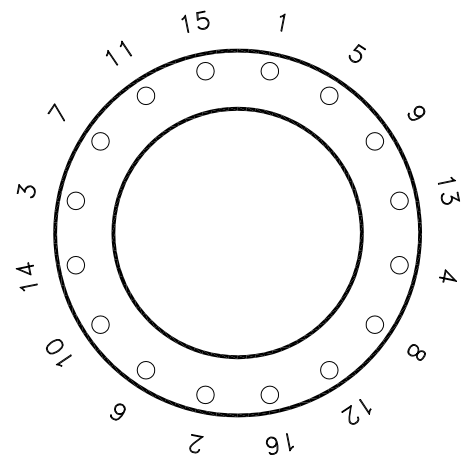
150# - FLAT GASKETS



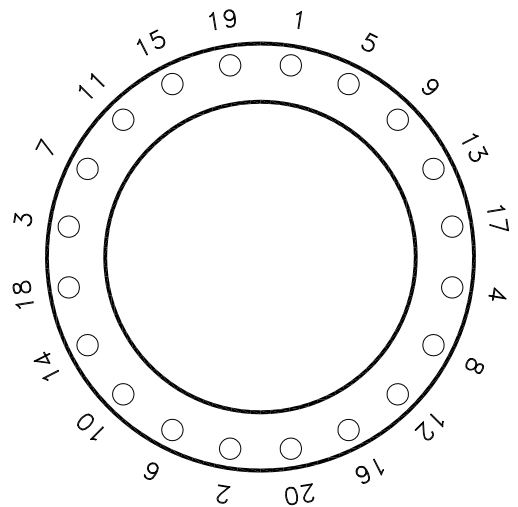
TYP. FOR 1" - 3" TYP. FOR 4" - 8"



TYP. FOR 10" - 14"



TYP. FOR 16" - 18"



TYP. FOR 20" - 24"

Bolt Size	Heavy Hex Socket Size
1/2"	7/8"
1/2"	7/8"
5/8"	1 1/16"
5/8"	1 1/16"
5/8"	1 1/16"
3/4"	1 1/4"
3/4"	1 1/4"
7/8"	1 7/16"
7/8"	1 7/16"
1"	1 5/8"
1"	1 5/8"
1 1/8"	1 3/4"
1 1/8"	1 3/4"
1 1/4"	2"

Size	Torque (ft-lbs) at Hydrotest Pressure (psig)			
	225	300	348	435
1"Ø	25 - 38	-	-	-
1.5"Ø	25 - 38	-	-	-
2"Ø	35 - 53	-	-	-
3"Ø	35 - 53	-	-	-
4"Ø	44 - 66	-	-	-
6"Ø	65 - 98	-	-	-
8"Ø	80 - 120	-	-	-
10"Ø	98 - 147	-	-	-
12"Ø	113 - 170	-	-	-
14"Ø	157 - 236	-	-	-
16"Ø	133 - 200	-	-	-
18"Ø	175 - 263	-	-	-
20"Ø	175 - 263	-	-	-
24"Ø	224 - 336	-	-	-

Size	Torque (N-m) at Hydrotest Pressure (bar)			
	15.5	20.7	24	30
DN25	34 - 51	-	-	-
DN40	34 - 51	-	-	-
DN50	47 - 71	-	-	-
DN80	47 - 71	-	-	-
DN100	60 - 89	-	-	-
DN150	88 - 132	-	-	-
DN200	108 - 163	-	-	-
DN250	133 - 199	-	-	-
DN300	153 - 230	-	-	-
DN350	213 - 319	-	-	-
DN400	180 - 271	-	-	-
DN450	237 - 356	-	-	-
DN500	237 - 356	-	-	-
DN600	304 - 456	-	-	-

Example of reading these tables:
 For a 2" flange connection with a flat, rubber gasket hydrotested to 225psig (15.5 bar), it is recommended to apply 35 ft-lbs (47 N-m) of torque. If necessary, torque may be increased to 53 ft-lbs (71 N-m).

- NOTE:
1. Typical sizes are based on ASME B16.5 150# and B16.1 125# drilling.
 2. Hydrotest pressure is 1.5 times the design pressure.
 3. Caution should be used during the bolt / torque process. Take care to prevent any damage to the FRP flange. If necessary, unbolt the connection and reseal with a new gasket.
 4. When bolting to raised-face (RF) flanges, use the torque values for o-ring gaskets. See the 1B chart.
 5. 1ft-lb = 1.356N-m.
 6. Values based on a "K" nut factor of 0.20 (coefficient of friction of 0.15).
 7. Lower torque values may be used provided the gasket seats and seals adequately.

150# - FLAT GASKETS

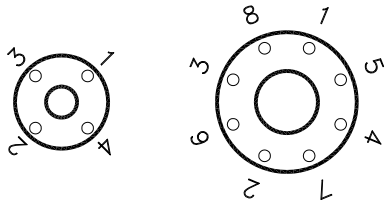
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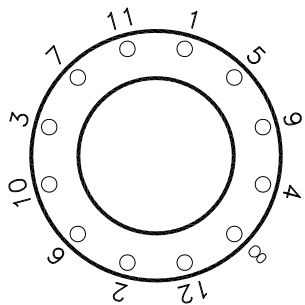
DRAWING: Torque Sequences #1A
 FILENAME: IS-E10-TRQ1A
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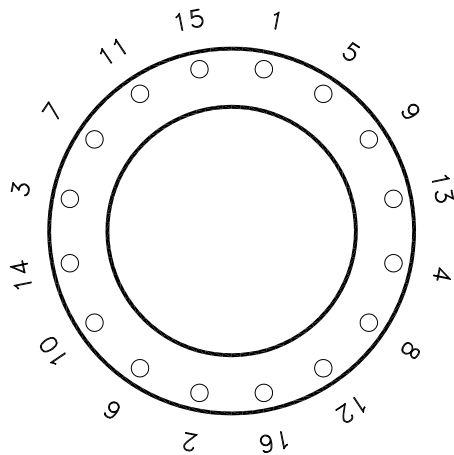
150# - STRESS SAVERS 150# - O-RINGS



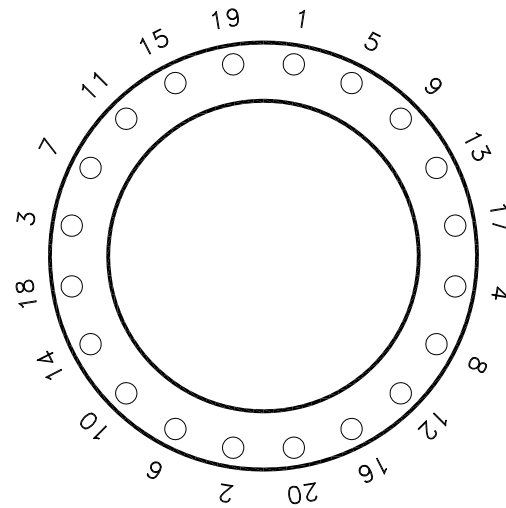
TYP. FOR 1" - 3" TYP. FOR 4" - 8"



TYP. FOR 10" - 14"



TYP. FOR 16" - 18"



TYP. FOR 20" - 24"

Bolt Size	Heavy Hex Socket Size
1/2"	7/8"
1/2"	7/8"
5/8"	1 1/16"
5/8"	1 1/16"
5/8"	1 1/16"
3/4"	1 1/4"
3/4"	1 1/4"
7/8"	1 7/16"
7/8"	1 7/16"
1"	1 5/8"
1"	1 5/8"
1 1/8"	1 3/4"
1 1/8"	1 3/4"
1 1/4"	2"

Bolt Torque Chart for Garlock's Stress Saver, Asahi's Low Torque AV Gasket and o-ring gaskets

Size	Torque (ft-lbs) at Hydrotest Pressure (psig)			
	225	300	348	435
1"Ø	25 - 38	25 - 38	25 - 38	25 - 38
1.5"Ø	25 - 38	25 - 38	25 - 38	25 - 38
2"Ø	35 - 53	35 - 53	35 - 53	35 - 53
3"Ø	35 - 53	35 - 53	35 - 53	35 - 53
4"Ø	34 - 51	34 - 51	35 - 53	35 - 53
6"Ø	61 - 92	62 - 93	63 - 95	65 - 98
8"Ø	64 - 96	66 - 99	67 - 101	70 - 105
10"Ø	69 - 104	72 - 108	73 - 110	77 - 116
12"Ø	73 - 110	76 - 114	78 - 117	84 - 126
14"Ø	109 - 164	115 - 173	118 - 177	
16"Ø	86 - 129	91 - 137	94 - 141	
18"Ø	121 - 182	129 - 194	132 - 198	
20"Ø	123 - 185	131 - 197	135 - 203	
24"Ø	147 - 221	151 - 227	165 - 248	

Size	Torque (N-m) at Hydrotest Pressure (bar)			
	15.5	20.7	24	30
DN25	34 - 51	34 - 51	34 - 51	34 - 51
DN40	34 - 51	34 - 51	34 - 51	34 - 51
DN50	47 - 71	47 - 71	47 - 71	47 - 71
DN80	47 - 71	47 - 71	47 - 71	47 - 71
DN100	46 - 69	46 - 69	47 - 71	47 - 71
DN150	83 - 124	84 - 126	85 - 128	88 - 132
DN200	87 - 130	89 - 134	91 - 136	95 - 142
DN250	94 - 140	98 - 146	99 - 148	104 - 157
DN300	99 - 148	103 - 155	106 - 159	114 - 171
DN350	148 - 222	156 - 234	160 - 240	
DN400	117 - 175	123 - 185	127 - 191	
DN450	164 - 246	175 - 262	179 - 268	
DN500	167 - 250	178 - 266	183 - 275	
DN600	199 - 299	205 - 307	224 - 336	

Example of reading these tables:
For a 2" flange connection with a Garlock Stress Saver, Asahi Low Torque or o-ring gasket hydrotested to 300psig (20.7 bar), it is recommended to apply 35 ft-lbs (47 N-m) of torque. If necessary, torque may be increased to 53 ft-lbs (71 N-m).

NOTE:

1. Typical sizes are based on ASME B16.5 150# and B16.1 125# drilling.
2. Hydrotest pressure is 1.5 times the design pressure.
3. Caution should be used during the bolt / torque process. Take care to prevent any damage to the FRP flange. If necessary, unbolt the connection and reseal with a new gasket.
4. When bolting to raised-face (RF) flanges, do not exceed the torque values in this chart.
5. 1ft-lb = 1.356N-m.
6. Values based on a "K" nut factor of 0.20 (coefficient of friction of 0.15).
7. Lower torque values may be used provided the gasket seats and seals adequately.

150# - STRESS SAVERS 150# - O-RINGS

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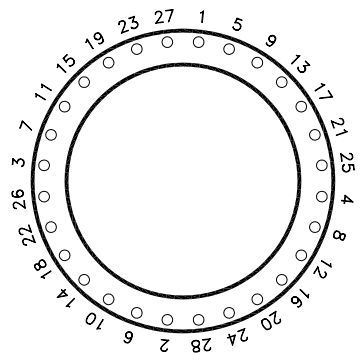
DRAWING: Torque Sequences #1B

FILENAME: IS-E10-TRQ1B

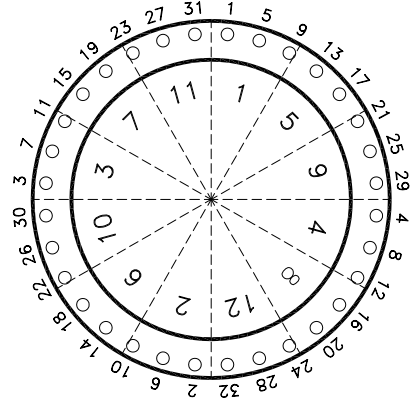
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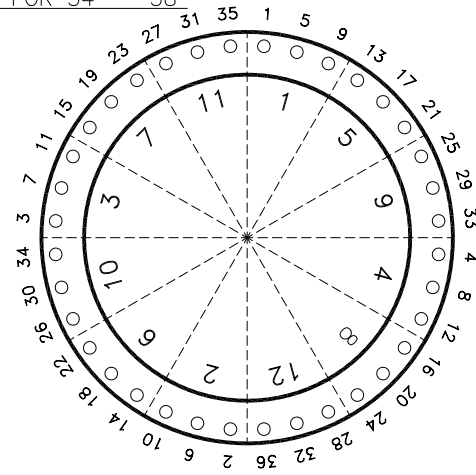
150# - FLAT GASKETS



TYP. FOR 28" - 32"



TYP. FOR 34" - 38"



TYP. FOR 40" AND 42"

Bolt Size	Heavy Hex Socket Size
1 1/4"	2"
1 1/4"	2"
1 1/4"	2"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 3/4"	2 3/4"

Bolt Torque Chart for flat, rubber gaskets

Size	Torque (ft-lbs) at Hydrotest Pressure (psig)			
	75	150	225	
26"Ø	130 - 195	166 - 249	200 - 300	
28"Ø	116 - 174	152 - 228	183 - 275	
30"Ø	119 - 179	157 - 236	190 - 285	
32"Ø	191 - 287	245 - 368	288 - 432	
34"Ø	172 - 258	222 - 333	264 - 396	
36"Ø	178 - 267	232 - 348	279 - 419	
38"Ø				
40"Ø				
42"Ø	176 - 264	234 - 351		
48"Ø	159 - 239	217 - 326		
54"Ø				

Size	Torque (N-m) at Hydrotest Pressure (bar)			
	5.2	10.3	15.5	
DN650	176 - 264	225 - 338	271 - 407	
DN700	157 - 236	206 - 309	248 - 372	
DN750	161 - 242	213 - 319	258 - 386	
DN800	259 - 388	332 - 498	391 - 586	
DN850	233 - 350	301 - 452	358 - 537	
DN900	241 - 362	315 - 472	378 - 567	
DN1050	239 - 358	317 - 476		
DN1200	216 - 323	294 - 441		

- NOTE:
1. Typical sizes are based on ASME B16.5 150# and B16.1 125# drilling.
 2. Hydrotest pressure is 1.5 times the design pressure.
 3. Caution should be used during the bolt / torque process. Take care to prevent any damage to the FRP flange. If necessary, unbolt the connection and reseal with a new gasket.
 4. When bolting to raised-face (RF) flanges, use the torque values for o-ring gaskets. See the 2B chart.
 5. 1ft-lb = 1.356N-m.
 6. Values based on a "K" nut factor of 0.20 (coefficient of friction of 0.15).
 7. 26"Ø with 24 bolt holes is not shown, 44"Ø and 46"Ø with 40 bolt holes are not shown.
 8. Lower torque values may be used provided the gasket seats and seals adequately.

Example of reading these tables:
 For a 36" flange connection with a flat, rubber gasket hydrotested to 150psig (10 bar), it is recommended to apply 232 ft-lbs (315 N-m) of torque. If necessary, up to 348 ft-lbs (472 N-m) may be applied.

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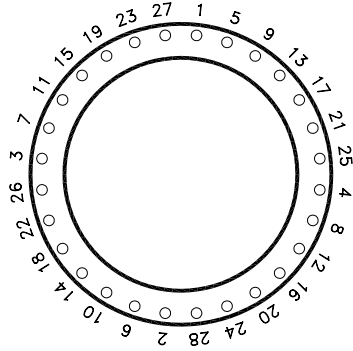
150# - FLAT GASKETS

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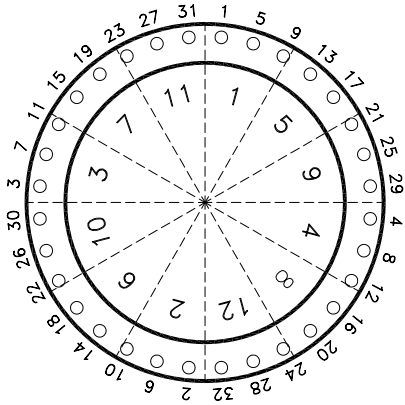
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DRAWING: Torque Sequences #2A
 FILENAME: IS-E10-TRQ2A
 REV: R7 - APR-04-2016

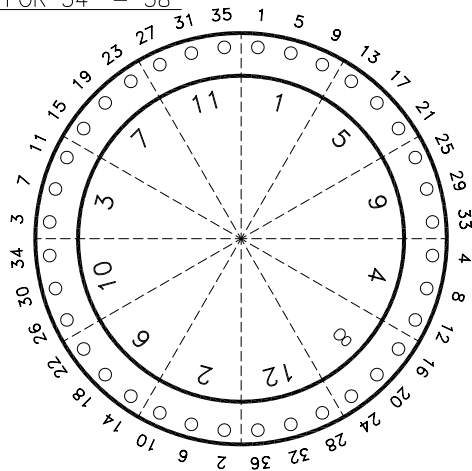
150# - O-RINGS



TYP. FOR 28" - 32"



TYP. FOR 34" - 38"



TYP. FOR 40" AND 42"

Bolt Size	Heavy Hex Socket Size
1 1/4"	2"
1 1/4"	2"
1 1/4"	2"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 1/2"	2 3/8"
1 3/4"	2 3/4"

Bolt Torque Chart for o-ring gaskets

Size	Torque (ft-lbs) at Hydrotest Pressure (psig)			
	75	150	225	
26"Ø	103 - 155	115 - 173	127 - 191	
28"Ø	90 - 135	102 - 153	114 - 171	
30"Ø	92 - 138	105 - 158	119 - 179	
32"Ø	154 - 231	173 - 260	191 - 287	
34"Ø	137 - 206	155 - 233	173 - 260	
36"Ø	139 - 209	159 - 239	179 - 269	
38"Ø				
40"Ø				
42"Ø	130 - 195	154 - 231		
48"Ø	112 - 168	138 - 207		
54"Ø				

Size	Torque (N-m) at Hydrotest Pressure (bar)			
	5.2	10.3	15.5	
DN650	140 - 210	156 - 234	172 - 258	
DN700	122 - 183	138 - 207	155 - 232	
DN750	125 - 187	142 - 214	161 - 242	
DN800	209 - 313	235 - 352	259 - 388	
DN850	186 - 279	210 - 315	235 - 352	
DN900	188 - 283	216 - 323	243 - 364	
DN950				
DN1000				
DN1050	176 - 264	209 - 313		
DN1200	152 - 228	187 - 281		
DN1350				

NOTE:

1. Typical sizes are based on ASME B16.5 150# and B16.1 125# drilling.
2. Hydrotest pressure is 1.5 times the design pressure.
3. Caution should be used during the bolt / torque process. Take care to prevent any damage to the FRP flange. If necessary, unbolt the connection and reseal with a new gasket.
4. When bolting to raised-face (RF) flanges, do not exceed the torque values in this chart.
5. 1ft-lb = 1.356N-m.
6. Values based on a "K" nut factor of 0.20 (coefficient of friction of 0.15).
7. 26"Ø with 24 bolt holes is not shown. 44"Ø and 46"Ø with 40 bolt holes are not shown.
8. Lower torque values may be used provided the gasket seats and seals adequately.

Example of reading these tables:
For a 36" flange connection with an o-ring gasket hydrotested to 225psig (15.5 bar), it is recommended to apply 179 ft-lbs (243 N-m) of torque. If necessary, up to 269 ft-lbs (364 N-m) may be applied.

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150# - O-RINGS

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DRAWING: Torque Sequences #2B
FILENAME: IS-E10-TRQ2B
REV: R7 - APR-04-2016

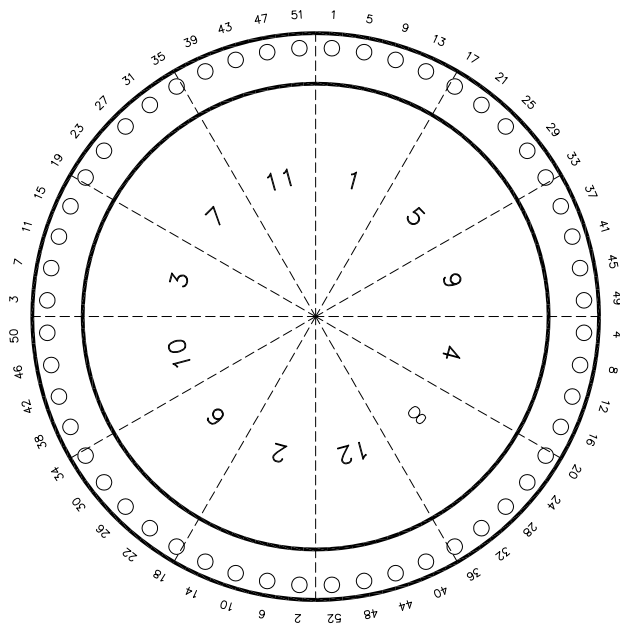
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150# - FLAT GASKETS

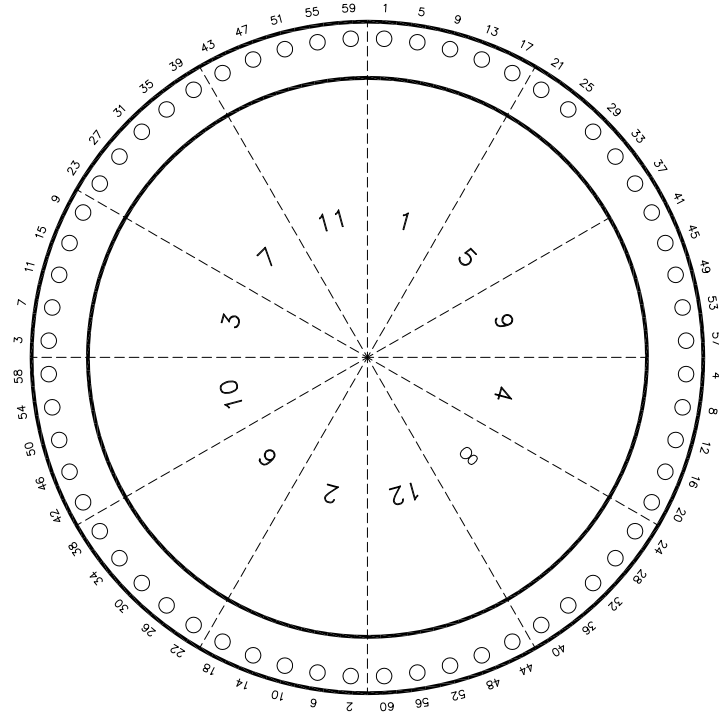
Bolt Size	Heavy Hex Socket Size
1 3/4"	2 3/4"

Bolt Torque Chart for flat, rubber gaskets				
Size	Torque (ft-lbs) at Hydrotest Pressure (psig)			
	75			
60"Ø	221 - 332			

Size	Torque (N-m) at Hydrotest Pressure (bar)			
	5.2			
DN1500	300 - 450			



TYP. FOR 60" AND 66"



TYP. FOR 72"

NOTE:

1. Typical sizes are based on ASME B16.5 150# and B16.1 125# drilling.
2. Hydrotest pressure is 1.5 times the design pressure.
3. Caution should be used during the bolt / torque process. Take care to prevent any damage to the FRP flange. If necessary, unbolt the connection and reseal with a new gasket.
4. When bolting to raised-face (RF) flanges, use the torque values for o-ring gaskets. See the 3B chart.
5. 1ft-lb = 1.356N-m.
6. Values based on a "K" nut factor of 0.20 (coefficient of friction of 0.15).
7. 56"Ø and 58"Ø with 40 bolt holes are not shown.
8. Lower torque values may be used provided the gasket seats and seals adequately.

Example of reading these tables:
 For a 60 flange connection with a flat, rubber gasket hydrotested to 75psig (5.2 bar), it is recommended to apply 221 ft-lbs (300 N-m) of torque. If necessary, up to 332 ft-lbs (450 N-m) may be applied.

150# - FLAT GASKETS

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DRAWING: **Torque Sequencess #3A**

FILENAME: **IS-E10-TRQ3A**

REV: **R6 - APR-04-2016**

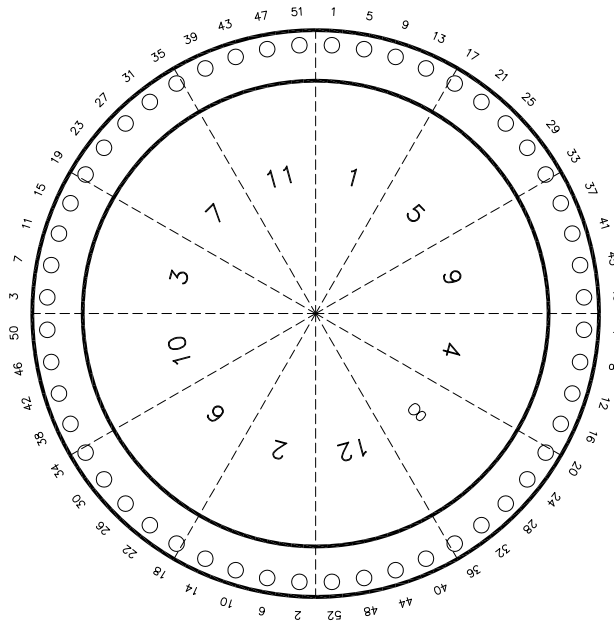
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150# - O-RINGS

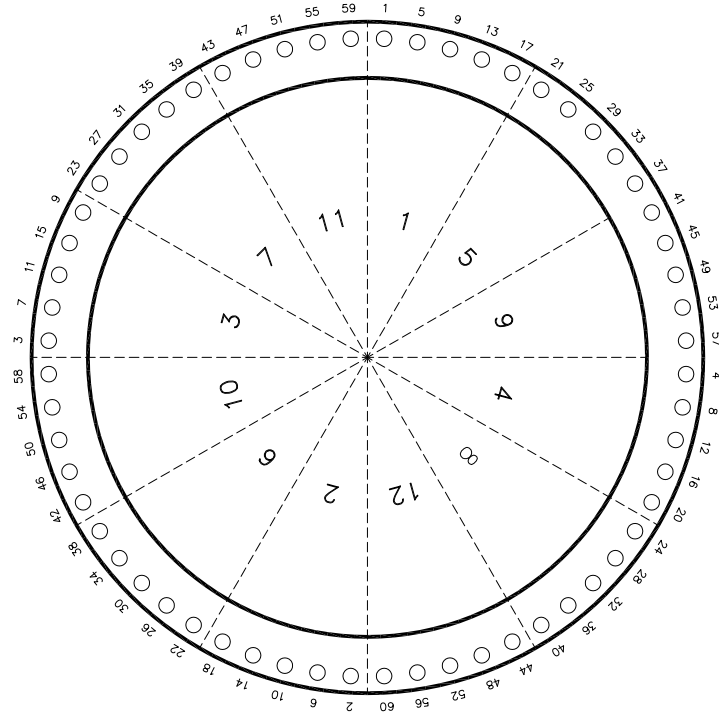
Bolt Size	Heavy Hex Socket Size
1 3/4"	2 3/4"

Bolt Torque Chart for o-ring gaskets				
Size	Torque (ft-lbs) at Hydrotest Pressure (psig)			
	75			
60"Ø	154 – 231			

Bolt Torque Chart for o-ring gaskets				
Size	Torque (N-m) at Hydrotest Pressure (bar)			
	5.2			
DN1500	209 – 313			



TYP. FOR 60" AND 66"



TYP. FOR 72"

- NOTE:**
1. Typical sizes are based on ASME B16.5 150# and B16.1 125# drilling.
 2. Hydrotest pressure is 1.5 times the design pressure.
 3. Caution should be used during the bolt / torque process. Take care to prevent any damage to the FRP flange. If necessary, unbolt the connection and reseal with a new gasket.
 4. When bolting to raised-face (RF) flanges, do not exceed the values in this chart.
 5. 1ft-lb = 1.356N-m.
 6. Values based on a "K" nut factor of 0.20 (coefficient of friction of 0.15).
 7. 56"Ø and 58"Ø with 40 bolt holes are not shown.
 8. Lower torque values may be used provided the gasket seats and seals adequately.

Example of reading these tables:
 For a 60 flange connection with an o-ring gasket hydrotested to 75psig (5.2 bar), it is recommended to apply 154 ft-lbs (209 N-m) of torque. If necessary, up to 231 ft-lbs (313 N-m) may be applied.

150# - O-RINGS

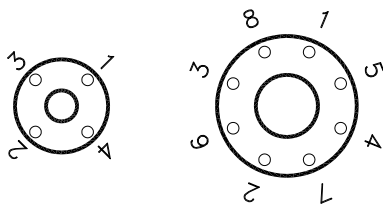
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DRAWING: Torque Sequencess #3B
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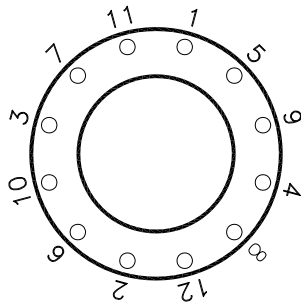
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300# - FLAT GASKETS

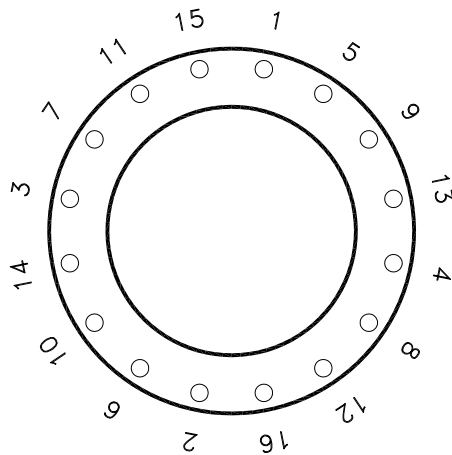


TYP. FOR 1" - 1.5"

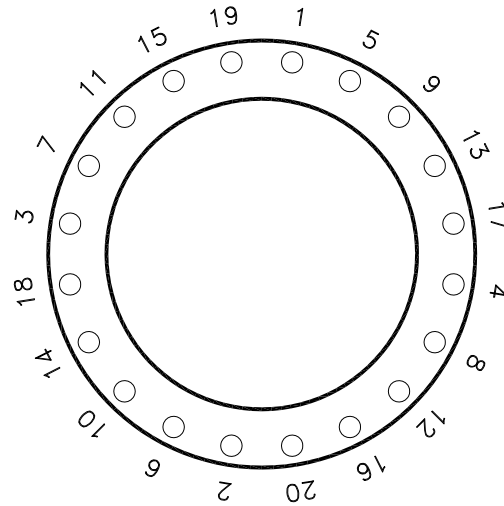
TYP. FOR 2" - 4"



TYP. FOR 6" - 8"



TYP. FOR 10" - 12"



TYP. FOR 14" - 16"

Bolt Size	Heavy Hex Socket Size
5/8"	1 1/16"
3/4"	1 1/4"
5/8"	1 1/16"
3/4"	1 1/4"
3/4"	1 1/4"
7/8"	1 7/16"
1"	1 5/8"
1 1/8"	1 3/4"
1 1/8"	1 3/4"
1 1/4"	2"
1 1/4"	2"
1 1/4"	2"
1 1/2"	2 3/8"

Size	Torque (ft-lbs) at Hydrotest Pressure (psig)			
	225	300	348	435
1"Ø	25 - 38	25 - 38	25 - 38	-
1.5"Ø	25 - 38	25 - 38	25 - 38	-
2"Ø	21 - 32	22 - 33	23 - 35	-
3"Ø	28 - 42	31 - 47	33 - 50	-
4"Ø	52 - 78	57 - 86	59 - 89	-
6"Ø	43 - 65	52 - 78	52 - 78	-
8"Ø	58 - 87	67 - 101	71 - 107	-
10"Ø	72 - 108	83 - 125	88 - 132	-
12"Ø	88 - 132	102 - 153	108 - 162	-
14"Ø	84 - 126	99 - 149	106 - 159	-
16"Ø	119 - 179	139 - 209	147 - 221	-
18"Ø	111 - 167	131 - 197	140 - 210	-
20"Ø	158 - 237	185 - 278	195 - 293	-
24"Ø	218 - 327	249 - 374	265 - 398	-

Bolt Torque Chart for flat, rubber gaskets

Size	Torque (N-m) at Hydrotest Pressure (bar)			
	15.5	20.7	24	30
DN25	34 - 51	34 - 51	34 - 51	-
DN40	34 - 51	34 - 51	34 - 51	-
DN50	28 - 43	30 - 45	31 - 47	-
DN80	38 - 57	42 - 63	45 - 67	-
DN100	71 - 106	77 - 116	80 - 120	-
DN150	58 - 87	71 - 106	71 - 106	-
DN200	79 - 118	91 - 136	96 - 144	-
DN250	98 - 146	113 - 169	119 - 179	-
DN300	119 - 179	138 - 207	146 - 220	-
DN350	114 - 171	134 - 201	144 - 216	-
DN400	161 - 242	188 - 283	199 - 299	-
DN450	151 - 226	178 - 266	190 - 285	-
DN500	214 - 321	251 - 376	264 - 397	-
DN600	296 - 443	338 - 506	359 - 539	-

Example of reading these tables:
For a 6" flange connection with a flat, rubber gasket hydrotested to 225psig (15.5 bar), it is recommended to apply 43 ft-lbs (55 N-m) of torque. If necessary, up to 65 ft-lbs (87 N-m) may be applied.

- NOTE:
1. Typical sizes are based on ASME B16.5 300# drilling.
 2. Hydrotest pressure is 1.5 times the design pressure.
 3. Caution should be used during the bolt / torque process. Take care to prevent any damage to the FRP flange. If necessary, unbolt the connection and reseal with a new gasket.
 4. When bolting to raised-face (RF) flanges, use the torque values for o-ring gaskets. See the 4B chart.
 5. 1ft-lb = 1.356N-m.
 6. Values based on a "K" nut factor of 0.20 (coefficient of friction of 0.15).
 7. Lower torque values may be used provided the gasket seats and seals adequately.

300# - FLAT GASKETS

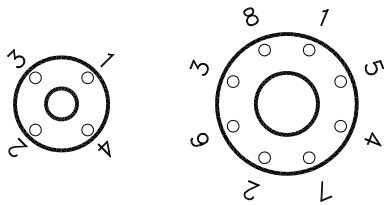
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DRAWING: Torque Sequences #4A-300#
FILENAME: IS-E10-TRQ4A
REV: R8 - APR-04-2016

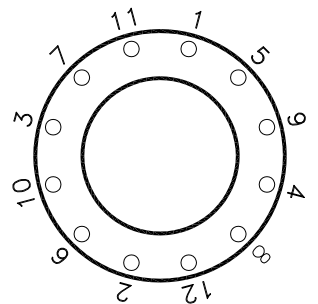
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300# O-RINGS

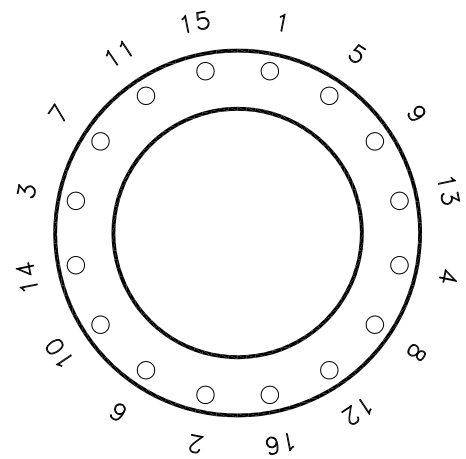


TYP. FOR 1" - 1.5"

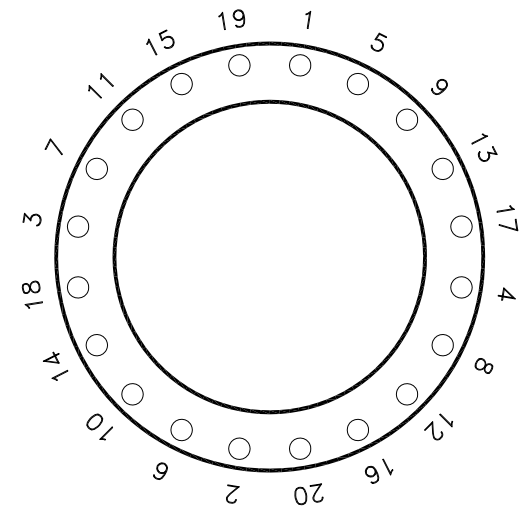
TYP. FOR 2" - 4"



TYP. FOR 6" - 8"



TYP. FOR 10" - 12"



TYP. FOR 14" - 16"

Bolt Size	Heavy Hex Socket Size
5/8"	1 1/16"
3/4"	1 1/4"
5/8"	1 1/16"
3/4"	1 1/4"
3/4"	1 1/4"
7/8"	1 7/16"
1"	1 5/8"
1 1/8"	1 3/4"
1 1/8"	1 3/4"
1 1/4"	2"
1 1/4"	2"
1 1/4"	2"
1 1/2"	2 3/8"

Size	Torque (ft-lbs) at Hydrotest Pressure (psig)			
	225	300	348	435
1"Ø	25 - 38	25 - 38	25 - 38	25 - 38
1.5"Ø	25 - 38	25 - 38	25 - 38	25 - 38
2"Ø	16 - 24	17 - 26	17 - 26	17 - 26
3"Ø	20 - 30	21 - 32	21 - 32	21 - 32
4"Ø	40 - 60	41 - 62	41 - 62	42 - 63
6"Ø	28 - 42	29 - 44	29 - 44	31 - 47
8"Ø	34 - 51	36 - 54	37 - 56	39 - 59
10"Ø	46 - 69	48 - 72	49 - 74	52 - 78
12"Ø	54 - 81	57 - 86	59 - 89	63 - 95
14"Ø	48 - 72	51 - 77	53 - 80	
16"Ø	71 - 107	76 - 114	78 - 117	
18"Ø	64 - 96	70 - 105	72 - 108	
20"Ø	98 - 147	106 - 159	110 - 165	
24"Ø	127 - 191	139 - 209	145 - 218	

Size	Torque (N-m) at Hydrotest Pressure (bar)			
	15.5	20.7	24	30
DN25	34 - 51	34 - 51	34 - 51	34 - 51
DN40	34 - 51	34 - 51	34 - 51	34 - 51
DN50	22 - 33	23 - 35	23 - 35	23 - 35
DN80	27 - 41	28 - 43	28 - 43	28 - 43
DN100	54 - 81	56 - 83	56 - 83	57 - 85
DN150	38 - 57	39 - 59	39 - 59	42 - 63
DN200	46 - 69	49 - 73	50 - 75	53 - 79
DN250	62 - 94	65 - 98	66 - 100	71 - 106
DN300	73 - 110	77 - 116	80 - 120	85 - 128
DN350	65 - 98	69 - 104	72 - 108	
DN400	96 - 144	103 - 155	106 - 159	
DN450	87 - 130	95 - 142	98 - 146	
DN500	133 - 199	144 - 216	149 - 224	
DN600	172 - 258	188 - 283	197 - 295	

Example of reading these tables:
 For a 6" 300# flange connection with an o-ring gasket hydrotested to 435psig (30 bar), it is recommended to apply 31 ft-lbs (42 N-m) of torque. If necessary, up to 47 ft-lbs may be applied.

- NOTE:
1. Typical sizes are based on ASME B16.5 300# drilling.
 2. Hydrotest pressure is 1.5 times the design pressure.
 3. Caution should be used during the bolt / torque process. Take care to prevent any damage to the FRP flange. If necessary, unbolt the connection and reseal with a new gasket.
 4. When bolting to raised-face (RF) flanges, do not exceed the values in this chart.
 5. 1ft-lb = 1.356N-m.
 6. Values based on a "K" nut factor of 0.20 (coefficient of friction of 0.15).
 7. Lower torque values may be used provided the gasket seats and seals adequately.

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300# - O-RINGS

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