

ACL® Clamp Nut Torque Guide

Introduction

The torque figures for ACL® Clamps are based on the following assumptions:

- The torque values given are for the common sanitary union design.
- Torque figures are based on maintaining ASME-BPE SG-4.2 CAT II Intrusion.
- The figures are based on the maximum working pressure (MAWP).
- Ferrules and gaskets must conform to recognised industry standards and enable the correct assembly of the union with minimal gasket crevices.
- Polymeric gasket unions should be re-torqued after allowing some time for the gasket to creep.
- The torque figure can be reduced if the MAWP is reduced and ASME BPE categories of intrusion are adhered to. However, a minimum of 2Nm should be considered.
- Torque is applied in a slow and steady manner up to the required figure.
- A suitable sanitary lubricant must be used for threads on unions where PTFE is the seal material.

ACL® Clamps use a variety of thread sizes which have been selected for the clamping force requirement of each size and style of clamp.

Table 1. ACL® Clamp Bolt Sizes by Size and Type

Nominal Size (inches)	SH	SSH	ASME VIII	S-Type
0.5	5/16" UNC - 18	M8 x 1.25	-	5/16" UNC - 18
DN10	5/16" UNC - 18	M8 x 1.25	-	5/16" UNC - 18
1.5	5/16" UNC - 18	M10 x 1.5	1/2" UNC - 13	5/16" UNC - 18
2	5/16" UNC - 18	M10 x 1.5	1/2" UNC - 13	5/16" UNC - 18
2.5	5/16" UNC - 18	M10 x 1.5	-	5/16" UNC - 18
3	5/16" UNC - 18	M10 x 1.5	1/2" UNC - 13	5/16" UNC - 18
3.5	5/16" UNC - 18	M10 x 1.5	-	5/16" UNC - 18
4	5/16" UNC - 18	M10 x 1.5	1/2" UNC - 13	5/16" UNC - 18
4.5	5/16" UNC - 18	M10 x 1.5	-	5/16" UNC - 18
5	5/16" UNC - 18	M12 x 1.75	-	-
5.5	M10 x 1.5	M12 x 1.75	-	-
6	M10 x 1.5	M12 x 1.75	1/2" UNC - 13	5/16" UNC - 18
6.625	M10 x 1.5	M12 x 1.75	-	-
8	M10 x 1.5	M12 x 1.75	1/2" UNC - 13	-
8.625	M10 x 1.5	M12 x 1.75	1/2" UNC - 13	-
10	M10 x 1.5	-	1/2" UNC - 13	-
10.625	M10 x 1.5	-	-	-
12	M10 x 1.5	-	1/2" UNC - 13	-
12.625	M10 x 1.5	-	-	-

Table 2. Maximum Torque Figures for Standard ACL® Clamp Threaded Fasteners

Maximum Torque Values		Nm (Lubricated)
Bolt Size	Nm (Dry)	
5/16" UNC - 18	11.2	10.05
M8 x 1.25	21.57	19.09
M10 x 1.5	42.17	37.85
M12 x 1.75	73.55	65.08
1/2" UNC	92.7	83.15

Table 3. Torque Conversion Factors

Units to be converted	SI Units		Imperial Units			Metric Units	
	cN.m	N.m	ozf.in	lbf.in	lbf.ft	kgf.cm	kgf.m
1cN.m =	1	0.01	1.416	0.088	0.007	0.102	0.001
1 N.m =	100	1	1.416	8.851	0.738	10.20	0.102
1ozf.in =	0.706	0.007	1	0.0625	0.005	0.072	0.0007
1lbf.in =	11.3	0.113	16	1	0.083	1.152	0.0115
1lbf.ft =	135.6	1.356	192	12	1	13.83	0.138
1kgf.cm =	9.807	0.098	13.89	0.868	0.072	1	0.01
1kgf.m =	980.7	9.807	1389	86.8	7.233	100	1

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Seals and Lubrication

Sanitary elastomeric seals have very good sealing capabilities and seal at a low clamping force. PTFE does not have these characteristics and the material creep even at low temperatures results in a decreased clamping force on the gasket which can produce a leak at a low pressure. Lubrication has a noticeable effect on the pressure holding capability of the clamp unions, specifically when polymeric gaskets are used. Also, when the bolts are un-lubricated there is an increased possibility that the threads will gall.

Lubricated clamp loads are 46% higher than dry loads. This will allow for a higher force to be imparted onto the polymeric gasket, thus resulting in a more reliable seal.

For instance:

- A ½” UNC bolt lubricated and tightened to 83.15Nm will apply a clamping load of 1448 Kg. This load will utilise 90% of the bolt yield strength.
- A ½” UNC bolt un-lubricated and tightened to 92.7Nm will apply a clamping load of 772 Kg. This load will utilise 40% of the bolt yield strength.

In addition to this; as the torque figure is increased, the chances of galling and failure of the eyebolt at the thread root increase. In order to ensure a better lifetime for your acl clamp, torque should be minimised to the correct level.

In the event that lubrication cannot be applied to the threads, a suitable bolt /nut material combination should be employed. The standard material for this application would normally be Nitronic 60 (Ref. ACL® Anti-Gall).

All technical information and advice given here is based on our previous experiences and/or test results. We give this information to the best of our knowledge, but assume no legal responsibility. Customers are asked to check the suitability and usability in the specific application, since the performance of the product can only be judged when all necessary operating data are available. Specifications are subject to change without notice. ACLs terms and conditions of sale apply to the purchase and sale of the product.

Table 4. ACL® Clamp Torque Values – Elastomeric (Dry)

Nominal Size (inches)	Flange Size	SH		SSH		ASME VIII		S-Type	
		MAWP	Torque (Nm)	MAWP	Torque (Nm)	MAWP	Torque (Nm)	MAWP	Torque (Nm)
0.5	25	50	2	75	2			25	2
DN10	34	50	2	75	2			25	2
1.5	50.5	50	2	75	2	167	2	25	2
2	64	50	2	75	2	90	2	25	2
2.5	77.5	50	2	75	2			25	2
3	91	40	3	60	3	90	3	20	3
3.5	106	40	3	60	3			20	3
4	119	35	3	53	3	57	3	17	3
4.5	130	30	4	45	4			15	4
5	144.4	30	4	45	4	28	4		
5.5	155	30	4	45	4				
6	167	30	5	45	4	22	4	15	4
6.625	183	25	5	38	5	22	5		
8	217.4	20	5	30	6	15	6		
8.625	233.5	20	6	30	6	12	6		
10	268	16	8			10	8		
10.625	286.1	16	8						
12	319	10	10			7	10		
12.625	338	10	10						

Note: Torque values for elastomeric union seals are given as a dry value. The torque value can be kept to a minimum as elastomeric seals are self-energising. In the event that a seal is not achieved, lubrication should be applied to the bolt or a higher torque should be used (do not exceed maximum torque values shown in Table 2).

Table 5. ACL® Clamp Torque Values – Polymeric (Lubricated)

Nominal Size (inches)	Flange Size	SH		SSH		ASME VIII		S-Type	
		MAWP	Torque (Nm)	MAWP	Torque (Nm)	MAWP	Torque (Nm)	MAWP	Torque (Nm)
0.5	25	50	6	75	6			25	6
DN10	34	50	6	75	6			25	6
1.5	50.5	50	6	75	6	167	10	25	6
2	64	50	6	75	6	90	10	25	6
2.5	77.5	50	6	75	6			25	6
3	91	40	9	60	9	90	15	20	9
3.5	106	40	9	60	9			20	9
4	119	35	9	53	9	57	15	17	9
4.5	130	30	10	45	12			10	10
5	144.4	30	10	45	20	28	20		
5.5	155	30	16	45	20				
6	167	30	20	45	20	22	20	7	10
6.625	183	25	20	38	25	22	25		
8	217.4	20	20	30	30	15	24		
8.625	233.5	20	24	30	30	12	24		
10	268	16	32			10	32		
10.625	286.1	16	32						
12	319	10	37.5			7	40		
12.625	338	10	37.5						

Note: Torque values for polymeric union seals are given as a lubricated value. In the event that a seal is not achieved, lubrication should be re-applied to the bolt or a higher torque should be used (do not exceed maximum torque values shown in Table 2).