



TORQUE ESTIMATING CHART

ASTM A193, Grade B-7, B-16 Bolts
Nut Factor (K): .14, .18, and .20

$$\text{Torque} = K \times \text{Clamp Load (lbs)} \times \text{Bolt Diameter (inches)}$$

Stud Diameter (inches)	Stress Area	Nut Size (ATF)	Torque Values (FT-Lbs)								
			40% Yield			50% Yield			60% Yield		
			K=0.14	K=0.18	K=0.20	K=0.14	K=0.18	K=0.20	K=0.14	K=0.18	K=0.20
1/2	.141	7/8	35	45	50	44	56	63	53	68	75
5/8	.226	1-1/16	69	89	99	86	111	123	104	133	148
3/4	.334	1-1/4	123	158	176	154	198	220	185	237	264
7/8	.462	1-7/16	198	255	283	248	318	354	297	382	424
1	.606	1-5/8	297	382	424	371	477	530	446	573	636
1-1/8	.790	1-13/16	435	560	622	544	699	777	653	839	932
1-1/4	1.00	2	613	788	876	766	985	1,095	920	1,182	1,314
1-3/8	1.233	2-3/16	831	1,068	1,187	1,039	1,336	1,484	1,247	1,603	1,781
1-1/2	1.492	2-3/8	1,097	1,410	1,567	1,371	1,763	1,959	1,646	2,116	2,351
1-5/8	1.78	2-9/16	1,417	1,822	2,024	1,771	2,277	2,530	2,126	2,733	3,036
1-3/4	2.08	2-3/4	1,784	2,293	2,548	2,230	2,867	3,186	2,676	3,441	3,823
1-7/8	2.41	2-15/16	2,214	2,847	3,163	2,768	3,558	3,954	3,321	4,270	4,744
2	2.77	3-1/8	2,715	3,490	3,878	3,394	4,363	4,848	4,073	5,236	5,818
2-1/4	.356	3-1/2	3,925	5,046	5,607	4,906	6,308	7,009	5,888	7,570	8,411
2-1/2	4.44	3-7/8	4,921	6,327	7,030	6,151	7,909	8,788	7,382	9,491	10,545
2-3/4	5.43	4-1/4	6,620	8,512	9,458	8,275	10,639	11,821	9,930	12,767	14,186
3	6.51	4-5/8	8,658	11,132	12,369	10,823	13,915	15,461	12,987	16,698	18,553
3-1/4	7.69	5	11,080	14,246	15,829	13,850	17,807	19,786	16,620	21,369	23,743
3-1/2	8.96	5-3/8	13,903	17,875	19,861	17,379	22,344	24,827	20,855	26,813	29,792
3-3/4	10.34	5-3/4	17,190	22,102	24,558	21,488	27,627	30,696	25,785	33,152	36,836
4	11.81	6-1/8	20,943	26,927	29,919	26,179	33,658	37,398	31,415	40,390	44,878
MATERIAL YIELD STRENGTH						NUMBER OF THREADS					
1/2" - 2-1/4" DIAMETER STUDS: 105,000 PSI 1/2" - 4" DIAMETER STUDS 95,000 PSI						1/2" DIAMETER STUDS: 13 TPI 5/8" DIAMETER STUDS: 11 TPI 3/4" DIAMETER STUDS: 10 TPI 7/8" DIAMETER STUDS: 9 TPI 1" - 4" DIAMETER STUDS: 8 TPI					

The K Factor is an experimentally determined constant that relates the torque applied to the load induced in the fastener. This factor is affected by the condition of the fastener, the lubricant used and the condition of the flange.

For example, the 0.18 K Factor listed above is based on the following conditions:
1. New condition of flanges, studs and nut.
2. Thorough application of lubricant on all mating surfaces of flange, nut and stud.
3. Use of hardened steel washers.

Clamp Load or Residual Load = Bolt Preload X Stress Area

Example - For a 1-3/8" bolt at 50% of yield bolt stress is 52,500 psi and stress area of 1.233= 64,732 lbs of clamp load

Example - For a 1-3/8" bolt at 40% of yield bolt stress is 42,000 psi and stress area of 1.233= 51,786 lbs of clamp load

When **tensioning** to get the **pump pressure divide** the **residual load** by the **ram area** of the tensioner that is being used.

Use the **load loss factor chart** to get the **grip length** and the proper **residual load**.

Example= For a 1 3/8" bolt at 45,000 psi **bolt stress** and a **stress area** of 1.233 with a **grip length** of 10" the **clamp** or **residual load** would be 63,807 lbs. With a Hydratight HL-2 1-3/8" tensioner with a ram area of 6.65 sq inches.

$$\frac{63,807 \text{ lbs}}{6.65} = 9595 \text{ psi}$$