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TORQUE CHARTS

Torque Wrench Principal

The torque wrench uses Hooke's Law in its design and construction. By deflecting (bending) a steel beam, or in some cases a coiled spring, the relationship between the pull on the handle (torque) and the amount of beam deflection is established.

When the head is attached to the bolt head or nut and the handle is pulled, the flexible beam is bent. On the beam type torque wrench the pointer rod, which is attached to the solid wrench head, is not bent. Since the scale is attached to the handle element, it follows the flexible beam, thus moving the scale under the pointer end. The scale is calibrated allowing the operator to see how much torque is being applied.

Note: Torque indicators can range from inch-grams, inch-ounces, inch-pounds, to foot-pounds (Newton-metres). Inch-pounds, foot-pounds and Newton-metre torque wrenches are the most common scales.

To convert foot-pounds to inch-pounds, multiply the foot-pounds by 12.

To convert inch-pounds to foot-pounds, divide inch-pounds by 12. To convert foot-pounds to Newton-metres, multiply by 1.356.

Torque Wrench Range

Torque wrenches are made in different sizes or ranges as well as in varying calibrations, such as the following:

- 0 - 200 inch-pound (0 - 22.6 Nm).
- 0 - 50 foot-pound (0 - 70 Nm).
- 0 - 100 foot-pound (0 - 135 Nm).
- 0 - 150 foot-pound (0 - 203 Nm).

Note: A torque wrench will produce best results if used somewhere near the middle half of its range. For example, a 0 - 100 foot-pound torque wrench will provide the most accurate reading at 25 to 75 foot-pounds.

MACHINE SCREWS AND BOLTS									
DRIVER SIZE				TORQUE					
THREAD SIZE	SLOT WIDTH	PHILLIPS	CLUTCH	STEEL 55,000 psi	BRASS 60,000 psi	SI. BRONZE 70,000 psi	STAINLESS	ALUMINUM 55,000 psi	
0	0.016	0		16 in. oz.	11 in. oz.	13 in. oz.	14 in. oz.	8 in. oz.	
1	0.019	0		28 in. oz.	19 in. oz.	23 in. oz.	24 in. oz.	15 in. oz.	
2	0.023	1	3/32	2.6 in. lbs.	2.0 in. lbs.	2.3 in. lbs.	2.5 in. lbs.	1.4 in. lbs.	
3	0.027	1	3/32	4.0 in. lbs.	3.2 in. lbs.	3.6 in. lbs.	4 in. lbs.	2.1 in. lbs.	
4	0.031	1	3/32	5.5 in. lbs.	4.3 in. lbs.	4.8 in. lbs.	5.2 in. lbs.	2.9 in. lbs.	
5	0.035	2		8 in. lbs.	6.8 in. lbs.	7.1 in. lbs.	8 in. lbs.	4.2 in. lbs.	
6	0.039	2	1/8	10 in. lbs.	8 in. lbs.	9 in. lbs.	9.6 in. lbs.	5.3 in. lbs.	
8	0.045	2	5/32	21 in. lbs.	16 in. lbs.	18 in. lbs.	20 in. lbs.	11 in. lbs.	
10	0.050	2	5/32	24 in. lbs.	19 in. lbs.	21 in. lbs.	23 in. lbs.	14 in. lbs.	
1/4	0.064	3	1/4	79 in. lbs.	62 in. lbs.	69 in. lbs.	75 in. lbs.	45 in. lbs.	
5/16	0.072	3	5/32	138 in. lbs.	107 in. lbs.	123 in. lbs.	132 in. lbs.	80 in. lbs.	
3/8	0.081	4	5/16	252 in. lbs.	192 in. lbs.	216 in. lbs.	240 in. lbs.	144 in. lbs.	
7/16	0.081	4		396 in. lbs.	312 in. lbs.	348 in. lbs.	372 in. lbs.	228 in. lbs.	
1/2	0.091	4		540 in. lbs.	420 in. lbs.	480 in. lbs.	516 in. lbs.	312 in. lbs.	
9/16	0.102			708 in. lbs.	564 in. lbs.	624 in. lbs.	684 in. lbs.	408 in. lbs.	
5/8	0.116			97 ft. lbs.	912 in. lbs.	96 ft. lbs.	92 ft. lbs.	720 in. lbs.	
3/4	0.131			130 ft. lbs.	102 ft. lbs.	115 ft. lbs.	124 ft. lbs.	960 in. lbs.	

TIGHTENING TORQUE GUIDE			
SAE GRADE 2 - Fine Thread			
SIZE	CLAMP LOAD	PLAIN	PLATED
1/4 - 28 (.250)	1,500	75 in. lbs.	56 in. lbs.
5/16 - 24 (.3125)	2,400	13 ft. lbs.	9 ft. lbs.
3/8 - 24 (.375)	3,600	23 ft. lbs.	17 ft. lbs.
7/16 - 20 (.4375)	4,913	36 ft. lbs.	27 ft. lbs.
1/2 - 20 (.500)	6,600	55 ft. lbs.	41 ft. lbs.
9/16 - 18 (.5625)	8,400	79 ft. lbs.	59 ft. lbs.
5/8 - 18 (.625)	10,575	110 ft. lbs.	83 ft. lbs.
3/4 - 16 (.750)	12,600	184 ft. lbs.	138 ft. lbs.
7/8 - 14 (.875)	15,375	192 ft. lbs.	144 ft. lbs.
1 - 12 (1.000)	16,425	274 ft. lbs.	205 ft. lbs.
1 - 14 (1.000)	16,800	280 ft. lbs.	210 ft. lbs.
1 1/8 - 12 (1.125)	21,150	397 ft. lbs.	297 ft. lbs.
1 1/4 - 12 (1.250)	26,550	553 ft. lbs.	415 ft. lbs.
1 3/8 - 12 (1.375)	32,550	746 ft. lbs.	559 ft. lbs.
1 1/2 - 12 (1.500)	39,150	979 ft. lbs.	734 ft. lbs.

TIGHTENING TORQUE GUIDE			
SAE GRADE 2 - Coarse Thread			
SIZE	CLAMP LOAD	PLAIN	PLATED
1/4 - 20 (.250)	1,313	66 in. lbs.	49 in. lbs.
5/16 - 18 (.3125)	2,175	11 ft. lbs.	8 ft. lbs.
3/8 - 16 (.375)	3,188	20 ft. lbs.	15 ft. lbs.
7/16 - 14 (.4375)	4,388	32 ft. lbs.	24 ft. lbs.
1/2 - 13 (.500)	5,850	49 ft. lbs.	37 ft. lbs.
9/16 - 12 (.5625)	7,500	70 ft. lbs.	53 ft. lbs.
5/8 - 11 (.625)	9,300	97 ft. lbs.	73 ft. lbs.
3/4 - 10 (.750)	11,400	166 ft. lbs.	125 ft. lbs.
7/8 - 9 (.875)	13,800	173 ft. lbs.	129 ft. lbs.
1 - 8 (1.000)	15,000	250 ft. lbs.	188 ft. lbs.
1 1/8 - 7 (1.125)	18,900	354 ft. lbs.	286 ft. lbs.
1 1/4 - 7 (1.250)	24,000	500 ft. lbs.	375 ft. lbs.
1 3/8 - 6 (1.375)	28,575	655 ft. lbs.	491 ft. lbs.
1 1/2 - 6 (1.500)	34,800	870 ft. lbs.	652 ft. lbs.

TIGHTENING TORQUE GUIDE			
SAE GRADE 5 - Fine Thread			
SIZE	CLAMP LOAD	PLAIN	PLATED
1/4 - 28 (.250)	2,325	10 ft. lbs.	87 in. lbs.
5/16 - 24 (.3125)	3,675	19 ft. lbs.	14 ft. lbs.
3/8 - 24 (.375)	5,588	35 ft. lbs.	26 ft. lbs.
7/16 - 20 (.4375)	7,575	55 ft. lbs.	41 ft. lbs.
1/2 - 20 (.500)	10,200	85 ft. lbs.	64 ft. lbs.
9/16 - 18 (.5625)	12,975	122 ft. lbs.	91 ft. lbs.
5/8 - 18 (.625)	16,350	170 ft. lbs.	128 ft. lbs.
3/4 - 16 (.750)	23,775	297 ft. lbs.	223 ft. lbs.
7/8 - 14 (.875)	32,475	474 ft. lbs.	355 ft. lbs.
1 - 12 (1.000)	42,300	705 ft. lbs.	529 ft. lbs.
1 - 14 (1.000)	32,275	721 ft. lbs.	541 ft. lbs.
1 1/8 - 12 (1.125)	47,475	890 ft. lbs.	668 ft. lbs.
1 1/4 - 12 (1.250)	59,550	1241 ft. lbs.	930 ft. lbs.
1 3/8 - 12 (1.375)	72,975	1672 ft. lbs.	1254 ft. lbs.
1 1/2 - 12 (1.500)	87,750	2194 ft. lbs.	1645 ft. lbs.

TIGHTENING TORQUE GUIDE			
SAE GRADE 5 - Coarse Thread			
SIZE	CLAMP LOAD	PLAIN	PLATED
1/4 - 20 (.250)	2,025	8 ft. lbs.	76 in. lbs.
5/16 - 18 (.3125)	3,338	17 ft. lbs.	13 ft. lbs.
3/8 - 16 (.375)	4,950	31 ft. lbs.	23 ft. lbs.
7/16 - 14 (.4375)	6,788	50 ft. lbs.	37 ft. lbs.
1/2 - 13 (.500)	9,075	76 ft. lbs.	57 ft. lbs.
9/16 - 12 (.5625)	11,625	109 ft. lbs.	82 ft. lbs.
5/8 - 11 (.625)	14,400	150 ft. lbs.	112 ft. lbs.
3/4 - 10 (.750)	21,300	266 ft. lbs.	200 ft. lbs.
7/8 - 9 (.875)	29,475	430 ft. lbs.	322 ft. lbs.
1 - 8 (1.000)	38,625	644 ft. lbs.	483 ft. lbs.
1 1/8 - 7 (1.125)	42,375	794 ft. lbs.	596 ft. lbs.
1 1/4 - 7 (1.250)	53,775	1120 ft. lbs.	840 ft. lbs.
1 3/8 - 6 (1.375)	64,125	1470 ft. lbs.	1102 ft. lbs.
1 1/2 - 6 (1.500)	78,000	1950 ft. lbs.	1462 ft. lbs.

TIGHTENING TORQUE GUIDE			
SAE GRADE 8 - Fine Thread			
SIZE	CLAMP LOAD	PLAIN	PLATED
1/4 - 28 (.250)	3,263	14 ft. lbs.	10 ft. lbs.
5/16 - 24 (.3125)	5,113	27 ft. lbs.	20 ft. lbs.
3/8 - 24 (.375)	7,875	49 ft. lbs.	37 ft. lbs.
7/16 - 20 (.4375)	10,650	78 ft. lbs.	58 ft. lbs.
1/2 - 20 (.500)	14,400	120 ft. lbs.	90 ft. lbs.
9/16 - 18 (.5625)	18,300	172 ft. lbs.	129 ft. lbs.
5/8 - 18 (.625)	23,025	240 ft. lbs.	180 ft. lbs.
3/4 - 16 (.750)	33,600	420 ft. lbs.	315 ft. lbs.
7/8 - 14 (.875)	45,825	668 ft. lbs.	501 ft. lbs.
1 - 12 (1.000)	59,700	995 ft. lbs.	746 ft. lbs.
1 - 14 (1.000)	61,125	1019 ft. lbs.	764 ft. lbs.
1 1/8 - 12 (1.125)	77,025	1444 ft. lbs.	1083 ft. lbs.
1 1/4 - 12 (1.250)	96,600	2012 ft. lbs.	1509 ft. lbs.
1 3/8 - 12 (1.375)	118,350	2712 ft. lbs.	2034 ft. lbs.
1 1/2 - 12 (1.500)	142,275	3557 ft. lbs.	2668 ft. lbs.

TIGHTENING TORQUE GUIDE			
SAE GRADE 8 - Coarse Thread			
SIZE	CLAMP LOAD	PLAIN	PLATED
1/4 - 20 (.250)	2,850	12 ft. lbs.	9 ft. lbs.
5/16 - 18 (.3125)	4,725	25 ft. lbs.	18 ft. lbs.
3/8 - 16 (.375)	6,975	44 ft. lbs.	33 ft. lbs.
7/16 - 14 (.4375)	9,600	70 ft. lbs.	52 ft. lbs.
1/2 - 13 (.500)	12,750	106 ft. lbs.	80 ft. lbs.
9/16 - 12 (.5625)	16,350	153 ft. lbs.	115 ft. lbs.
5/8 - 11 (.625)	20,325	212 ft. lbs.	159 ft. lbs.
3/4 - 10 (.750)	30,075	376 ft. lbs.	282 ft. lbs.
7/8 - 9 (.875)	41,550	606 ft. lbs.	454 ft. lbs.
1 - 8 (1.000)	54,525	909 ft. lbs.	682 ft. lbs.
1 1/8 - 7 (1.125)	68,700	1288 ft. lbs.	966 ft. lbs.
1 1/4 - 7 (1.250)	87,225	1817 ft. lbs.	1363 ft. lbs.
1 3/8 - 6 (1.375)	103,950	2382 ft. lbs.	1787 ft. lbs.
1 1/2 - 6 (1.500)	126,450	3161 ft. lbs.	2371 ft. lbs.

METRIC BOLT TORQUE CHART			
Recommended torque in N•m			
Bolt Diameter	Property Class 4.8	Property Class 8.8	Property Class 10.9
M5	3	7	9
M6	6	12	16
M8	15	30	40
M10	25	55	75
M12	50	100	135
M14	80	160	215
M16	125	245	335
M20	240	480	650
M24	410	825	1125
M30	820	1640	2240
M36	1435	2870	3910

Bolt Size	18-8 St. St.	Brass	Silicon Bronze	Aluminum 2024-T4	316 St. St.	Monel	Nylon*
	In.-Lbs.	In.-Lbs.	In.-Lbs.	In.-Lbs.	In.-Lbs.	In.-Lbs.	In.-Lbs.
2.56	2.5	2.0	2.3	1.4	2.6	2.5	
2.64	3.0	2.5	2.8	1.7	3.2	3.1	.44
3.48	3.9	3.2	3.6	2.1	4.0	4.0	
3.56	4.4	3.6	4.1	2.4	4.6	4.5	
4.40	5.2	4.3	4.8	2.9	5.5	5.3	
4.48	6.6	5.4	6.1	3.6	6.9	6.7	1.19
5.40	7.7	6.3	7.1	4.2	8.1	7.8	
5.44	9.4	7.7	8.7	5.1	9.8	9.6	
6.32	9.6	7.9	8.9	5.3	10.1	9.8	
6.40	12.1	9.9	11.2	6.6	12.7	12.3	2.14
8.32	19.8	16.2	18.4	10.8	20.7	20.2	
8.36	22.0	18.0	20.4	12.0	23.0	22.4	4.3
10.24	22.8	18.6	21.2	13.8	23.8	25.9	6.61
10.32	31.7	25.9	29.3	19.2	33.1	34.9	8.2
1/4" .20	75.2	61.5	68.8	45.6	78.8	85.3	16.0
1/4" .28	94.0	77.0	87.0	57.0	99.0	106.0	20.8
5/16" .18	132	107	123	80	138	149	
5/16" .24	142	116	131	86	147	160	34.9
3/8" .16	236	192	219	143	247	266	
3/8" .24	259	212	240	157	271	294	
7/16" .14	376	317	349	228	393	427	
7/16" .20	400	327	371	242	418	451	
1/2" .13	517	422	480	313	542	584	
1/2" .20	541	443	502	328	565	613	
9/16" .12	682	558	632	413	713	774	
9/16" .18	752	615	697	456	787	855	
5/8" .11	1110	907	1030	715	1160	1330	
5/8" .18	1244	1016	1154	798	1301	1482	
3/4" .10	1530	1249	1416	980	1582	1832	
3/4" .16	1490	1220	1382	958	1558	1790	
7/8" .9	2328	1905	2140	1495	2430	2775	
7/8" .14	2318	1895	2130	1490	2420	2755	
1" .8	3440	2815	3185	2205	3595	4130	
1" .14	3110	2545	2885	1995	3250	3730	
	Ft.-Lbs.	Ft.-Lbs.	Ft.-Lbs.	Ft.-Lbs.	Ft.-Lbs.	Ft.-Lbs.	
1.1/8" .7	413	337	383	265	432	499	
1.1/8" .12	390	318	361	251	408	470	
1.1/4" .7	523	428	485	336	546	627	
1.1/4" .12	480	394	447	308	504	575	
1.1/2" .6	888	727	822	570	930	1064	