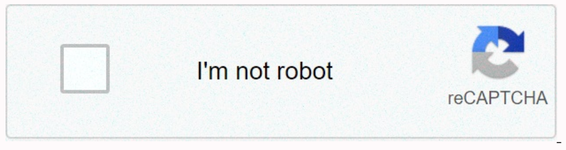

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Brass bolt torque chart pdf

Metric brass bolt torque chart pdf. How to properly torque bolts. How to cut a brass bolt. Brass bolt torque settings.

Abstract: ASTM nut and bolt Text: Length Compound (diameter & pitch) Metric Options (see adjacent chart) BLKOX , and contact surface when torque . Their single-piece design eliminates the need for gaskets, sealing , , contact factory for other sealing compounds. METRIC THREAD SIZE M3X0.5 M4X0.7 M5X0.8 M6X1 M8X1 , Consult factory for additional sizes. METRIC NUT MATERIAL: Stainless-Steel Can also be made of carbon steel, nickel-plated brass , aluminum, etc. Standard rubber is silicone rubber, contact factory for These charts show suggested maximum torque values for threaded products and are intended only as a guide.
Always refer to the manufacturers recommended torque values if possible.
CDI Torque Products is not responsible for any application of torque or it's consequences as a result of using this chart. Use at your own risk! Abstract: ASTM nut and bolt Text: Length Compound (diameter & pitch) Metric Options (see adjacent chart) BLKOX , and contact surface when torque . Their single-piece design eliminates the need for gaskets, sealing , , contact factory for other sealing compounds. METRIC THREAD SIZE M3X0.5 M4X0.7 M5X0.8 M6X1 M8X1 , Consult factory for additional sizes. METRIC NUT MATERIAL: Stainless-Steel Can also be made of carbon steel, nickel-plated brass , aluminum, etc. Standard rubber is silicone rubber, contact factory for Determining the proper torque for a fastener is the biggest problem in fastener installation. Some of the many variables causing problems are The coefficient of friction between mating threads The coefficient of friction between the bolthead (or nut) and its mating surface The effect of bolt coatings and lubricants on the friction coefficients The percentage of bolt tensile strength to be used for preload Once agreement is reached on item 4, how to accurately determine this value Relative spring rates of the structure and the bolts Interaction formulas to be used for combining simultaneous shear and tension loads on a bolt (Should friction loads due to bolt clamping action be included in the interaction calculations?) Whether "running torque" for a locking device should be added to the normal torque Development of Torque Tables The coefficient of friction can vary from 0.04 to 1.10, depending on the materials and the lubricants being used between mating materials. (Table IV from ref. 2 gives a variety of friction coefficients.) Since calculated torque values are a function of the friction coefficients between mating threads and between the bolthead or nut and its mating surface, it is vitally important that the torque table values used are adjusted to reflect any differences in friction coefficients between those used to calculate the table and the user's values.

Standard Arc Welding Studs - Tensile / Torque Strengths							
Low Carbon Steel - 61,000 PSI Min. Tensile, 49,000 PSI Min. Yield							
Thread Size	Thread Diameter (in)	MEEA (in) 2 *	Yield Load (Lbs)**	Ultimate Tensile Load (Lbs)	Yield Torque (Ft lbs)***	Ultimate Torque (Ft lbs)***	Shear Strength (60% of Tensile Load)
10-24	0.1875	0.017	853	1,061	2.7	3.3	637
10-32	0.1875	0.020	975	1,214	3.0	3.8	728
1/4-20	0.2500	0.032	1,553	1,934	6.5	8.1	1,160
1/4-28	0.2500	0.036	1,774	2,208	7.4	9.2	1,325
5/16-18	0.3125	0.032	1,578	1,964	8.2	10.2	1,179
5/16-24	0.3125	0.058	2,837	3,532	14.8	18.4	2,119
3/8-16	0.3750	0.077	3,788	4,715	23.7	29.5	2,829
3/8-24	0.3750	0.088	4,292	5,344	26.8	33.4	3,206
7/16-14	0.4375	0.106	5,194	6,466	37.9	47.1	3,880
7/16-20	0.4375	0.119	5,807	7,229	42.3	52.7	4,337
1/2-13	0.5000	0.142	6,938	8,638	57.8	72.0	5,183
1/2-20	0.5000	0.160	7,825	9,742	65.2	81.2	5,845
5/8-11	0.6250	0.226	11,054	13,762	115.2	143.4	8,257
5/8-18	0.6250	0.256	12,520	15,586	130.4	162.3	9,351
3/4-10	0.7500	0.334	16,366	20,374	204.6	254.7	12,224
3/4-16	0.7500	0.372	18,248	22,716	228.1	284.0	13,630
7/8-9	0.8750	0.461	22,599	28,133	329.6	410.3	16,880
7/8-14	0.8750	0.509	24,931	31,037	363.6	452.6	18,622
1-8	1.0000	0.605	29,650	36,911	494.2	615.2	22,147
1-14	1.0000	0.679	33,276	41,425	554.6	690.4	24,855
M5 - 0.80	0.1969	0.022	1,062	1,322	3.5	4.3	793
M6 - 1.00	0.2362	0.031	1,506	1,875	5.9	7.4	1,125
M8 - 1.25	0.3150	0.056	2,744	3,416	14.4	17.9	2,050
M10 - 1.50	0.3937	0.089	4,348	5,413	28.5	35.5	3,248
M12 - 1.75	0.4724	0.129	6,322	7,870	49.8	62.0	4,722
M16 - 2.00	0.6299	0.240	11,778	14,662	123.6	153.9	8,797
M20 - 2.50	0.7874	0.376	18,402	22,909	241.5	300.6	13,745
M22 - 2.50	0.8661	0.466	22,832	28,424	329.6	410.3	17,054
M24 - 3.0	0.9449	0.541	26,494	32,983	417.2	519.4	19,790

Running torque should be included in the values listed in the tables because any torque puts shear load on the bolt. The torque values in table V have been calculated as noted in the footnotes, by using formulas from reference 3. (A similar table was published in Product Engineering by Arthur Korn around 1944.) Higher torques (up to theoretical yield) are sometimes used for bolts that cannot be locked to resist vibration. The higher load will increase the vibration resistance of the bolt, but the bolt will yield and unload if its yield point is inadvertently exceeded. Since the exact yield torque cannot be determined without extensive instrumentation, it is not advisable to torque close to the bolt yield point. Fastener proof load is sometimes listed in the literature. This value is usually 75 percent of theoretical yield, to prevent inadvertent yielding of the fastener through torque measurement inaccuracies. Table V -- Bolt Torque [No lubrication on threads. Torque values are based on friction coefficients of 0.12 between threads and 0.14 between nut and washer or head and washer, as manufactured (no special cleaning).] Size Root area,in.2 Torque range(class 8, 150 ksi, bolts (Note 1)) 10-24 0.0145 23 to 34 in.-lb 10-32 0.0175 29 to 43 in.-lb 1/4-20 0.0269 54 to 81 in.-lb 1/4-28 0.0326 68 to 102 in.-lb 5/16-18 0.0454 117 to 176 in.-lb 5/16-24 0.0524 139 to 208 in.-lb 3/8-16 0.0678 205 to 308 in.-lb 3/8-24 0.0809 230 to 345 in. -lb 7/16-14 0.0903 28 to 42 ft -lb 7/16-20 0.1090 33 to 50 ft-lb 1/2-13 0.1257 42 to 64 ft-lb 1/2-20 0.1486 52 to 77 ft-lb 9/16-12 0.1620 61 to 91 ft-lb 9/16-18 0.1888 73 to 109 ft-lb 5/8-11 0.2018 84 to 126 ft-lb 5/8-18 0.2400 104 to 156 ft-lb 3/4-10 0.3020 117 to 176 ft-lb (Note 2) 3/4-16 0.3513 139 to 208 ft-lb (Note 2) 7/8-9 0.4193 184 to 276 ft-lb (Note 2) 7/8-14 0.4805 213 to 320 ft-lb (Note 2) 1-8 0.5510 276 to 414 ft-lb (Note 2) 1-14 0.6464 323 to 485 ft-lb (Note 2) 1 1/8-7 0.6931 390 to 585 ft-lb (Note 2) 1 1/8-12 0.8118 465 to 698 ft-lb (Note 2) 1 1/4-7 0.8898 559 to 838 ft-lb (Note 2) 1 1/4-12 1.0238 655 to 982 ft-lb (Note 2) Note 1: The values given are 50 and 75 percent of theoretical yield strength of a bolt material with a yield of 120 ksi.

Bolt Size	TPI	Tensile Stress Area	Fastener Coating	Bolt Torque & Clamp Load	10,000 psi	25,000 psi	SAE J429- Grade 2	SAE J429- Grade 5	SAE J429- Grade 8	ASTM A574 Socket Head Cap Screw
3/8 UNC	16	0.0775		Clamp Load (Lb)	775	1,937	3,196	4,940	6,974	8,136
			Lubricated		4	9	15	23	33	38
			Zinc Plated	Torque (Ft-Lb)	4	11	18	28	39	46
			Plain - Dry		5	12	20	31	44	51
3/8 UNF	24	0.0878		Clamp Load (Lb)	878	2,196	3,623	5,599	7,905	9,222
			Lubricated		4	10	17	26	37	43
			Zinc Plated	Torque (Ft-Lb)	5	12	20	31	44	52
			Plain - Dry		5	14	23	35	49	58
7/16 UNC	14	0.1063		Clamp Load (Lb)	1,063	2,658	4,385	6,777	9,568	11,162
			Lubricated		6	15	24	37	52	61
			Zinc Plated	Torque (Ft-Lb)	7	17	29	44	63	73
			Plain - Dry		8	19	32	49	70	81
7/16 UNF	20	0.1187		Clamp Load (Lb)	1,187	2,968	4,897	7,568	10,684	12,465
			Lubricated		6	16	27	41	58	68
			Zinc Plated	Torque (Ft-Lb)	8	19	32	50	70	82
			Plain - Dry		9	22	36	55	78	91
1/2 UNC	13	0.1419		Clamp Load (Lb)	1,419	3,547	5,853	9,046	12,771	14,899
			Lubricated		9	22	37	57	80	93
			Zinc Plated	Torque (Ft-Lb)	11	27	44	68	96	112
			Plain - Dry		12	30	49	75	106	124
1/2 UNF	20	0.1600		Clamp Load (Lb)	1,600	3,999	6,598	10,197	14,396	16,795
			Lubricated		10	25	41	64	90	105
			Zinc Plated	Torque (Ft-Lb)	12	30	49	76	108	126
			Plain - Dry		13	33	55	85	120	140

Corresponding values for materials with different yield strengths can be obtained by multiplying these table values by the ratio of the respective material yield strengths. Note 2: Bolts of 0.75-in. diameter and larger have reduced allowables (75 percent of normal strength) owing to inability to heat treat this large a cross section to an even hardness.
Try this bolted joint calculator. stress analysis of a bolted joint accounts for preload, applied axial load, and applied shear load Alternative Torque Formula A popular formula for quick bolt torque calculations is T = KFd, where T denotes torque, F denotes axial load, d denotes bolt diameter, and K (torque coefficient) is a calculated value from the formula: $$ K = \left({ d_m \over 2d }\right) { \tan{\psi} + \mu \sec{\alpha} \over 1 - \mu \tan{\psi} \sec{\alpha} } + 0.625 \mu_c $$ as given in reference 4 (p. 378) where dm thread mean diameter ψ thread helix angle μ friction coefficient between threads α thread angle μc friction coefficient between bolthead (or nut) and clamping surface The commonly assumed value for K is 0.2, but this value should not be used blindly. Table VI gives some calculated values of K for various friction coefficients. A more realistic "typical" value for K would be 0.15 for steel on steel. Note that μ and μc are not necessarily equal, although equal values were used for the calculated values in table VI. Table VI -- Torque Coefficients Friction coefficient TorqueCoefficient,K Betweenthreads,μ Between bolthead(or nut) andclamping surface,μc 0.05 0.05 0.074 0.10 0.10 0.133 0.15 0.15 0.189 0.20 0.20 0.250 Torque-Measuring Methods A number of torque-measuring methods exist, starting with the mechanic's "feel" and ending with installing strain gages on the bolt. The accuracy in determining the applied torque values is cost dependent. Tables VII and VIII are by two different "experts," and their numbers vary.
However, they both show the same trends of cost versus torque accuracy. Table VII -- Industrial Fasteners Institute's Torque-Measuring Method [From ref. 1.] Preload measuring method Accuracy, percent Relative cost Feel (operator's judgment) ±35 1 Torque wrench ±25 1.5 Turn of the nut ±15 3 Load-indicating washers ±10 7 Fastener elongation ±3 to 5 15 Strain gages ±1 20 Table VIII -- Machine Design's Torque-Measuring Method [From ref. 5.] (a) Typical tool accuracies Type of tool Element controlled Typical accuracy range,percent of full scale Slug wrench Turn 1 Flat Bar torque wrench Torque ±3 to 15 Turn 1/4 Flat Impact wrench Torque ±10 to 30 Turn ±10 to 20° Hydraulic wrench Torque ±3 to ±10 Turn ±5 to 10° Gearhead air-powered wrench Torque ±10 to ±20 Turn ±5 to 10° Mechanical multiplier Torque ±5 to 20 Turn ±2 to 10° Worm-gear torque wrench Torque ±0.25 to 5 Turn ±1 to 5° Digital torque wrench Torque ±1/4 to 1 Turn 1/4 Flat Ultrasonically controlled wrench Bolt elongation ±1 to 10 Hydraulic tensioner Initial bolt stretch ±1 to 5 Computer-controlled tensioning Simultaneous torque and turn ±0.5 to 2 (b) Control accuracies Element controlled Preload accuracy, percent To maximize accuracy Torque ±15 to ±30 Control bolt, nut, and washer hardness, dimensions, and finish.

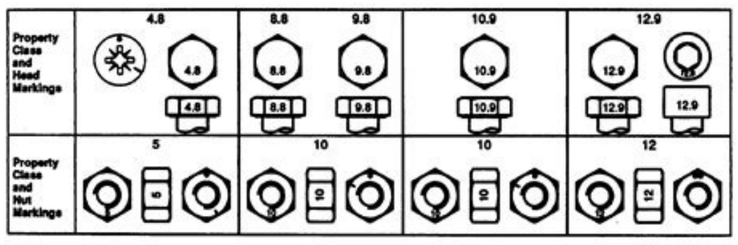
Screw dimension	Hexagon Head Bolt			Hexagon Socket Head Cap Screws			TORX		TORXPLUS		Triple Square	LHSTIX	Ref) Standard Tightning Torque (Nm)				
	Standard	Compact	High Strength	Standard	Button Head / Shoulder Head	Hexagon Socket Set Screws	T	E	IP	EP [EPL]	XZN	LH-S [LH-SS]	Grade 4.6	Grade 6.8	Grade 8.8	Grade 10.9	Grade 12.9
M2	4			1.5		0.9	T6/T8		6IP				0.12	0.24	0.32	0.45	0.54
M2.5	5			2		1.3	T8		8IP		M3		0.25	0.49	0.65	0.92	1.1
M3	5.5			2.5	2	1.5	T10	E4	8IP/7IOP	4EP	M3		0.43	0.87	1.16	1.63	1.96
M3.5	(6)						T15		10IP/11SP				0.68	1.37	1.82	2.56	3.08
M4	7			3	2.5	2	T20/T25	E5	15IP/20IP	5EP	M4	LH4S	1.01	2.02	2.7	3.79	4.54
M5	8			4	3	2.5	T25/T27	E6	20IP/25IP /27IP	6EP [6EPL]	M5	LH5S	2.04	4.09	5.47	7.67	9.18
M6	10			5	4	3	T30	E8	27IP/30IP	8EP [10EPL]	M6	LH6S	3.47	6.97	9.27	13	15.6
M7	11						T40	E8	40IP	8EP [12EPL]			5.85	11.6	15.5	21.8	26.2
M8	13	(12)		6	5	4	T40/T45	E10	40IP/45IP	10EP [14EPL]	M8	LH8S	8.41	16.9	22.5	31.6	37.9
M10	16 (17)	(14)		8	6	5	T50	E12	45IP/50IP	12EP [16EPL]	M10	LH10S [LH8SS]	16.7	33.4	44.5	62.6	75.2
M12	18 (19)	(17)	21 (22)	10	8	6	T55	E14	55IP	14EP [20EPL]	M12	LH12S [LH10SS]	29.1	58.3	77.6	109	131
M14	21 (22)	(19)		12			T55/T60	E14/E18	55IP/60IP	18EP [24EPL]	M14	LH14S [LH12SS]	46.4	92.7	124	174	209
M16	24	(22)	27	14	10	8	T60/T70	E16/E20	60IP/70IP	20EP [26EPL]	M16	LH16S [LH14SS]	72.3	145	194	271	325
M18	27	(24)		(14)			T70/T80	E24	80IP	24EP [30EPL]	M18		100	199	266	373	447
M20	30 (32)	(27/29)	32	17	12	10	T80/T90	E24	90IP	24EP [32EPL]			141	282	376	529	635
M22	34 (32/35)	(30/32)	36	(17)			T90/T100	E28	100IP	24EP [36EPL]			192	384	511	720	865
M24	36 (38)	(32/35)	41	19		12	T100	E32	100IP	32EP [40EPL]			244	488	650	915	1100
M27	41	(36)	46	(19)				E32		32EP			358	713	951	1340	1610
M30	46	(41)	50	22				E36		36EP			484	971	1290	1820	2190
M33	50	(46)		(24)				E40		40EP			661	1320	1760	2470	2970
M36	55 (54)	(50)		27				E44		44EP			848	1690	2260	3180	3810
M39	60 (58)	(55)		(27)									1100	2190	2920	4110	4930
M42	65 (63)			32									1350	2710	3610	5080	6080
M45	70 (67)			(32)									1700	3400	4540	6370	7630
M48	75 (71)			36									2030	4060	5440	7620	9120
M52	80 (77)			(36)									2640	5290	7040	9880	11800
M56	85			41									3270	6560	8710	12300	14800
M60	90												4080	8180	10900	15300	18300
M64	95			46									4930	9890	13100	18500	22300
M68	(100)												5970	12000	16000	22500	27000

*Reference: Hexagon Head Bolt: ISO 4014-4018, 8676, 8758
High Strength Hexagon Bolt: JIS B 1198
Hexagon Socket Head Cap Screws: ISO 7380
Hexagon Socket Button Head Screws: ISO 7380
Hexagon Socket Set Screws: ISO 4026-4029
TORX T/E: TORX Standard TMH series
TORXPLUS IP/EP: TORXPLUS Standard CMH series
Triple Square: DIN 2324/2325
LHSTIX LH-S/SS: LH-S/SS Standard

* Standard Tightening Torque: Calculated based on Torque Coefficient (K): 0.2
Axial Force (Fi) : 60% of Proof Strength(σ0.2)

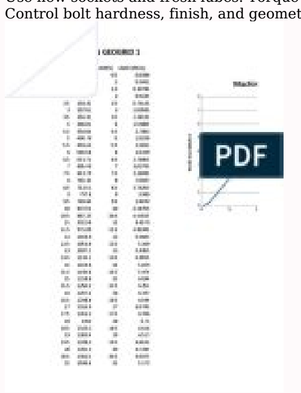
Have consistent lubricant conditions, quantities, application, and types. Turn ±15 to ±30 Use consistent snug torque. Control part geometry and finish.

METRIC BOLT AND CAP SCREW TORQUE VALUES



Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	225	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	220	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

Use new sockets and fresh lubes. Torque and turn ±10 to ±25 Plot torque vs turn and compare to previously derived set of curves.
Control bolt hardness, finish, and geometry. Torque past yield ±3 to ±l0 Use "soft" bolts and tighten well past yield point.



Use consistent snugging torque. Control bolt hardness and dimensons.
Bolt stretch ±1 to ±8 Use bolts with flat, parallel ends. Leave transducer engaged during tightening operation. Mount transducer on bolt centerline. References Fastener Standards. 5th ed., Industrial Fasteners Institute, Cleveland, OH, 1970. Baumeister, et al.: Mark's Standard Handbook for Mechanical Engineers. 8th ed., McGraw-Hill, 1978. Seely, F.B.: Resistance of Materials. 3rd ed., Wiley & Sons, 1947. Shigley, J.E.; and Mitchell, L.D.: Mechanical Engineering Design.
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