

TIGHTENING TORQUE REFERENCE CHART FOR SAE AND METRIC BOLTS

NL = Not Lubricated

L = Lubricated

1 lbs ft = 1.356 N·m



HEX KEY INTERCHANGE

SAE

Metric

TIGHTENING TORQUE FOR SAE BOLTS (30% of yield strength S_y) in lbs ft

MATERIAL	UNC	1/4-20	5/16-18	3/8-16	1/2-13	5/8-12	3/4-10	1-8	1 1/2-6	1 3/4-5	2-4	2 1/2-4	3-3	3 1/2-3
GRADE 1	NL	4	8	14	22	34	48	88	100	194	201	492	581	762
	L	3	6	10	17	26	37	51	90	145	218	309	436	572
GRADE 2	NL	6	12	22	35	54	78	107	191	194	291	492	581	762
	L	5	9	17	27	40	58	81	143	145	218	309	436	572
GRADE 5/1.2	NL	10	20	36	57	87	126	173	308	496	743	1053	1486	1948
	L	7	15	27	43	65	94	130	239	372	557	790	1114	1481
GRADE 8	NL	14	28	50	81	123	177	246	435	700	1050	1488	2100	2752
	L	10	21	38	60	90	133	184	326	525	787	1116	1575	2084
MATERIAL	UNF	1/4-28	5/16-24	3/8-24	1/2-20	5/8-18	3/4-16	1-14	1 1/2-12	1 3/4-12	2-10	2 1/2-10	3-8	3 1/2-8
GRADE 1	NL	4	9	16	25	38	55	77	104	214	325	482	644	808
	L	3	7	12	19	29	41	58	101	180	245	347	483	601
GRADE 2	NL	7	14	25	39	61	87	122	213	214	326	482	644	808
	L	5	10	19	30	46	65	91	159	160	245	347	483	601
GRADE 5/1.2	NL	11	22	40	64	98	140	196	343	547	834	1181	1648	2217
	L	8	17	30	48	74	105	147	257	410	625	886	1234	1663
GRADE 8	NL	16	31	57	90	139	198	277	485	773	1178	1669	2325	3103
	L	12	24	43	68	104	148	208	364	580	884	1251	1744	2350

TIGHTENING TORQUE FOR METRIC BOLTS (30% of yield strength S_y) in lbs ft

MATERIAL	ST. PITCH	M6-1	M8-1.25	M10-1.5	M12-1.75	M14-2	M16-2	M18-2.5	M20-2.5	M22-2.5	M24-3	M27-3	M30-3.5	M33-3.5	M36-4
CLASS 4.6	NL	3	8	16	29	46	71	98	139	189	240	351	477	549	833
	L	3	6	12	21	34	53	74	104	142	180	263	357	486	629
CLASS 8.8	NL	8	22	44	76	122	190	262	370	509	640	896	1271	1730	2221
	L	7	17	33	57	91	142	197	278	378	480	702	953	1287	1658
CLASS 10.9	NL	15	32	64	112	179	279	385	544	739	940	1375	1867	2540	3263
	L	10	24	48	84	134	209	289	408	555	705	1031	1400	1905	2447
CLASS 12.9	NL	16	38	75	131	209	326	451	636	865	1100	1609	2195	2973	3878
	L	12	29	56	98	157	245	338	477	649	825	1207	1639	2230	2863
MATERIAL	FINE PITCH	M6-0.75	M8-1	M10-1	M12-1.25	M14-1.5	M16-1.5	M18-1.5	M20-1.5	M22-1.5	M24-1.5	M27-1.5	M30-1.5	M33-1.5	M36-1.5
CLASS 4.6	NL	4	9	18	31	50	76	110	154	207	273	393	545	733	958
	L	3	7	14	23	37	57	83	116	156	204	295	409	550	719
CLASS 8.8	NL	10	24	49	83	132	202	294	411	553	727	1048	1455	1954	2556
	L	7	18	37	63	99	151	220	308	415	545	789	1091	1466	1917
CLASS 10.9	NL	15	35	72	123	194	296	431	603	813	1068	1539	2136	2870	3754
	L	11	26	54	92	146	222	323	453	610	801	1155	1602	2152	2815
CLASS 12.9	NL	17	41	84	143	227	347	505	708	951	1249	1802	2500	3358	4383
	L	13	31	63	108	170	260	379	530	719	937	1351	1875	2519	3295

5/16

2

3/32

2.5

7/64

3

1/8

3.5

5/32

4

3/16

5

7/32

6

1/4

7

5/16

8

3/8

10

Bolt Torque Guide

Don Alexander



Bolt Torque Guide:

The Overlanding Vehicle Builder's Guide Don Alexander, 2024-03-15 What is overlanding Wikipedia states Overlanding is self reliant overland travel to remote destinations where the journey is the principal goal Typically but not exclusively it is accomplished with mechanized off road capable transport from bicycles to trucks where the principal form of lodging is camping It often lasts for extended periods of time months to years and spans international boundaries Overlanding did not originate in America and it is a little different here You would be hard pressed to find a bicycle out in the desert and most people don't stay out there quite that long However the spirit of the activity is the same Do you want to give overlanding a try Great You will need some gear In *The Overlanding Vehicle Builder's Guide* veteran racer off roader and journalist Don Alexander provides a terrific overview of what to consider when building your overlanding rig This includes the planned duration of the trip the number of people in your party how far off the beaten path you want to go and the creature comforts you require Understanding those wants and needs shapes what gear you need for the best experience Covered are the strengths and weaknesses of the types of vehicles themselves modifications to the vehicles to make them more capable accessories lighting camping gear food and water storage etc and equipment for trail mishaps and recovery Driving techniques and trail rules and etiquette are also included If you are ready to build a rig or just want to know more about the hobby this book is a great guide to help you get started

Machinist Guide David B Smith, 2015-04-15 This is a Machinist Notebook Reference guide Revised Apr 11 2015 Written for machinists by a journeymen machinist in a real shop environment With tables charts illustration drawing and Sketches for machinist gunsmith auto industries With work sheets for none standard threading and gear cutting It also has simple illustration on how to make a few simple tooling and aids in the shop information for machinist As listed Three wire Major Diameter worm DP and MOD Using a Dividing Head How use a Compound Indexing How to make the Smith Compound indexer Rebound Ball Hardness Tester Grinding Lathe Tools bits Speeds and lubrication Rebound Ball Hardness Tester Hardness Chart Roughness Finish Compactor Scale Over the wire dimensions inch bolts in mm Index Table for 40 tooth worm 2 to 540 Compound Indexing on 40 tooth worm 51 250 teeth Index Table for 72 tooth worm Index Table for 90 tooth worm 2 230 Gear cutting and blanks This is book with written for fast reading NOT NOVEL for reading for slow reading

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