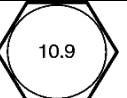




Torque-Tension Relationship for Metric Fasteners

Caution: All material included in this chart is advisory only, and its use by anyone is voluntary. In developing this information, Fastenal has made a determined effort to present its contents accurately. Extreme caution should be used when using a formula for torque/tension relationships. Torque is only an indirect indication of tension.

Under/over tightening of fasteners can result in costly equipment failure or personal injury.

Nominal Dia. (mm)	Pitch		Class 4.6			Class 8.8				Class 10.9				Class 12.9		
		Clamp Load (lbs)	Tightening Torque		Clamp Load (lbs)	Tightening Torque			Clamp Load (lbs)	Tightening Torque			Clamp Load (lbs)	Tightening Torque		
			K = 0.15	K = 0.20		Ecoguard	K = 0.15	K = 0.20		Ecoguard	K = 0.15	K = 0.20		Ecoguard	K = 0.15	K = 0.20
4	0.7	333	8 in-lbs	10 in-lbs	858	18 in-lbs	20 in-lbs	27 in-lbs	1228	25 in-lbs	29 in-lbs	39 in-lbs	1436	29 in-lbs	34 in-lbs	45 in-lbs
5	0.8	538	16	21	1387	35	41	55	1985	51	59	78	2319	59	68	91
6	1	763	27	36	1968	60	70	93	2816	86	100	133	3291	101	117	155
7	1	1095	45	60	2822	101	117	156	4039	145	167	223	4720	169	195	260
8	1.25	1389	66	87	3580	147	169	226	5123	210	242	323	5987	245	283	377
10	1.5	2200	10.8 ft-lbs	14.4 ft-lbs	5671	24.2 ft-lbs	27.9 ft-lbs	37.2 ft-lbs	8115	34.6 ft-lbs	39.9 ft-lbs	53.2 ft-lbs	9484	40.4 ft-lbs	46.7 ft-lbs	62.2 ft-lbs
12	1.75	3197	18.9	25.2	8240	42.2	48.7	64.9	11792	60.4	69.6	92.9	13781	70.5	81.4	108.5
14	2	4379	30.2	40.2	11289	67.4	77.8	103.7	16154	96.5	111.3	148.4	18879	112.7	130.1	173.4
16	2	5943	47	62	15320	105	121	161	21924	150	173	230	25622	175	202	269
18	2.5	7301	65	86	19471	149	172	230	26934	207	239	318	31477	242	279	372
20	2.5	9286	91	122	24763	211	244	325	34256	292	337	450	40034	341	394	525
22	2.5	11509	125	166	30692	288	332	443	42457	398	460	613	49619	466	537	716
24	3	13372	158	211	35659	365	421	562	49329	505	583	777	57649	590	681	908
27	3	17428	232	309	46474	535	618	823	64288	740	854	1139	75132	865	998	1331
30	3.5	21266	314	419	56709	726	837	1116	78448	1004	1158	1544	91680	1173	1354	1805
33	3.5	26310	427	570	70160	987	1139	1519	97055	1366	1576	2102	113425	1596	1842	2456
36	4	30982	549	732	82620	1269	1464	1952	114291	1755	2025	2700	133569	2051	2366	3155

The torque values can only be achieved if nut (or tapped hole) has a proof load greater than or equal to the bolt's minimum ultimate tensile strength.

Clamp loads estimated as 75% of proof load for specified bolts.

Torque values listed in inch-pounds through and including M8; M10 and over are in ft-pounds.

Torque values calculated from formula $T = KDF$ where; $K = 0.13$ when coated with Ecoguard, $K = 0.15$ for "lubricated" condition, $K = 0.20$ for plain and dry condition