



**LAWSON** Products



# Fastener Torque Book

## Disclaimer

Torque values listed in this book are based on mathematical calculations and experimental data. The values are valid only when the matched strength system listed is used.

The torque values listed are for dry\*, uncoated bolts; variables such as oil, or other lubrications, as well as assembly factors, may alter these values and must be taken into consideration.

Since all applications differ, it is suggested that the listed torque values be used as a guideline and that only through actual in place testing can the true torque-tension value be generated.

### Socket Products

Socket depth limits maximum torque. Torque figures are based on 80% of maximum torque for a given key size.

It is recommended to use standard socket head capscrews or hex head capscrews for critical applications.

**\*Note: Unless otherwise listed.**

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# Introduction to Matched Strength Fastening System

A matched strength fastening system is essential to a reliable and properly functioning bolted joint.

A matched system consists of quality components identified as the Capscrew, Nut, and Washer of equal strengths. The strength of the system used will be determined by the requirements of the joint.



## The Capscrew

The Capscrew is one of the main components to the system. The majority of the load is placed on this component. In order for the capscrew to function properly, it must be stretched. When stretched, the capscrew acts like a rubber band expanding and contracting with the movement of the bolted joint keeping a consistent load on the joint. This stretch is accomplished by pre-loading the capscrew using the recommended torque values from the specific fastener manufacturer. This pre-load is referred to as the clamp load.

## The Nut

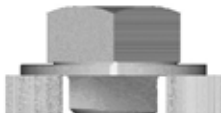
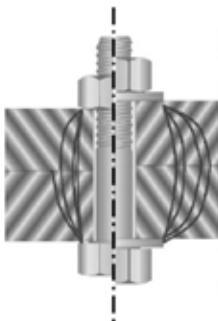
The nut is another key component of a fastening system. The hex nut maintains the load needed on the system. When using a nut and a capscrew of matched strength, the system will perform as designed when installed using calibrated torque equipment.

## The Washer

The final and most important component is the flat washer.

Washers aid in effectively distributing the load generated by the capscrew and nut, allowing for reduced strain on the capscrew.

The washer also offers a “true” hole for the capscrew bearing surface to rest on. This “true” hole prevents base material from cutting into the underhead radius of the capscrew preventing premature failure of the system.



There are two common types of flat washers; Soft and Thru-Hardened. Soft washers are suitable for fastener applications up to 120,000 psi tensile strength (SAE Grade 5). Thru-Hardened washers should be used for all applications including and above 120,000 psi tensile strength (Grade 5).

## **Production Grade Capscrews vs. Maintenance Engineered Capscrews**

Not all capscrews are created equal. Each capscrew is designed for a specific purpose. There are two main categories of capscrews: Production Grade Capscrews and Maintenance Grade Capscrews.

Production Grade Capscrews include standard grades of capscrews such as SAE Grades 2, 5, and 8. These capscrews are typically used in initial equipment assembly, and minor equipment maintenance. Production Capscrew fastening systems benefit the most from original equipment manufacturing and production because every component is at its “nominal” condition.

Maintenance Grade Capscrews include fastening systems such as Tru-Torq®, and Tuff-Torq®. As machines are used, the quality and overall performance will degrade over time. Components of machines will warp, deform, shrink, and expand. This is where the Maintenance Grade Fastening Systems will aid in re-assembly when equipment breaks down or undergoes routine maintenance. These systems are designed with machine degradation in mind. Although they are often manufactured to the same minimum industry standards as production grade systems, product specifications are enhanced to accommodate the varying situations. Examples include: minimum tensile strengths, increased clamp loads, friction control, fatigue resistant thread profiles, and dimensional enhancements.

# Torque Adjustments

## Thread Locking Compounds

- **Increase** the torque approximately 20% when using the permanent compound
- **Decrease** the torque approximately 20% when using the removable compound



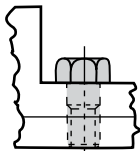
## Lubricants

- **Less** torque is required
- Depending on what type of lubricant, **decrease** approx. 20% - 30%



## Tapped Hole

- **More** torque is required
- **Increase** by approx. 35% - 40%



## Tightening by the Head

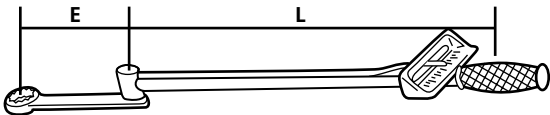
- **More** torque is required
- **Increase** by approx. 15% - 20%



## Torque Adjustments continued

When an extension is used with a torque wrench, adjustments to the torque readings must be made; otherwise, over-tightening will occur.

The distance 'E' as shown below, from the center of the drive socket to the center of the extension must be added to the torque value reading.



The following equation can be used to make these adjustments:

Required Torque \*  $\frac{L}{E+L}$  = Torque Wrench Reading where:

L is in inches

E is in inches

Torque is in lb.-in, lb.-ft, or Newton-Meters

An example of this equation is shown below:

Required Torque = 105 lb-ft

E = 6 inches

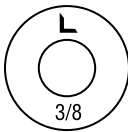
L = 24 inches

Torque Wrench Reading =  $105 * \frac{24}{6 + 24} = 84$  lb-ft



# **Inch Standard Fastening Systems**

# Tru-Torq® Hex Head Capscrew



## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	L ≤ 6 in.	L > 6 in.
1/4	7/16	7/16	0.194	0.181	0.288	0.274	0.750	1.000
5/16	1/2	1/2	0.242	0.227	0.336	0.320	0.875	1.125
3/8	9/16	9/16	0.289	0.273	0.415	0.398	1.000	1.250
7/16	5/8	11/16	0.338	0.318	0.463	0.444	1.125	1.375
1/2	3/4	3/4	0.386	0.364	0.573	0.552	1.250	1.500
9/16	13/16	7/8	0.433	0.410	0.621	0.598	1.375	1.625
5/8	15/16	15/16	0.481	0.456	0.731	0.706	1.500	1.750
3/4	1 1/8	1 1/8	0.577	0.548	0.827	0.798	1.750	2.000
7/8	1 5/16	1 5/16	0.672	0.640	0.922	0.890	2.000	2.250
1	1 1/2	1 1/2	0.768	0.732	1.018	0.982	2.250	2.500
1 1/8	1 11/16	1 11/16	0.861	0.790	1.176	1.136	2.500	2.750
1 1/4	1 7/8	1 7/8	0.975	0.900	1.272	1.220	2.750	3.000

## Properties

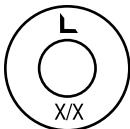
**Ultimate Tensile Strength: 180,000 psi**

**Proof Load: 150,000 psi**

## Tru-Torq® Hex Head Capscrew Fastening System

Size	Tru-Torq® Hex Nut	Grade C Locknut	Clamp
	Torque	Torque	
	lb-ft	lb-ft	lbs
1/4-20	19	8	3,580
1/4-28	21	9	4,092
5/16-18	34	17	5,898
5/16-24	37	19	6,532
3/8-16	41	30	8,718
3/8-24	46	34	9,881
7/16-14	65	48	11,960
7/16-20	73	54	13,356
1/2-13	100	73	15,964
1/2-20	112	82	17,995
9/16-12	144	106	20,469
9/16-18	161	118	22,835
5/8-11	252	146	25,425
5/8-18	285	165	28,795
3/4-10	447	259	37,627
3/4-16	498	288	41,958
7/8-9	720	419	51,945
7/8-14	794	460	57,316
1-8	1,079	625	68,148
1-14	1,211	701	76,487
1-1/8-7	1,530	886	85,868
1-1/8-12	1,715	993	96,269
1-1/4-7	2,158	1,249	109,025
1-1/4-12	2,389	1,383	120,706

# Tuff-Torq® Hex Head Capscrew



## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	L ≤ 6 in.	L > 6 in.
1/4	7/16	7/16	0.194	0.181	0.288	0.274	0.750	1.000
5/16	1/2	1/2	0.242	0.227	0.336	0.320	1.875	1.125
3/8	9/16	9/16	0.289	0.273	0.415	0.398	1.000	1.250
7/16	5/8	11/16	0.338	0.318	0.463	0.444	1.125	1.375
1/2	3/4	3/4	0.386	0.364	0.573	0.552	1.250	1.500
9/16	13/16	7/8	0.433	0.410	0.621	0.598	1.375	1.625
5/8	15/16	15/16	0.481	0.456	0.731	0.706	1.500	1.750
3/4	1 1/8	1 1/8	0.577	0.548	0.827	0.798	1.750	2.000
7/8	1 5/16	1 5/16	0.672	0.640	0.922	0.890	2.000	2.250
1	1 1/2	1 1/2	0.768	0.732	1.018	0.982	2.250	2.500

## Properties

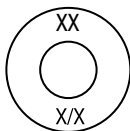
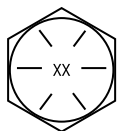
**Ultimate Tensile Strength: 150,000 psi**

**Proof Load: 120,000 psi**

## Tuff-Torq® Hex Head Capscrew Fastening System

Size	Tuff-Torq® Hex Nut	Grade C Locknut	Grade G Locknut	Clamp
	Torque	Torque	Torque	
	lb-ft	lb-ft	lb-ft	lbs
1/4-20	9	7	7	2,864
1/4-28	10	8	8	3,274
5/16-18	18	14	14	4,719
5/16-24	20	15	15	5,226
3/8-16	33	24	24	6,974
3/8-24	37	27	27	7,905
7/16-14	52	38	38	9,568
7/16-20	58	43	43	10,684
1/2-13	80	59	64	12,771
1/2-20	90	66	72	14,396
9/16-12	115	84	92	16,375
9/16-18	128	94	103	18,268
5/8-11	159	117	124	20,340
5/8-18	180	132	144	23,036
3/4-10	282	207	226	30,101
3/4-16	315	231	252	33,566
7/8-9	455	333	364	41,556
7/8-14	502	368	401	45,863
1-8	772	500	545	54,517
1-14	867	561	612	61,190

# Grade 8 Hex Head Capscrew



## Dimensional Information

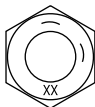
Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	L ≤ 6 in.	L > 6 in.
1/4	7/16	7/16	0.163	0.150	0.226	0.212	0.750	1.000
5/16	1/2	1/2	0.211	0.195	0.273	0.258	0.875	1.125
3/8	9/16	9/16	0.243	0.226	0.337	0.320	1.000	1.250
7/16	5/8	11/16	0.291	0.272	0.385	0.365	1.125	1.375
1/2	3/4	3/4	0.323	0.302	0.448	0.427	1.250	1.500
9/16	13/16	7/8	0.371	0.348	0.496	0.473	1.375	1.625
5/8	15/16	15/16	0.403	0.378	0.559	0.535	1.500	1.750
3/4	1 1/8	1 1/8	0.483	0.455	0.665	0.617	1.750	2.000
7/8	1 5/16	1 5/16	0.563	0.531	0.776	0.724	2.000	2.250
1	1 1/2	1 1/2	0.627	0.591	0.887	0.831	2.250	2.500
1 1/8	1 11/16	1 11/16	0.718	0.658	0.999	0.939	2.500	2.750
1 1/4	1 7/8	1 7/8	0.813	0.749	1.094	1.030	2.750	3.000

## Properties

**Ultimate Tensile Strength: 150,000 psi**

**Proof Load: 120,000 psi**

## Possible Grade 8 Hex Nut Markings



# Grade 8 Hex Head Capscrew Fastening System

Size	Grade 8 Hex Nut	Grade C Locknut	Clamp
	Torque	Torque	
	lb-ft	lb-ft	lbs
1/4-20	12	7	2,864
1/4-28	14	8	3,274
5/16-18	25	14	4,719
5/16-24	27	15	5,226
3/8-16	44	24	6,974
3/8-24	49	27	7,905
7/16-14	70	38	9,568
7/16-20	78	43	10,684
1/2-13	106	59	12,771
1/2-20	120	66	14,396
9/16-12	154	84	16,375
9/16-18	171	94	18,268
5/8-11	212	117	20,340
5/8-18	240	132	23,036
3/4-10	376	207	30,101
3/4-16	420	231	33,566
7/8-9	606	333	41,556
7/8-14	669	368	45,853
1-8	909	500	54,517
1-14	1,020	561	61,190
1-1/8-7	1,288	--	68,695
1-1/8-12	1,444	--	77,015
1-1/4-7	1,817	--	87,220
1-1/4-12	2,012	--	95,656

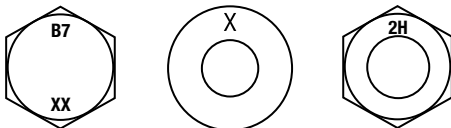
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## Grade 8 Hex Head Capscrew Fastening System *continued*

Size	Grade G Locknut	Nylon Insert Locknut	Flex-Type Locknut	Clamp
	Torque	Torque	Torque	
	lb-ft	lb-ft	lb-ft	
1/4-20	7	12	7	2,864
1/4-28	8	14	8	3,274
5/16-18	14	25	14	4,719
5/16-24	15	27	15	5,226
3/8-16	24	44	24	6,974
3/8-24	27	49	27	7,905
7/16-14	38	87	--	9,568
7/16-20	43	97	--	10,684
1/2-13	64	133	59	12,771
1/2-20	72	150	66	14,396
9/16-12	92	192	--	16,375
9/16-18	103	214	--	18,268
5/8-11	127	318	--	20,340
5/8-18	144	360	--	23,036
3/4-10	226	564	--	30,101
3/4-16	252	629	--	33,566
7/8-9	364	909	--	41,556
7/8-14	401	1,003	--	45,853
1-8	454	1,363	--	54,517
1-14	612	1,530	--	61,190
1-1/8-7	--	1,932	--	68,695
1-1/8-12	--	2,166	--	77,015
1-1/4-7	--	2,726	--	87,220
1-1/4-12	--	3,018	--	95,656



# B7 Alloy Heavy Hex Bolts



## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	$L \leq 125\text{mm}$	$125 < L \leq 200$
1/2	7/8	7/8	0.364	0.302	0.504	0.464	1.250	1.500
5/8	1 1/16	1 1/16	0.444	0.378	0.631	0.587	1.500	1.750
3/4	1 1/8	1 1/4	0.524	0.455	0.758	0.710	1.750	2.000
7/8	1 7/16	1 7/16	0.604	0.531	0.885	0.833	2.000	2.250
1	1 5/8	1 5/8	0.700	0.591	1.012	0.956	2.250	2.500
1 1/8	1 13/16	1 13/16	0.780	0.658	1.139	1.079	2.500	2.750

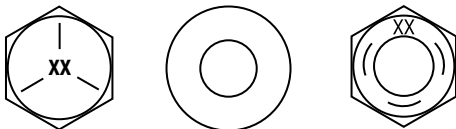
## Properties

**Ultimate Tensile Strength: 125,000 psi**

**Yield Strength: 105,000 psi**

Size	B7	
	Torque	Clamp
	lb-ft	lbs
1/2-13	83	10,004
1/2-20	--	--
5/8-11	166	15,933
5/8-18	--	--
3/4-10	295	23,579
3/4-16	--	--
7/8-9	475	32,552
7/8-14	--	--
1-8	712	42,705
1-14	--	--
1-1/8-8	1,045	55,727
1-1/8-12	--	--

# Grade 5 Hex Head Capscrew



## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	L ≤ 6 in.	L > 6 in.
1/4	7/16	7/16	0.163	0.150	0.226	0.212	0.750	1.000
5/16	1/2	1/2	0.211	0.195	0.273	0.258	0.875	1.125
3/8	9/16	9/16	0.243	0.226	0.337	0.320	1.000	1.250
7/16	5/8	11/16	0.291	0.272	0.385	0.365	1.125	1.375
1/2	3/4	3/4	0.323	0.302	0.448	0.427	1.250	1.500
9/16	13/16	7/8	0.371	0.348	0.496	0.473	1.375	1.625
5/8	15/16	15/16	0.403	0.378	0.559	0.535	1.500	1.750
3/4	1 1/8	1 1/8	0.483	0.455	0.665	0.617	1.750	2.000
7/8	1 5/16	1 5/16	0.563	0.531	0.776	0.724	2.000	2.250
1	1 1/2	1 1/2	0.627	0.591	0.887	0.831	2.250	2.500
1 1/8	1 11/16	1 11/16	0.718	0.658	0.999	0.939	2.500	2.750
1 1/4	1 7/8	1 7/8	0.813	0.749	1.094	1.030	2.750	3.000

## Properties

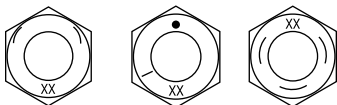
**Ultimate Tensile Strength: 120,000 psi (1/4" - 1" dia.)**

**105,000 psi (Over 1" - 1-1/2" dia.)**

**Proof Load: 85,000 psi (1/4" - 1" dia.)**

**74,000 psi (Over 1" - 1-1/2" dia.)**

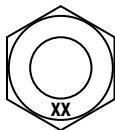
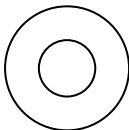
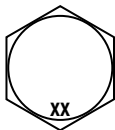
## Possible Grade 5 Hex Nut Markings



# Grade 5 Hex Head Capscrew Fastening System

Size	Hex Nut	Grade C Locknut	Nylon Insert Locknut	Flex-Type Locknut	Clamp
	Torque	Torque	Torque	Torque	
	lb-ft	lb-ft	lb-ft	lb-ft	
1/4-20	8	4	8	5	2,029
1/4-28	10	5	10	5	2,319
5/16-18	17	10	17	10	3,342
5/16-24	19	11	19	11	3,702
3/8-16	31	17	31	17	4,940
3/8-24	35	19	35	19	5,599
7/16-14	49	27	62	--	6,777
7/16-20	55	30	69	--	7,568
1/2-13	75	41	94	41	9,046
1/2-20	85	47	106	47	10,197
9/16-12	109	60	136	--	11,599
9/16-18	121	67	152	--	12,940
5/8-11	150	83	225	--	14,408
5/8-18	170	93	255	--	16,317
3/4-10	267	147	400	--	21,322
3/4-16	297	163	446	--	23,776
7/8-9	429	236	644	--	29,436
7/8-14	474	261	710	--	32,479
1-8	644	354	965	--	38,616
1-14	722	397	1,084	--	43,343

# Grade 2 Hex Head Capscrew



## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	L ≤ 6 in.	L > 6 in.
1/4	7/16	7/16	0.163	0.150	0.226	0.212	0.750	1.000
5/16	1/2	1/2	0.211	0.195	0.273	0.258	0.875	1.125
3/8	9/16	9/16	0.243	0.226	0.337	0.320	1.000	1.250
7/16	5/8	11/16	0.291	0.272	0.385	0.365	1.125	1.375
1/2	3/4	3/4	0.323	0.302	0.448	0.427	1.250	1.500
9/16	13/16	7/8	0.371	0.348	0.496	0.473	1.375	1.625
5/8	15/16	15/16	0.403	0.378	0.559	0.535	1.500	1.750
3/4	1 1/8	1 1/8	0.483	0.455	0.665	0.617	1.750	2.000
7/8	1 5/16	1 5/16	0.563	0.531	0.776	0.724	2.000	2.250
1	1 1/2	1 1/2	0.627	0.591	0.887	0.831	2.250	2.500
1 1/8	1 11/16	1 11/16	0.718	0.658	0.999	0.939	2.500	2.750
1 1/4	1 7/8	1 7/8	0.813	0.749	1.094	1.030	2.750	3.000

## Properties

**Ultimate Tensile Strength: 74,000 psi (1/4" - 3/4" dia.)**  
**60,000 psi (Over 3/4" - 1-1/2" dia.)**

**Proof Load: 55,000 psi (1/4" - 3/4" dia.)**  
**33,000 psi (Over 3/4" - 1-1/2" dia.)**

## Grade 2 Hex Head Capscrew Fastening System

Size	Hex Nut	Nylon Insert Locknut	Flex-Type Locknut	Clamp
	Torque	Torque	Torque	
	lb-ft	lb-ft	lb-ft	
1/4-20	5	5	3	1,313
1/4-28	6	6	3	1,500
5/16-18	11	11	6	2,163
5/16-24	12	12	7	2,395
3/8-16	20	20	11	3,196
3/8-24	23	23	12	3,623
7/16-14	32	40	--	4,385
7/16-20	36	45	--	4,897
1/2-13	49	61	27	5,853
1/2-20	55	69	30	6,598
5/8-11	97	146	--	9,323
5/8-18	110	165	--	10,558
3/4-10	172	259	--	13,797
3/4-16	192	288	--	15,385
7/8-9	167	250	--	11,428
7/8-14	184	276	--	12,609
1-8	250	375	--	14,992
1-14	280	421	--	16,827

# 316 and 18-8 Stainless Steel Hex Head Capscrews

## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	L < 6 in.	L > 6 in.
1/4	7/16	7/16	0.163	0.150	0.226	0.212	0.750	1.000
5/16	1/2	1/2	0.211	0.195	0.273	0.258	0.875	1.125
3/8	9/16	9/16	0.243	0.226	0.337	0.320	1.000	1.250
7/16	5/8	11/16	0.291	0.272	0.385	0.365	1.125	1.375
1/2	3/4	3/4	0.323	0.302	0.448	0.427	1.250	1.500
5/8	15/16	15/16	0.403	0.378	0.559	0.535	1.500	1.750
3/4	1 1/8	1 1/8	0.483	0.455	0.665	0.617	1.750	2.000
7/8	1 5/16	1 5/16	0.563	0.531	0.776	0.724	2.000	2.250
1	1 1/2	1 1/2	0.627	0.591	0.887	0.831	2.250	2.500
1 1/8	1 11/16	1 11/16	0.718	0.658	0.999	0.939	2.500	2.750
1 1/4	1 7/8	1 7/8	0.813	0.749	1.094	1.030	2.750	3.000

## Properties

**Ultimate Tensile Strength: 100,000 psi (1/4" - 5/8" dia.)**

**85,000 psi (Over 3/4" - 1-1/2" dia.)**

**Yield Strength: 65,000 psi (1/4" - 5/8" dia.)**

**45,000 psi (Over 3/4" - 1-1/2" dia.)**

## 316 and 18-8 Stainless Steel Hex Head Capscrews

Size	316 SS		18-8 SS	
	Torque	Clamp	Torque	Clamp
	lb-ft	lbs	lb-ft	lbs
1/4-20	5	1,551	5	1,551
1/4-28	--	--	5	1,773
5/16-18	9	2,556	9	2,556
5/16-24	--	--	10	2,831
3/8-16	17	3,778	17	3,778
3/8-24	--	--	19	4,282
7/16-14	26	5,183	26	5,183
7/16-20	--	--	30	5,787
1/2-13	40	6,918	40	6,918
1/2-20	--	--	45	7,798
5/8-11	80	11,018	80	11,018
5/8-18	--	--	91	12,478
3/4-10	99	11,288	99	11,288
3/4-16	--	--	--	--
7/8-9	159	15,584	159	15,584
7/8-14	--	--	--	--
1-8	239	20,444	239	20,444
1-14	--	--	--	--
1-1/8-8	338	25,761	338	25,761
1-1/8-12	--	--	--	--
1-1/4-7	477	32,708	477	32,708
1-1/4-12	--	--	--	--

*Lawson's 316 and 18-8 Stainless Steel Capscrew Torque Values are published wet.  
These Values are given with Lubri-Temp used as the lubricant.*

# Premium Socket Products

Diameter - Pitch	Size Wise Socket Head Capscrew		Premium Flat Head Socket Capscrew		Premium Set Screw	
	Torque	Clamp	Torque	Clamp	Torque	Compression
	Used in Tapped Hole		Used in Tapped Hole		Used in Tapped Hole	
	lb-ft*	lbs	lb-ft*	lbs	lb-ft*	lbs
#4-40	15 lb-in	634	--	--	5 lb-in	176
#5-40	23 lb-in	836	--	--	--	--
#6-32	28 lb-in	945	15 lb-in	832	11 lb-in	275
#6-40	32 lb-in	1,066	--	--	--	--
#8-32	52 lb-in	1,470	30 lb-in	1,294	20 lb-in	424
#8-36	55 lb-in	1,548	--	--	--	--
#10-24	75 lb-in	1,838	40 lb-in	1,617	36 lb-in	594
#10-32	86 lb-in	2,100	45 lb-in	1,848	36 lb-in	--
1/4-20	14	3,339	8	2,938	7	1,100
1/4-28	16	3,822	9	3,363	7	--
5/16-18	29	5,502	17	4,842	14	1,650
5/16-24	32	6,090	18	5,359	14	--
3/8-16	51	8,138	29	7,161	24	2,200
3/8-24	58	9,219	33	8,113	24	--
7/16-14	81	11,130	--	--	36	2,750
7/16-20	91	12,495	--	--	--	--
1/2-13	124	14,910	71	13,121	52	3,300
1/2-20	140	16,800	83	14,784	52	--
5/8-11	238	22,883	142	20,137	110	4,400
5/8-18	270	25,920	--	--	110	--
3/4-10	423	33,818	250	29,760	--	--
3/4-16	472	37,766	--	--	--	--
7/8-9	682	46,778	--	--	--	--
1-8	1,023	61,358	--	--	--	--
1-1/4-7	1,449	98,111	--	--	--	--
1-1/2-6	3,556	142,256	--	--	--	--



# Commercial Grade Socket Products

Diameter - Pitch	ASTM A574 Socket Head Capscrew		Flat Head Socket Capscrew		Button Head Socket Capscrew		Cup Point Socket Set Screw		Socket Shoulder Screw	
	Torque	Clamp	Torque	Clamp	Torque	Clamp	Torque	Comp- ression	Torque	Clamp
	Used in Tapped Hole		Used in Tapped Hole		Used in Tapped Hole		Used in Tapped Hole			
	lb-ft*		lbs		lb-ft*		lbs		lb-ft*	
#4-40 #5-40	17 lb-in 23 lb-in	634 836	8 lb-in 11 lb-in	558 736	8.4 lb-in 12 lb-in	558 736	5 lb-in 10 lb-in	160 200	-- --	-- --
#6-32 #6-40	28 lb-in 32 lb-in	945 1,066	13 lb-in --	832 --	16 lb-in --	832 --	10 lb-in	250	-- --	-- --
#8-32 #8-36	52 lb-in 55 lb-in	1,470 1,548	23 lb-in --	1,294 --	29 lb-in --	1,294 --	20 lb-in	385	-- --	-- --
#10-24 #10-32	75 lb-in 86 lb-in	1,838 2,100	34 lb-in 38 lb-in	1,617 1,848	42 lb-in 47 lb-in	1,617 1,848	36 lb-in	540	3 --	1,617 --
1/4-20 1/4-28	14 16	3,339 3,822	7 8	2,938 3,363	8 10	2,938 3,363	7	1,000	7 --	-- --
5/16-18 5/16-24	29 32	5,502 6,090	14 15	4,842 5,359	17 19	4,842 5,359	14	1,500	14 --	4,842 --
3/8-16 3/8-24	51 58	8,138 9,219	24 28	7,161 8,113	30 34	7,161 8,113	24	2,000	24 --	7,161 --
7/16-14 7/16-20	81 91	11,130 12,495	46 --	9,794 --	-- --	-- --	36	2,500	-- --	-- --
1/2-13 1/2-20	124 140	14,910 16,860	60 67	13,121 14,837	74 --	13,121 --	52	3,000	60 --	13,121 --
9/16-12 9/16-18	173 193	18,428 20,554	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
5/8-11 5/8-18	238 270	22,883 25,920	119 134	20,137 22,810	147 --	20,137 --	110	4,000	119 --	20,137 --
3/4-10 3/4-16	423 472	33,818 37,766	250 --	29,760 --	-- --	-- --	200	5,000	-- --	-- --
7/8-9 7/8-14	682 752	46,778 51,536	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
1-8 1-14	1,023 --	61,358 --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
1-1/4-7 1-3/8-6	2,044 2,680	98,111 116,944	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --

# Stainless Steel Socket Head Capscrews

Diameter - Pitch	18-8 Stainless Steel Socket Head Capscrew		18-8 Stainless Steel Flat Head Socket Capscrew		18-8 Stainless Steel Socket Set Screws	
	Torque	Clamp	Torque	Clamp	Torque	Axial Holding Power
	Used in Tapped Hole		Used in Tapped Hole		Used in Tapped Hole	
	lb-ft*	lbs	lb-ft*	lbs	lb-ft*	lbs
#6-32	15 lb-in	185	11 lb-in	163	7 lb-in	250
#8-32	28 lb-in	284	20 lb-in	250	16 lb-in	385
#10-24	40 lb-in	355	30 lb-in	312	26 lb-in	540
#10-32	45 lb-in	405	34 lb-in	356	26 lb-in	540
1/4-20	6	1,431	3	1,259	4	1,259
1/4-28	--	--	--	--	5	1,441
5/16-18	13	2,358	6	2,075	9	2,075
3/8-16	23	3,488	11	3,069	16	3,069
7/16-14	37	4,770	--	--	25	4,198
1/2-13	57	6,390	27	5,623	39	5,623
5/8-11	113	10,170	53	8,950	78	8,950
3/4-10	200	10,321	--	--	138	9,082

Diameter - Pitch	18-8 Socket Shoulder Screw		18-8 Stainless Steel Button Head Socket Capscrew	
	Torque	Clamp	Torque	Clamp
	Used in Tapped Hole		Used in Tapped Hole	
	lb-ft*	lbs	lb-ft*	lbs
#6-32	--	--	11 lb-in	163
#8-32	--	--	20 lb-in	250
#10-24	1	312	30 lb-in	312
#10-32	--	--	34 lb-in	356
1/4-20	2	1,259	5	1,259
1/4-28	--	--	--	--
5/16-18	5	2,075	10	2,075
3/8-16	9	3,069	18	3,069
7/16-14	--	--	--	--
1/2-13	--	--	--	--
5/8-11	--	--	--	--
3/4-10	--	--	--	--

## General Locknut Information

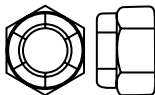
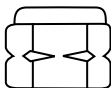
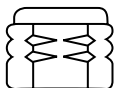
Size	Grade C		Grade G	
	Wrench Size	Height	Wrench Size	Height
		nom.		max.
1/4 5/16	7/16 1/2	0.281 0.328	7/16 1/2	0.300 0.365
3/8 7/16	9/16 11/16	0.406 0.453	9/16 11/16	0.425 0.495
1/2 9/16	3/4 7/8	0.563 0.509	3/4 --	0.555 --
5/8 3/4	15/16 1 1/8	0.719 0.813	15/16 1 1/8	0.690 0.825
7/8 1	1 5/16 1 1/2	0.906 1.000	-- --	-- --
1 1/8 1 1/4	1 11/16 1 7/8	1.156 1.250	-- --	-- --



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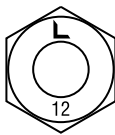
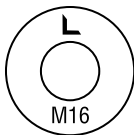
## General Locknut Information continued

Size	Grade 8 Nylon Locknuts		Grade 5/2 Nylon Locknuts		Flex-Type Locknuts	
	Wrench Size	Height	Wrench Size	Height	Wrench Size	Height
		max.		max.		max.
1/4	7/16	0.328	7/16	0.328	7/16	0.290
5/16	1/2	0.359	1/2	0.359	1/2	0.353
3/8	9/16	0.469	9/16	0.469	9/16	0.462
7/16	11/16	0.524	11/16	0.524	--	--
1/2	3/4	0.609	3/4	0.609	3/4	0.602
9/16	7/8	0.656	7/8	0.656	--	--
5/8	15/16	0.765	15/16	0.765	--	--
3/4	1 1/8	0.890	1 1/8	0.890	--	--
7/8	1 5/16	0.999	1 5/16	0.999	--	--
1	1 1/2	1.124	1 1/2	1.124	--	--
1 1/8	1 11/16	1.281	1 11/16	1.281	--	--
1 1/4	1 7/8	1.422	1 7/8	1.422	--	--



# **Metric Standard Fastening Systems**

# Metri-12 Hex Head Capscrew



## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	$L < 125\text{mm}$	$125 < L \leq 200$
M6	10mm	10mm	4.98	4.62	5.70	5.40	18	24
M8	13mm	13mm	6.60	6.12	7.50	7.14	22	28
M10	16mm	16mm	7.96	7.40	9.30	8.94	26	32
M12	18mm	18mm	9.31	8.87	12.00	11.57	30	36
M14	21mm	21mm	10.91	10.21	14.10	13.40	34	40
M16	24mm	24mm	12.38	11.62	16.40	15.70	38	44
M20	30mm	30mm	15.46	14.54	20.30	19.00	46	52
M24	36mm	36mm	15.44	14.56	21.50	20.20	54	60

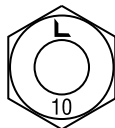
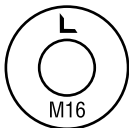
## Properties

**Ultimate Tensile Strength: 1,242 MPa (180,000 psi)**

**Proof Load: 1,040 MPa (150,000 psi)**

Size	Torque		Clamp	
	N-m	lb-ft	N	lbs
M6 x 1.0 M8 x 1.25	16 39	12 29	15,621 28,417	3,512 6,389
M10 x 1.5 M12 x 1.75	77 133	56 98	45,014 65,412	10,120 14,705
M14 x 2.0 M16 x 2.0	213 331	157 244	89,610 121,614	20,145 27,340
M20 x 2.5 M24 x 3.0	646 1,053	477 777	190,022 219,434	42,719 49,331

# Metri-Torq® Hex Head Capscrew



## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)
	Capscrew	Nut	max.	min.	max.	min.	L ≤ 125mm
M6	10mm	10mm	4.98	4.62	5.20	4.90	18
M8	13mm	13mm	6.60	6.12	6.80	6.44	22
M10	17mm	17mm	9.52	8.96	8.00	7.40	26
M12	18mm	19mm	11.11	10.49	10.00	9.80	30

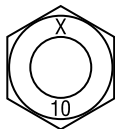
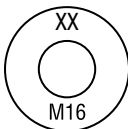
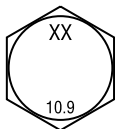
## Properties

**Ultimate Tensile Strength: 1,040 MPa (150,000 psi)**

**Proof Load: 830 MPa (120,000 psi)**

Size	Torque		Clamp	
	N-m	lb-ft	N	lbs
M6 x 1.0	15	11	12,527	2,816
M8 x 1.25	36	27	22,789	5,123
M10 x 1.5	72	53	36,099	8,115
M12 x 1.75	126	93	52,456	11,793

# 10.9 Hex Head Capscrew



## Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	$L \leq 125\text{mm}$	$125 < L < 200$
M6	10mm	10mm	4.15	3.85	5.20	4.90	18	24
M8	13mm	13mm	5.50	5.10	6.80	6.44	22	28
M10	17mm	17mm	7.93	7.47	8.40	7.40	26	32
M12	19mm	19mm	9.26	8.74	10.80	9.80	30	36
M14	22mm	21mm	9.09	8.51	12.80	12.10	34	40
M16	24mm	24mm	10.32	9.68	14.80	14.10	38	44
M18	27mm	27mm	12.35	11.65	15.80	15.10	42	48
M20	30mm	30mm	12.88	12.12	18.00	16.90	46	52
M24	36mm	36mm	15.44	15.56	21.50	20.20	54	60

## Properties

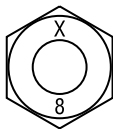
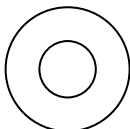
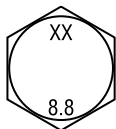
**Ultimate Tensile Strength: 1,040 MPa (150,000 psi)**

**Proof Load: 830 MPa (120,000 psi)**

Size	Torque		Clamp	
	N-m	lb-ft	N	lbs
M6 x 1.0	15	11	12,527	2,816
M8 x 1.25	36	27	22,789	5,123
M10 x 1.5	72	53	36,099	8,115
M12 x 1.75	126	93	52,456	11,793
M14 x 2.0	201	148	71,861	16,155
M16 x 2.0	312	230	97,526	21,925
M18 x 2.5	431	318	119,814	26,935
M20 x 2.5	610	450	152,385	34,258
M24 x 3.0	1,053	777	219,434	49,331



## 8.8 Hex Head Capscrew



### Dimensional Information

Size	Wrench Size		Head Height		Nut Height		Minimum Thread Length (L)	
	Capscrew	Nut	max.	min.	max.	min.	L < 125mm	125 < L < 200
M3	5.5mm	5.5mm	2.15	1.85	2.40	2.15	12	--
M4	7mm	7mm	2.95	2.65	3.20	2.90	14	--
M5	8mm	8mm	3.65	3.35	4.70	4.40	16	--
M6	10mm	10mm	4.15	3.85	5.20	4.90	18	--
M7	11mm	11mm	5.0	4.6	5.50	5.14	20	--
M8	13mm	13mm	5.5	5.1	6.80	6.44	22	28
M10	17mm	16mm	6.63	6.17	8.40	8.04	26	32
M12	19mm	18mm	7.76	7.24	10.80	10.37	30	36
M14	22mm	21mm	9.09	8.51	12.80	12.10	34	40
M16	24mm	24mm	10.32	9.68	14.80	14.10	38	44
M20	30mm	30mm	12.82	12.18	18.00	16.90	46	52
M24	36mm	36mm	15.32	14.68	21.50	20.20	54	60

### Properties

**Ultimate Tensile Strength: 830 MPa (120,000 psi)**

**Proof Load: 600 MPa (87,000 psi)**

*Continued on next page*

## 8.8 Hex Head Capscrew Fastening System *continued*

Size	Torque		Clamp	
	N-m*	lb-ft*	N	lbs
M3 x 0.5 M4 x 0.7	1,358 mN-m 3,160 mN-m	12 lb-in 28 lb-in	2,264 3,950	509 888
M5 x 0.8 M6 x 1.0	6 11	5 8	6,382 9,056	1,435 2,036
M7 x 1.0 M8 x 1.25	18 26	13 19	12,987 16,474	2,920 3,703
M8 x 1.0 M10 x 1.5	28 52	21 38	17,625 26,022	3,962 5,866
M10 x 1.25 M10 x 1.0	55 58	41 43	27,539 29,022	6,191 6,525
M12 x 1.75 M12 x 1.5	91 95	67 70	37,920 39,657	8,525 8,915
M12 x 1.25 M14 x 2.0	99 145	73 107	41,432 51,948	9,314 11,678
M14 x 1.5 M16 x 2.0	157 226	116 166	56,046 70,501	12,600 15,849
M16 x 1.5 M20 x 2.5	241 441	178 325	75,262 110,158	16,920 24,765
M24 x 3.0	761	562	158,627	35,661

**\*Note: Unless otherwise listed.**

# A4 and A2 Stainless Steel Hex Head Capscrews

## Dimensional Information

Size	Wrench Size		Head Height nom.	Nut Height max.	Minimum Thread Length (L)	
	Capscrew	Nut			$L \leq 125\text{mm}$	$125 < L \leq 200$
M4	7mm	7mm	2.8	3.2	14	--
M5	8mm	8mm	3.5	4.7	16	--
M6	10mm	10mm	4.0	5.2	18	24
M8	13mm	13mm	5.3	6.8	22	28
M10	17mm	16mm	6.4	8.4	26	32
M12	19mm	18mm	7.5	10.8	30	36
M16	24mm	24mm	10.0	14.8	38	44
M20	30mm	30mm	12.5	18.0	46	52
M24	36mm	36mm	15.0	21.5	54	60

## Properties

**Ultimate Tensile Strength: 830 MPa (120,000 psi)**

**Proof Load: 600 MPa (87,000 psi)**

Size	A4				A2			
	Torque		Clamp		Torque		Clamp	
	N-m*	lb-ft*	N	lbs	N-m*	lb-ft*	N	lbs
M4 x 0.7 M5 x 0.8	1,936 mN-m 3,909 mN-m	17 lb-in 35 lb-in	3,457 5,584	777 1,255	1,936 mN-m 3,909 mN-m	17 lb-in 35 lb-in	3,457 5,584	777 1,255
M6 x 1.0 M8 x 1.25	7 16	5 12	7,924 14,415	1,781 3,241	7 15	5 12	7,924 14,415	1,781 3,241
M10 x 1.25 M12 x 1.75	32 56	24 41	22,833 33,180	5,133 7,459	32 56	24 41	22,833 33,180	5,133 7,459
M16 x 2.0 M20 x 2.5	-- --	-- --	-- --	-- --	138 270	102 199	61,688 96,388	13,868 21,669
M24 x 3.0	--	--	--	--	366	270	109,056	24,517

**\*Note: Unless otherwise listed.**

*Lawson's A2 and A4 Stainless Steel Capscrew Torque Values are published wet.  
These values are given with Lubri-Temp used as the lubricant.*

# Commercial Grade Metric Socket Products

Diameter - Pitch	Property Class 12.9 Socket Head Capscrew			Property Class 10.9 Button Head Socket			Property Class 10.9 Flat Head Socket Capscrew		
	Torque		Clamp	Torque		Clamp	Torque		Clamp
	Used in Tapped Hole			Used in Tapped Hole			Used in Tapped Hole		
	lb-ft*	Nm	lbs	lb-ft*	Nm	lbs	lb-ft*	Nm	lbs
M3 x 0.5 M4 x 0.7	19lb-in 41 lb-in	2.1 4.6	960 1,680	9 lb-in 18 lb-in	1 2	326 571	9 lb-in 18 lb-in	1 2	326 571
M5 x 0.8 M6 x 1.0	8 14	11 19	2,720 3,857	3 6	4 8	925 1,311	4 7	5 9	925 1,311
M8 x 1.25 M8 x 1.0	32 33	43 45	7,021 7,492	9 --	12 --	2,387 --	11 --	15 --	2,387 --
M10 x 1.5 M10 x 1.25	64 65	87 88	11,140 11,707	22 --	30 --	3,788 --	30 --	40 --	3,788 --
M12 x 1.75 M12 x 1.5	103 113	140 153	16,205 16,859	44 --	60 --	5,510 --	48 --	65 --	5,510 --
M14 x 2.0 M16 x 2.0	177 269	240 365	20,400 30,210	-- --	-- --	-- --	-- --	-- --	-- --
M16 x 1.5 M18 x 2.5	285 369	387 500	31,995 35,712	-- --	-- --	-- --	-- --	-- --	-- --
M20 x 2.5 M24 x 3.0	523 900	709 1,220	47,054 67,823	-- --	-- --	-- --	-- --	-- --	-- --
M30 x 3.5	1,900	2,576	108,392	--	--	--	--	--	--

Diameter - Pitch	Property Class 8.8 Low Head Socket Capscrew			Property Class 12.9 Socket Set Screw			Property Class 12.9 Socket Shoulder Screws		
	Torque		Clamp	Torque		Clamp	Torque		Clamp
	Used in Tapped Hole			Used in Tapped Hole			Used in Tapped Hole		
	lb-ft*	Nm	lbs	lb-ft*	Nm	lbs	lb-ft*	Nm	lbs
M3 x 0.5 M4 x 0.7	9lb-in 18 lb-in	1 2	82 143	8 lb-in 19 lb-in	0.9 2.2	231 346	-- --	-- --	-- --
M5 x 0.8 M6 x 1.0	4 7	5 9	231 328	3 5	4 7	416 577	5 9	7 12	925 1,311
M8 x 1.25 M8 x 1.0	12 --	16 --	597 --	15 --	20 --	1,304 --	21 --	29 --	2,387 --
M10 x 1.5 M10 x 1.25	28 --	38 --	947 --	29 --	39 --	2,104 --	42 --	57 --	3,788 --
M12 x 1.75 M12 x 1.5	43 --	58 --	947 --	51 --	69 --	2,990 --	74 --	100 --	5,510 --
M14 x 2.0 M16 x 2.0	-- --	-- --	-- --	128 --	174 --	5,194 --	177 --	240 --	10,271 --
M16 x 1.5 M18 x 2.5	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
M20 x 2.5 M24 x 3.0	-- --	-- --	-- --	249 431	338 584	7,800 11,580	347 --	470 --	15,998 --
M30 x 3.5	--	--	--	--	--	--	--	--	--

# Metric Stainless Steel Socket Products

Diameter - Pitch	A2/A4 Stainless Steel Metric Socket Head Capscrew			A2/A4 Stainless Steel Metric Button Head Socket Capscrew		
	Torque		Clamp	Torque		Clamp
	Used in Tapped Hole			Used in Tapped Hole		
	lb-ft*	Nm	lbs	lb-ft*	Nm*	lbs
M3 x 0.5 M4 x 0.7	16 lb-in 26 lb-in	1 3	282 382	5 lb-in 7 lb-in	565 mNm 791 mNm	223 300
M5 x 0.8 M6 x 1.0	4 6	5 8	607 1,236	2 3	3 4	525 960
M8 x 1.25 M10 x 1.5	16 32	22 43	2,293 3,777	-- --	-- --	-- --
M12 x 1.75 M16 x 2.0	55 140	74 189	5,260 9,891	-- --	-- --	-- --

Diameter - Pitch	A2/A4 Stainless Steel Metric Flat Head Socket Capscrew			A2/A4 Stainless Steel Socket Set Screw		
	Torque		Clamp	Torque		Axial Holding Power
	Used in Tapped Hole			Used in Tapped Hole		
	lb-ft*	Nm	lbs	lb-ft*	Nm*	lbs
M3 x 0.5 M4 x 0.7	5 lb-in 1	565 mNm 1	223 300	2 lb-in 5 lb-in	226 mNm 565 mNm	223 300
M5 x 0.8 M6 x 1.0	2 3	3 4	525 960	1 2	1 3	525 960
M8 x 1.25 M10 x 1.5	6 15	8 20	2,093 3,400	4 7	5 9	2,093 3,400
M12 x 1.75 M16 x 2.0	25 --	34 --	4,987 --	15 --	20 --	4,987 --

**\*Note: Unless otherwise listed.**

## Platings and Finishes

Plating/Finish	Color	Characteristics and Uses
Black Oxide	Lustre Black	A chemical immersion process that does not add to thickness. Good wearing qualities.
Blue/Clear Zinc	Bright Silver/Bluish	Commonly used popular finish combining good rust-resisting qualities, appearance and economy. Less porous than yellow.
Dacromet	Dull Gray	Coating for use in high-strength fastener applications where there is no chance of hydrogen embrittlement.
MagnaGuard	Lustre Gray	Coating for use in high-strength fastener applications where there is no chance of hydrogen embrittlement.
Galvanized	Dull Gray	Good rust resistant but not recommended for small screws due to its tendency to clog threads.
Stainless Steel	Bright Silver	Not a coating. Appearance of stainless steel.





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