






Grade identification markings and mechanical requirements for carbon steel threaded fasteners in inch

Table 27 Grade identification markings and mechanical requirements for carbon steel externally threaded fasteners

Grade Identification marking	Specification	Nominal size inch	Mechanical requirements fasteners				
			Yield strength ksi min.	Tensile strength ksi min.	Rockwell hardness		
					Surface max.	Core	
						min.	max.
	ASTM A307 Gr.A	1/4 - 4	—	60	—	B69	B100
	ASTM A307 Gr.B	1/4 - 4	— —	60 min. 100 max.	—	B69	B95
 No mark	SAE J429 Gr. 1	1/4 - 1 1/2	36	60	—	B70	B100
	SAE J429 Gr. 2	1/4 - 3/4 över 3/4 - 1 1/2	57 —	74 60	— —	B80 B70	B100 B100
	SAE J429 Gr. 5	1/4 - 1 1 1/8 - 1 1/2	92 81	120 105	30N54 30N50	C25 C19	C34 C30
	ASTM A449 Type 1	1/4 - 1 1 1/8 - 1 1/2 1 3/4 - 3	92 81 58	120 105 90	— — —	C25 C19 B91	C34 C30 B100
	ASTM A325 Type 1	1/2 - 1 1 1/8 - 1 1/2	92 81	120 105	— —	C24 C19	C35 C31
	SAE J 429 Gr. 5.2	1/4 - 1	92	120	30N56	C26	C36
	ASTM A449 Type 2	1/4 - 1	92	120	—	C25	C34
	ASTM A325 Type 3	1/2 - 1	92	120	—	C24	C35
		1 1/8 - 1 1/2	81	105	—	C19	C31
	SAE J429 Gr. 8	1/4 - 1 1/2	130	150	30N58.6	C33	C39
	ASTM A354 Gr. BD	1/4 - 2 1/2	130	150	—	C33	C39
		2 3/4 - 4	115	140	—	C31	C38
	ASTM A490 Type 1	1/2 - 1 1/2	130	150 min. 170 max.	— —	C33	C38
	SAE J429 Gr. 8.2	1/4 - 1	130	150	30N58.6	C33	C39
	ASTM A490 Type 3	1/2 - 1 1/2	130	150 min. 170 max.	— —	C33	C38








Source: IFI.

Table 28 Grade identification markings and mechanical requirements for carbon steel nuts with UNC, 8 UN, 6 UN and coarser pitch threads

Grade Identification marking	Strength grade of nut	Dimensional style of nut	Nominal nut size inch	Proof load stress ksi		Nut Rockwell hardness	
				Non-zinc coated nuts	Zinc coated nuts	min.	max.
 No mark	ASTM A563 Gr: A	hex	1/4 - 1 1/2	90	68	B68	C32
		heavy hex	1/4 - 4	100	75		
		hex thick	1/4 - 1 1/2				
 No mark	SAE Gr: 2	hex	1/4 - 1 1/2	90	–	–	C32
 No mark	ASTM A563 Gr: B	hex	1/4 - 1	120	90	B69	C32
			1 1/8 - 1 1/2	105	79		
		heavy hex och hex thick	1/4 - 1	133	100	B69	C32
			1 1/8 - 1 1/2	116	87		
 No mark	SAE Gr: 5	hex	1/4 - 1	120	–	–	C32
			1 1/8 - 1 1/2	105	–		
 	ASTM A563 Gr: C ASTM A563 Gr: C3	heavy hex	1/4 - 4	144	144	B78	C38
 	ASTM A563 Gr: D ASTM A194 Gr: 2	hex heavy hex	1/4 - 1 1/2 1/4 - 4	135 150	135 150	B84	C38
	ASTM A563 Gr: D	hex thick	1/4 - 1-1/2	150	150	B84	C38
 	SAE Gr: 8	hex	1/4 - 5/8	150	–	C24	C32
			3/4 - 1			C26	C34
			1 1/8 - 1 1/2			C26	C36
 	ASTM A563 Gr: DH ASTM A194 Gr: 2H	hex	1/4 - 1 1/2	150	150	C24	C38
  	ASTM A563 Gr: DH ASTM A563 Gr: DH 3 ASTM A194 Gr: 2H	heavy hex	1/4 - 4	175	175	C24	C38
	ASTM A563 Gr: DH	hex thick	1/4 - 1 1/2	175	175	C24	C38

Source: IFI.

Table 28 Grade identification markings and mechanical requirements for carbon steel nuts with UNF, 12 UN and finer pitch threads

Grade Identification marking	Strength grade of nut	Dimensional style of nut	Nominal nut size inch	Proof load stress ksi		Nuts Rockwell hardness	
				Non-zinc coated nuts	Zinc coated nuts	min.	max.
 No mark	ASTM A563 Gr.A	hex	1/4 - 1 1/2	80	60	B68	C32
		heavy hex	1/4 - 4	90	68		
		hex thick	1/4 - 1 1/2				
 No mark	SAE Gr. 2	hex	1/4 - 1 1/2	90	—	—	C32
 No mark	ASTM A563 Gr.B	hex	1/4 - 1	109	82	B69	C32
			1 1/8 - 1 1/2	94	70		
		heavy hex och hex thick	1/4 - 1	120	90	B69	C32
			1 1/8 - 1 1/2	105	79		
 No mark	SAE Gr. 5	hex	1/4 - 1	109	—	—	C32
			1 1/8 - 1 1/2	94	—		
 D	ASTM A563 Gr.D	hex	1/4 - 1 1/2	135	135	B84	C38
		heavy hex	1/4 - 4	150	150		
		hex thick	1/4 - 1 1/2				
 D	SAE Gr. 8	hex	1/4 - 5/8	150	—	C24	C32
			3/4 - 1			C26	C34
			1 1/8 - 1 1/2			C26	C36
 DH	ASTM A563 Gr.DH	hex	1/4 - 1 1/2	150	150	C24	C38
		heavy hex	1/4 - 4	175	175		
		hex thick	1/4 - 1 1/2				

Source: IFI.

Type of nut	Hex	Hex Thick	Heavy Hex
Thickness	0.875 D ¹	1 D ¹	1 D ¹
Width across flats	1.5 D ¹	1.5 D ¹	1.5 D ¹ + 0.125

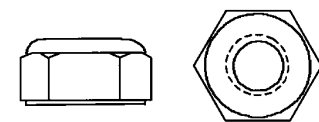
¹) D = thread diameter.

Source: IFI.

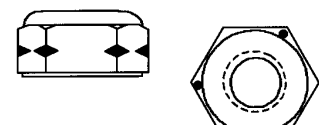
Lock nuts in inch

IFI

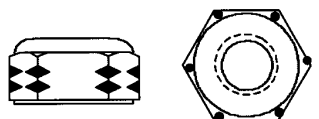
Is marked according to the following example.



IFI Grade A
(no mark)



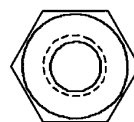
IFI Grade B



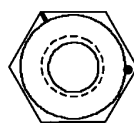
IFI Grade C

SAE

SAE J995 does not require markings. In cases where marking is applied it is done according to the mentioned below.



SAE Grade 2
(no mark)



SAE Grade 5



SAE Grade 8

Table 199 Mechanical properties - Bolts, screws and studs with inch threads (UNC- and UNF-threads)

Mechanical property	Property class				
	4.6 SAE Grade 1 ¹⁾	5.8 SAE Grade 2 ¹⁾	8.8 SAE Grade 5 ¹⁾	10.9 SAE Grade 8 ¹⁾	12.9 ASTM A574 ¹⁾
Tensile strength, R_m , N/mm ² min. 1000 lbf/in ² min.	414 60	510 74	827 ²⁾ 120	1034 150	1240 ²⁾ 180
Vickers hardness HV	127 - 254	157 - 254	268 - 336	326 - 382	382 - 446
Rockwell hardness HR HRB	70 - 100	80 - 100			
Rockwell hardness HR HRC			25 - 34	33 - 39	39 - 45
Brinell hardness HB	121 - 241	149 - 241	255 - 319	310 - 363	
Surface hardness HV 0,3 max.	—	—	356	402	454
Yield stress, R_e , N/mm ² min. ³⁾ 1000 lbf/in ² min.	248 36	393 57	—	—	—
Stress at permanent set limit, $R_{p0,2}$, N/mm ² min. $R_{p0,2}$, 1000 lbf/in ² min.	—	—	634 ²⁾ 92	896 130	1117 ²⁾ 162
Stress under proof load, S_p , N/mm ² min. 1000 lbf/in ² min.	228 33	379 55	586 ²⁾ 85	827 120	965 ²⁾ 140
Elongation after fracture, A_5 %	22	10	12	9	8
Strength under wedge loading, N/mm ² min. 1000 lbf/in ² min.	414 60	510 74	827 ²⁾ 120	1034 150	1240 ²⁾ 180
Impact strength, KU min.	—	—	30	20	15
Head soundness	No fracture				
Minimum height of non-decarburized thread zone, E	—	—	$\frac{1}{2} H_I$	$\frac{2}{3} H_I$	$\frac{3}{4} H_I$
Maximum depth of complete decarburization, G mm	—	—	0,015	0,015	0,015

¹⁾ = Designation according to SAE and ASTM.

²⁾ = The corresponding property classes according to SAE and ASTM have in coarser dimensions somewhat lower mechanical properties.

³⁾ = In a case where the yield stress, R_{eL} , cannot be determined, it is permissible to measure the stress at permanent set limit, $R_{p0,2}$.

Source: SS 2265.

Table 200 Mechanical properties - Nuts

Characteristic			Property class				
			4	6 SAE Grade 2 ¹⁾	8 SAE Grade 5 ¹⁾	10 SAE Grade 8 ¹⁾	12 ASTM A574 ¹⁾
Proof stress, S_p min.	UNC	N/mm ² 1000 lbf/in ²	414 60	621 90	827 120 ²⁾	1034 150	1240 180
	UNF	N/mm ² 1000 lbf/in ²	414 60	621 90	752 109 ²⁾	1034 150	1240 180
Hardness	Brinell hardness	HB max	285	302	302	336	354
	Rockwell hardness	HRC max	30	32	32	36 ³⁾	38
	Vickers hardness	HV max	300	318	318	354	373

¹⁾ = Designation according to SAE and ASTM.

²⁾ = The corresponding property classes according to SAE and ASTM have in coarser dimensions somewhat lower mechanical properties.

³⁾ = For dimensions below 1", a lower hardness is permitted according to SAE and ASTM.

Source: SS 2268.

Table 201 Mechanical properties - Locknuts in inch

Grade	Locknut size (bolt dia.) inch	Proof load stress psi	Rockwell hardness
A	No. 4 - 1-1/2	90 000	C28 max.
B	No. 4 - 1	120 000	C28 max.
	Over 1 - 1-1/2	105 000	C28 max.
C	No. 4 - 5/8	150 000	C24/32
	Over 5/8 - 1		C26/34
	Over 1 - 1-1/2		C26/36
F	1/4 - 3/4	120 000	C28 max.
G	1/4 - 5/8	150 000	C24/32
	3/4	150 000	C26/34

Table 202 Proof loads - Nuts with inch threads - Coarse threads

Nominal thread diameter inch	Number of threads per inch	Nominal stress area of the mandrel A_S mm ²	Property class				
			4	6 SAE Grade 2	8 SAE Grade 5	10 SAE Grade 8	12 ASTM A574
			Proof load ($A_S \times S_P$), N				
1/4	20	20,5	—	12 700	16 950	21 200	25 400
5/16	18	33,8	—	21 000	27 950	34 950	41 900
3/8	16	50	—	31 000	41 350	51 700	62 000
7/16	14	68,6	—	42 600	56 750	70 900	85 100
1/2	13	91,5	—	56 800	75 700	94 600	113 500
9/16	12	117	—	72 700	96 800	121 000	145 100
5/8	11	146	60 400	90 700	120 700	151 000	181 000
3/4	10	216	89 400	134 100	178 600	223 300	267 800
7/8	9	298	123 400	185 100	246 400	308 100	369 500
1	8	391	161 900	242 800	323 400	404 300	484 800
1 1/8	7	492	203 700	305 500	406 900	508 700	610 100
1 1/4	7	625	258 700	388 100	516 900	646 200	775 000
1 3/8	6	745	308 400	462 600	616 100	770 300	923 800
1 1/2	6	907	375 500	563 200	750 100	937 800	1 124 700

Source: SS 2268.

Table 203 Min. ultimate tensile loads - Bolts, screws and studs with inch threads - Coarse threads

Nominal thread diameter inch	Number of threads per inch	Nominal stress area mm ²	Property class				
			4.6	5.8	8.8	10.9	12.9
			SAE Grade 1	SAE Grade 2	SAE Grade 5	SAE Grade 8	ASTM A574
			Minimum ultimate tensile load (A _s × R _m), N				
1/4	20	20,5	8 500	10 450	16 950	21 200	25 400
5/16	18	33,8	14 000	17 250	27 950	34 950	41 900
3/8	16	50	20 700	25 500	41 350	51 700	62 000
7/16	14	68,6	28 400	34 900	56 750	70 900	85 100
1/2	13	91,5	37 900	46 700	75 700	94 600	113 500
9/16	12	117	48 400	59 700	96 800	121 000	145 100
5/8	11	146	60 400	74 400	120 700	151 000	181 000
3/4	10	216	89 400	110 200	178 600	223 300	267 800
7/8	9	298	123 400	152 000	246 400	308 100	369 500
1	8	391	161 900	199 400	323 400	404 300	484 800
1 1/8	7	492	203 700	250 900	406 900	508 700	610 100
1 1/4	7	625	258 700	318 700	516 900	646 200	775 000
1 3/8	6	745	308 400	380 000	616 100	770 030	923 800
1 1/2	6	907	375 500	462 600	750 100	937 800	1 124 700

Source: SS 2265.

Table 204 Min. ultimate tensile loads - Bolts, screws and studs with inch threads - Fine threads

Nominal thread diameter inch	Number of threads per inch	Nominal stress area mm²	Property class				
			4.6 SAE Grade 1	5.8 SAE Grade 2	8.8 SAE Grade 5	10.9 SAE Grade 8	12.9 ASTM A574
			Min. ultimate tensile load (A _s × R _m), N				
1/4	28	23,5	9 700	12 000	19 400	24 300	29 100
5/16	24	37,5	15 500	19 100	31 000	38 800	46 500
3/8	24	56,7	23 500	28 900	46 900	58 600	70 300
7/16	20	76,6	31 700	39 100	63 300	79 200	95 000
1/2	20	103	42 600	52 500	85 200	106 500	127 700
9/16	18	131	54 200	66 800	108 300	135 400	162 400
5/8	18	165	68 300	84 200	136 500	170 600	204 600
3/4	16	241	99 800	122 900	199 300	249 200	298 800
7/8	14	329	136 200	167 800	272 100	340 200	408 000
1	12	428	177 200	218 300	353 900	442 500	530 700
1 1/8	12	552	228 500	281 500	456 500	570 800	684 500
1 1/4	12	692	286 500	352 900	572 300	715 500	858 100
1 3/8	12	848	351 100	432 500	701 300	876 800	1 051 500
1 1/2	12	1 020	422 300	520 200	843 500	1 054 700	1 264 800

Source: SS 2265.