SELECTING THE CORRECT BOLT

Picking Bolt Length and Calculating Bolt Stiffness (kb)

- Find the nut height (H).
- Find the washer thickness (t).
- Find the thread length (Lt).
- Pick Preferred bolt length (L).
- Calculate the unthreaded length of the bolt (ld).
- Calculate the length of the threaded portion in the grip (lt).
- Calculate the area of unthreaded portion of bolt (Ad).
- Find the area of the threaded portion of the bolt (At).

Finding Thread Length (Lt)

- Inch series bolts

$Lt := 2D + .25 \quad L \le 6 \text{ inches} \qquad Lt := 2D + .5 \quad L > 6 \text{inches}$

D is the diameter of the bolt in inches.

L is the length of the bolt

- Metric series bolts

D≤48 millimeters

$Lt = 2D + .25 \quad L \le 125 \text{millimeter}$

$Lt = 2D + 12 \quad 125 \le L \le 200$

$Lt = 2D + 25 \quad L > 200$

More Calculations

- Calculation of the unthreaded length of bolt (ld).

ld= (Total length of bolt (L))-(Threaded length of bolt (Lt))

- Calculation of the threaded portion of the grip (lt).

lt)= (Total length of grip (Lg))-(Unthreaded length of bolt (ld))

- Calculation of the area of the unthreaded portion of bolt (Ad).

$$Ad := \frac{(\pi \cdot d)}{4}$$

- The value for the area of the unthreaded portion of the bolt (At) comes from tables

Calculation of bolt stiffness (kb)

- E = Modulus of Elasticity
- Ad = Area of unthreaded portion of bolt
- At = Area of threaded portion of bolt
- lt = Thread length
- ld = Unthreaded length of bolt

$$kb := \frac{(Ad \cdot At \cdot E)}{(Ad \cdot lt + At \cdot ld)}$$

TABLE 8-1:
Diameters and Areas of COURSE-PITCH and FINE-PITCH Metric Threads (All Dimensions are in **Millimeters**)

	COURSE-PITCH SERIES			FINE-PITCH SERIES		
Nominal Major Diameter d	Pitch p	Tensile Stress Area A_s	Minor Diameter Area A_r	Pitch p	Tensile Stress Area A_s	Minor Diameter Area A_r
1.6	0.35	1.27	1.07			
2	0.4	2.07	1.79			
2.5	0.45	3.39	2.98			
3	0.5	5.03	4.47			
3.5	0.6	6.78	6			
4	0.7	8.78	7.75			
5	0.8	14.2	12.7			
6	1	20.1	17.9			
8	1.25	36.6	32.8	1	39.2	36
10	1.5	58	52.3	1.25	61.2	56.3
12	1.75	84.3	76.3	1.25	92.1	86
14	2	115	104	1.5	125	116
16	2	157	144	1.5	167	157
20	2.5	245	225	1.5	272	259
24	3	353	324	2	384	365
30	3.5	561	519	2	621	596
36	4	817	759	2	915	884
42	4.5	1120	1050	2	1260	1230
48	5	1470	1380	2	1670	1630
56	5.5	2030	1910	2	2300	2250
64	6	2680	2520	2	3030	2980
72	6	3460	3280	2	3860	3800
80	6	4340	4140	1.5	4850	4800
90	6	5590	5360	2	6100	6020
100	6	6990	6740	2	7560	7470
110				2	9180	9080

TABLE 8-2:
Diameters and Area of Unified Screw Threads UNC and UNF* (All dimensions are in **Inches**)

		COURSE SERIES (UNC)			FINE SERIES (UNF)		
Size Designation	Nominal Major Diameter	Threads Per Inch N	Tensile Stress Area A_s	Minor Diameter Area A_r	Threads Per Inch N	Tensile Stress Area A_s	Minor Diameter Area A_r
0	0.0600				80	0.00180	0.00151
1	0.0730	64	0.00263	0.00218	72	0.00278	0.00237
2	0.0860	56	0.00370	0.00310	64	0.00394	0.00339
3	0.0990	48	0.00487	0.00406	56	0.00523	0.00451
4	0.1120	40	0.00604	0.00496	48	0.00661	0.00566
5	0.1250	40	0.00796	0.00672	44	0.00880	0.00716
6	0.1380	32	0.00909	0.00745	40	0.01015	0.00874
8	0.1640	32	0.01400	0.01196	36	0.01474	0.01265
10	0.1900	24	0.01750	0.01450	32	0.02000	0.01750
12	0.2160	24	0.02420	0.02060	28	0.02580	0.02260
1/4	0.2500	20	0.03180	0.02690	28	0.03640	0.03260
5/16	0.3125	18	0.05240	0.04540	24	0.05800	0.05240
3/8	0.3750	16	0.07750	0.06780	24	0.08780	0.08090
7/16	0.4375	14	0.10630	0.09330	20	0.11870	0.10900
1/2	0.5000	13	0.14190	0.12570	20	0.15990	0.14860
9/16	0.5625	12	0.18200	0.16200	18	0.20300	0.18900
5/8	0.6250	11	0.22600	0.20200	18	0.25600	0.24000
3/4	0.7500	10	0.33400	0.30200	16	0.37300	0.35100
7/8	0.8750	9	0.46200	0.41900	14	0.50900	0.48000
1	1.0000	8	0.60600	0.55100	12	0.66300	0.62500
1 1/4	1.2500	7	0.96900	0.89000	12	1.07300	1.02400
1 1/2	1.5000	6	1.40500	1.29400	12	1.58100	1.52100

Recommended Torque to Achieve Optimum Preload (Clamping Force) Using ARP® Moly Assembly Lubricant or 30-wt. oil - Torque (ft./lbs.) - Preload (lbs.)

Note: For those using Newton/meters as a torquing reference, you must multiply the appropriate ft./lbs. factor by 1.356.

Thread Size and Type	Fastener Tensile Strength (PSI) 170,000 (1171 N/mm²) Torque w/30 wt. oil	170,000 (1171 N/mm²) Torque w/ARP® Moly	170,000 (1171 N/mm²) Preload	190,000 (1309 N/mm²) Torque w/30 wt. oil	190,000 (1309 N/mm²) Torque w/ARP® Moly	190,000 (1309 N/mm²) Preload	220,000 (1515 N/mm²) Torque w/oil Not recommended	220,000 (1515 N/mm²) Torque w/ARP® Moly	220,000 (1515 N/mm²) Preload
1/4" stud	12	10	3,804	14	11	4,280	15	12	4,755
1/4-20	13	10	3,804	14	11	4,280	16	13	4,755
1/4-28	14	11	4,344	16	13	4,887	18	14	5,430
5/16" stud	25	20	6,264	28	22	7,047	32	25	7,830
5/16-18	26	21	6,264	29	23	7,047	32	26	7,830
5/16-24	28	22	6,948	32	25	7,817	35	28	8,685
3/8" stud	45	35	9,276	50	39	10,436	56	44	11,595
3/8-16	46	36	9,276	51	41	10,436	57	45	11,595
3/8-24	50	39	10,512	57	44	11,826	63	49	13,140
7/16" stud	71	56	12,720	80	63	14,310	89	70	15,900
7/16-14	73	58	12,720	82	65	14,310	91	72	15,900
7/16-20	80	62	14,220	90	70	15,998	100	78	17,775
1/2" stud	108	84	16,992	122	95	19,116	135	105	21,240
1/2-13	111	88	16,992	125	99	19,116	138	110	21,240
1/2-20	122	95	19,164	137	107	21,560	152	119	23,955
9/16" stud	156	122	21,792	175	137	24,516	195	152	27,240
9/16-12	159	126	21,792	179	142	24,516	199	158	27,240
9/16-18	174	136	24,312	196	153	27,351	217	170	30,390
5/8" stud	214	167	27,072	241	187	30,456	268	208	33,840
5/8-11	220	174	27,072	247	196	30,456	275	217	33,840
5/8-18	243	189	30,660	273	212	34,493	303	236	38,325
8mm stud	25	20	6,264	28	22	7,047	32	25	7,830
10mm stud	54	42	10,680	61	48	12,015	68	53	13,350
11mm stud	80	63	14,220	90	71	15,998	100	79	17,775
12mm stud	97	77	15,540	109	86	17,483	122	96	19,425

ARP FASTENER LUBE

It's difficult to determine the amount of torque required to provide the correct preload and clamp force of a given fastener. For example– when tightened, dry uncoated fasteners use up about 95% of the applied torque simply by overcoming the friction between the male and female threads. To ensure that all ARP® fasteners provide the optimum level of service, the installed residual stress is calculated and verified experimentally using a superior quality lubricant. It is important to note that the friction coefficients of lubricants vary dramatically, making it difficult to consistently produce the exact amount of stress within the fastener to clamp the components together. That's why ARP® developed an ultra-consistent lubricant and recommend the use of our premium grade ASSEMBLY LUBRICANT or THREAD SEALER in order to precisely duplicate the recommended tightening specifications provided with all ARP® fasteners.

- Premium grade Moly base with rust and corrosion inhibitors.
- Effective lubrication range: -30°F to 750°F.
- Load range: 500,000 Psi.
- Other applications: Primary assembly lube for engine components, press fitting, gear trains and general machinery.

Thread Sealer

- Teflon based w/rust & corrosion inhibitors.
- Effective range: -30° to 550°F.
- Sealant range: 10,000 Psi (pressure).
- Application: delivers a flexible leak-proof seal in aluminum, steel, stainless steel and plastic against coolants, water, gasoline, natural gas and LPG.

NOTE: These products are formulated for use on fasteners. Not recommended for use on rotating components

Forged from 8740 chrome moly, all bolts feature generous under-head radius and rolled threads for the utmost reliability. The threads are rolled after heattreating, which gives them about 1000% longer fatigue life than most bolts, which are threaded prior to heat-treating. Available in the popular High Performance Series, which, at a nominal rating of **180,000 psi**, is a premium replacement for OEM fasteners, or the **200,000 psi** nominal rated Pro Series, application-specific main bolts with reduced wrenching head and are designed for use in competition applications.

ARP Bolts - Head Bolts

Connecting Rod Bolts

ARP Bolts - Head Studs