

TABLES & OTHER *Information*

Mechanical Data - Stainless Steel

Tensile, Torque and Shear Calculations for Standard Number and Fractional Thread Sizes

Stainless Steel 302/302HQ/304 ASTM F593 Thread Class UN-2A

Fastener	ND	TPI	PD	MD	SAF	SAP	SAT ^a	UTM ^b	YTM ^b	PTM ^c	UTS	YTS
										90% YTM	UTM•SAT	YTM•SAT
	Nominal Diameter (in)	Threads per Inch	Calculated Pitch Diameter (in)	Calculated Minor Diameter (in)	Calculated Stress Area Full Body (in ²)	Calculated Stress Area Pitch (in ²)	Calculated Stress Area Threads (in ²)	Material Ultimate Tensile Strength Min (PSI)	Material Yield Tensile Strength Min (PSI)	Material Proof Tensile Strength Min (PSI)	Fastener Thread Ultimate Tensile Strength Min (lbs)	Fastener Thread Yield Strength Min (lbs)
#4-40	0.110	40	0.094	0.078	0.0095	0.0069	0.0058	75,000	30,000	27,000	432	173
#6-32	0.138	32	0.118	0.097	0.0150	0.0109	0.0091	75,000	30,000	27,000	681	273
#8-32	0.164	32	0.144	0.123	0.0211	0.0162	0.0140	75,000	30,000	27,000	1,051	420
#10-32	0.190	32	0.170	0.149	0.0284	0.0226	0.0200	75,000	30,000	27,000	1,500	600
#10-24	0.190	24	0.163	0.136	0.0284	0.0209	0.0175	75,000	30,000	27,000	1,315	526
1/4-20	0.250	20	0.218	0.185	0.0491	0.0372	0.0318	75,000	30,000	27,000	2,387	955
5/16-18	0.313	18	0.276	0.240	0.0767	0.0600	0.0524	75,000	30,000	27,000	3,932	1,573
3/8-16	0.375	16	0.334	0.294	0.1104	0.0878	0.0775	75,000	30,000	27,000	5,812	2,325
7/16-14	0.438	14	0.391	0.345	0.1503	0.1201	0.1063	75,000	30,000	27,000	7,973	3,189
1/2-13	0.500	13	0.450	0.400	0.1963	0.1591	0.1419	75,000	30,000	27,000	10,642	4,257
5/8-11	0.625	11	0.566	0.507	0.3068	0.2516	0.2260	75,000	30,000	27,000	16,950	6,780
3/4-10	0.750	10	0.685	0.620	0.4418	0.3686	0.3345	75,000	30,000	27,000	25,085	10,034
7/8-9	0.875	9	0.803	0.731	0.6013	0.5062	0.4617	75,000	30,000	27,000	34,630	13,852
1-8	1.000	8	0.919	0.838	0.7854	0.6630	0.6057	75,000	30,000	27,000	45,431	18,172

Fastener	PL	PR ^d	PP ^e	FC ^f	TR	TP	TU ^g	YSM ^h	YSF	YSP	YST	YTF
	PTM•SAT	75% PL	90% PL		FC•PR•ND	FC•PP•ND	FC•UTS•ND	0.577•YTM	YSM•SAF	YSM•SAP	YSM•SAT	YTM•SAF
	Fastener Proof Load (lbs)	Fastener Preload Reused (lbs)	Fastener Preload Permanent (lbs)	Friction Coefficient	Torque Reused (in•lb)	Torque Permanent (in•lb)	Torque Ultimate (in•lb)	Material Yield Shearing Stress Min (PSI)	Fastener Full Body Yield Shear Min (lbs)	Fastener Pitch Yield Shear Min (lbs)	Fastener Thread Yield Shear Min (lbs)	Fastener Full Body Yield Tensile Strength Min (lbs)
#4-40	156	117	140	0.2	3	3	9.5	17,310	165	120	100	285
#6-32	245	184	221	0.2	5	6	18.8	17,310	259	188	157	449
#8-32	378	284	340	0.2	9	11	34.5	17,310	366	281	242	634
#10-32	540	405	486	0.2	15	18	57.0	17,310	491	392	346	851
#10-24	473	355	426	0.2	13	16	50.0	17,310	491	361	303	851
1/4-20	859	644	773	0.2	32	39	119.3	17,310	850	643	551	1,473
5/16-18	1,416	1,062	1,274	0.2	66	80	245.8	17,310	1,328	1,039	908	2,301
3/8-16	2,092	1,569	1,883	0.2	118	141	435.9	17,310	1,912	1,520	1,341	3,313
7/16-14	2,870	2,153	2,583	0.2	188	226	697.7	17,310	2,602	2,080	1,840	4,510
1/2-13	3,831	2,873	3,448	0.2	287	345	1,064.2	17,310	3,399	2,753	2,456	5,890
5/8-11	6,102	4,577	5,492	0.2	572	686	2,118.8	17,310	5,311	4,355	3,912	9,204
3/4-10	9,030	6,773	8,127	0.2	1,016	1,219	3,762.7	17,310	7,647	6,380	5,790	13,254
7/8-9	12,467	9,350	11,220	0.2	1,636	1,964	6,060.3	17,310	10,409	8,763	7,993	18,040
1-8	16,355	12,266	14,720	0.2	2,453	2,944	9,086.2	17,310	13,595	11,477	10,485	23,562



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Mechanical Data - Metric - Stainless Steel

Tensile, Torque and Shear Calculations for Metric Thread Sizes

Stainless Steel 302/302HQ/304 ASTM F738 Thread Class 6g Property Class 4.6 Elongation 20%

	ND	TPI	PD	MD	SAF	SAP	SAT ^a	UTM ^b	YTM ^b	PTM ^c	UTS	YTS
										90% YTM	UTM*SAT	YTM*SAT
Fastener	Nominal Diameter (mm)	Pitch	Calculated Pitch Diameter (mm)	Calculated minor Diameter (mm)	Calculated Stress Area Full Body (mm ²)	Calculated Stress Area Pitch (mm ²)	Calculated Stress Area Threads (mm ²)	Material Ultimate Tensile Strength Min (MPa)	Material Yield Tensile Strength Min (MPa)	Material Proof Tensile Strength Min (MPa)	Fastener Ultimate Tensile Strength Min (N)	Fastener Thread Yield Strength Min (N)
4mm - 0.7	4.00	0.7	3.55	3.14	12.566	9.872	8.779	515	206	185	452	181
5mm - 0.8	5.000	0.8	4.480	4.019	19.6350	15.7660	14.1825	515	206	185	730	292
6mm - 1.0	6.00	1	5.35	4.77	28.274	22.484	20.123	515	206	185	1,036	415
8mm - 1.25	8.000	1.25	7.188	6.466	50.2655	40.5806	36.6085	515	206	185	1,885	754
10mm - 1.50	10.00	1.5	9.03	8.16	78.540	63.981	57.990	515	206	185	2,986	1,195

	PL	PR ^d	PP ^e	FC ^f	TR	TP	TU ^g	YSM ^h	YSF	YSP	YST	YTF
	PTM*SAT	75% PL	90% PL		FC*PR*ND	FC*PP*ND	FC*UTS*ND	0.577*YTM	YSM*SAF	YSM*SAP	YSM*SAT	YTM*SAF
Fastener	Fastener Proof Load (N)	Fastener Preload Reused (N)	Fastener Preload Permanent (N)	Friction Coefficient	Torque Reused (N•M)	Torque Permanent (N•M)	Torque Ultimate (N•M)	Material Yield Shearing Stress Min (Mpa)	Fastener Full Body Yield Shear Min (N)	Fastener Pitch Yield Shear Min (N)	Fastener Thread Yield Shear Min (N)	Fastener Full Body Yield Tensile Strength Min (N)
4mm - 0.7	163	122	146	0.2	1.0	1.2	3.6	119	149	117	104	259
5mm - 0.8	263	197	237	0.2	2.0	2.4	7.3	119	233	187	169	404
6mm - 1.0	373	280	336	0.2	3.4	4.0	12.4	119	336	267	239	582
8mm - 1.25	679	509	611	0.2	8.1	9.8	30.2	119	597	482	435	1,035
10mm - 1.50	1,075	806	968	0.2	16.1	19.4	59.7	119	934	760	689	1,618

Notes:

a	Stress area for the treads is calculated on an area approximately half way between the root diameter and pitch diameter. This more closely reflects actual results versus using root diameter for stress area calculations
b	Data provided by our suppliers
c	Proof Tensile is estimated to be 90% of Yield Tensile when Proof Tensile data is not readily available.
d	Preload for reuse of threaded fastener is 75% of Proof Load. Fastener may be rebolted multiple times with no degradation.
e	Preload for permanent installation of fastener is 90% of Proof Load. Fastener is permanently stretched and will not achieve the same clamping force on reuse.
f	Friction Coefficient will vary greatly depending on bolting conditions including lubrication. 0.2 is standard when bolt condition is plain finish or unknown.
g	Ultimate Torque is not useful in designing a bolted joint. Preloaded torque is more practical. This data is provided as a reference only.
h	Using the distortion-energy theory; Maximum Shear Stress equals .577 times the Maximum Tensile.

Source: "Mechanical Engineering Design", 5th ed.; Shigley and Mischke, McGraw Hill, C1989.

CAUTION:

Fasteners should not be used at their tensile or shear limits. A safety factor must be applied to engineering calculations. The particular safety factor will vary depending on the application. **The end user will choose the safety factor for his/her application.**



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