Technical Information & Torque Specifications

All of our bolts are made with aircraft grade Titanium Alloy. One of the outstanding benefits of Mettec bolts is that we forge the heads for superior strength. The threads are then rolled to produce greater fatigue strength and reduce galling.

Our bolts exceed minimum Ultimate Tensile Strength (UTS) of 120,000 psi. Mettec can also make titanium bolts that exceed 160,000 psi in Ultimate Tensile Strength (UTS). Both styles of bolts conform to DIN and ASTM specifications. Titanium bolts can replace both grade 5 and grade 8 steel bolts which have minimum UTS requirements of 120,000 psi and 150,000 psi respectively. Metric bolts with an 8.8 rating can be replaced with titanium while bolts with a 10.9 rating can sometimes be replaced with titanium depending on intended use. Any bolts with a rating over 10.9 rating should not be replaced with titanium.

Torque Accuracy on Fasteners

Screw threads appear to be a simple concept yet much confusion and inconsistency exist regarding torque values. The mechanics of the screw thread are actually very complex and have numerous interacting variables. Sliding friction is affected by materials (like steel or aluminum on titanium), surface roughness, bearing area, material hardness, lubrication and so on.

Accuracy: Tightening is not an accurate science, look at the preloading accuracy published in the "Machinery's Handbook, 25th Edition, page 1404"

Method	Accuracy
By Feel	+/- 35%
Torque Wrench	+/- 25%
Turn-of-nut	+/- 15%
Preload washers	+/- 10%
Bolt elongation	+/- 3%
Strain gauges	+/- 1%

Torque Limits for American Size Bolts in Tension
(For bolts in shear reduce the values shown below by 30-40%)

Non-lubricated			Lubricated		
	Torque	Torque		Torque	Torque
Bolt Size	Min.	Max.	Bolt Size	Min.	Max.
5/16-18	80 in lbs	90 in lbs	5/16-18	72 in lbs	81 in lbs
3/8-16	160 in lbs	185 in lbs	3/8-16	144 in lbs	148 in lbs
3/8-24	200 in lbs	250 in lbs	3/8-24	180 in lbs	225 in lbs
7/16-14	235 in lbs	255 in lbs	7/16-14	211 in lbs	229 in lbs
7/16-20	520 in lbs	630 in lbs	7/16-20	468 in lbs	567 in lbs
1/2-13	400 in lbs	480 in lbs	1/2-13	360 in lbs	432 in lbs
1/2-20	770 in lbs	950 in lbs	1/2-20	693 in lbs	855 in lbs

Torque Limits for Metric Size Bolts in Tension
(For bolts in shear reduce the values shown below by 30-40%)

Non-lubricated			Lubricated		
	Torque	Torque		Torque	Torque
Bolt Size	Min.	Max.	Bolt Size	Min.	Max.
M6-1.00	80 in-lbs	100 in-lbs	M6-1.00	72 in-lbs	90 in-lbs
M8-1.25	120 in-lbs	145 in-lbs	M8-1.25	108 in-lbs	130 in-lbs
M10-1.25	200 in-lbs	255 in-lbs	M10-1.25	180 in-lbs	230 in-lbs
M10-1.5	160 in-lbs	185 in-lbs	M10-1.5	144 in-lbs	148 in-lbs

Recommended Torque Spec's for Titanium Fasteners

Use torque values specified by your equipment manufacture, when available. For titanium fasteners the torque values are listed below. We recommend anti-seize or moly paste be applied to the threads. If you have a specified torque value outside the Mettec range give us a call so that we may be able to more clearly understand your application and provide specific solutions if one exists for the use of titanium in your assembly.

The importance of correct application cannot be overemphasized. Undertorque can result in unnecessary wear of nuts and bolts as well as the parts they hold together. When insufficient pressures are applied, uneven loads will be transmitted throughout the assembly which may result in excessive wear or premature failure due to fatigue. Overtorque can be equally damaging because of failure of the bolt or nut from overstressing the thread areas.