

About the Author/JOE GREENSLADE

Joe Greenslade is President of Greenslade & Company, Inc. in Fort Worth, Texas, a supplier of fastener inspection products, inspection software, and ISO 17025 (A2LA) accredited calibration services. He also provides a variety of consulting services including serving as Expert Witness in fastener related litigations.

Joe has been in the fastener industry in a variety of capacities since 1970. He has written over 220 fastener technology related articles and has spoken to many fastener industry organizations throughout the United States. Joe has been awarded 12 U.S. Patents for fastener inspection devices.

Joe is an active member of the American Society of Mechanical Engineers (ASME), the American Society for Testing and Materials (ASTM), the National Fastener Distributor's Association (NFDA), and a member of the Board of Directors of the American Association for Laboratory Accreditation (A2LA). He is a former member of the Industrial Fasteners Institute (IFI). He was a member of the Fastener Quality Act Task Force representing the fastener industry. Joe also serves on the Screw Thread Improvement Task Force working with government and industry to improve aerospace related thread specifications, and thread gaging and calibration procedures.



Answer Customer Tightening Torque Questions Fast and Professionally With TORKSense®

If you are a fastener supplier you are going to have customers asking you how much torque they should apply when tightening some of the bolts, nuts, and screws they buy from you. Over the years several articles have been published with various torque charts in them. The problem is always finding the applicable chart and the appropriate torque value within that chart that fits your customer's application.

When you cannot find the torque chart with the correct parameters related to your customer's application, you must resort to applying the widely accepted torque calculation formula $T = DKF$.

The "D" in the formula is the threaded fastener's nominal diameter expressed in decimals (inches), meaning that for a 7/8-9 bolt, .875 inches is plugged into the formula. The "K" is the "nut factor" or "K factor" in the formula. It is different for every fastener finish and must be found in one of several engineering reference guides. The "F" is the desired clamp force for the application. Normally, this value is equal to 75% of the bolt's yield strength. The yield strength of various fastener materials can be found in one of the ASTM, SAE, or ISO standards.

When using the $T = DKF$ formula for calculating rec-

ommended tightening torque values for inch fasteners, the user plugs in the three applicable values for D, K, and F. Using simple algebra, the recommended torque value can be determined. The answer is expressed in inch-pounds. To get foot-pounds the answer must be divided by 12.

Calculating torque values for metric fasteners gets a little more complicated because "D" and "F" must be

converted from metric to inch values for the formula to provide correct answers expressed in inch pounds. If a metric torque value in Newton-meters (Nm) is needed, a conversion factor must be applied to the inch-pound answer.

Even if you know where to find all of the values to plug into the formula, looking up all of the values every time is a hassle. Now a simple-to-use piece of inexpensive software (\$100) makes calculating tightening torque values for inch and metric parts of all strength levels and

finishes a snap.

The torque calculating software is TORKSense®. TORKSense has one small main screen with three boxes for the user to fill in and one box that provide the resultant calculated torque value. The three fill-in boxes are for thread size, material yield strength, and the nut

TORKSense Screen Shot

The screenshot shows the TORKSense software interface with the following fields and buttons:

- Step 1:** A button labeled "Click Inch" next to a dropdown menu currently set to "M".
- Step 2:** A button labeled "Click here and select 7/8-9" pointing to the "Access Thread Database" button.
- Step 3:** A button labeled "Click here and select Grade 5" pointing to the "Access Material Database" button.
- Step 4:** A button labeled "Click here and select Dacromet 320" pointing to the "Access Nut Factor Database" button.
- Step 5:** A button labeled "Click here" pointing to the "Calculate Torque Value" button.

Other visible fields include:

- Thread Diameter: 0.875 inches
- Thread Pitch: 0.11111 inches
- Yield Strength of Bolt Material: 81000 Lbf/irf
- Percentage of Yield to be used: 75 %
- Nut Factor K: 0.28
- Torque Value: 572.69863 Lbf-ft

Additional buttons include "Display Full Results" and "Click here to create a detailed report".

factor.

After selecting "I" for inch or "M" for metric parts, the user chooses three pull-down menus to select the parameters related to the customer's specific application; thread size, yield strength, and finish. In the thread database, the user can find all inch thread sizes from #0-80 through 4"-8 and all metric thread sizes from M1 x 0.2 through M100 x 6.0. The material database includes all inch and metric fastener grades and prop-

Sample Report

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Tightening Torque Calculation Report

A-1 Professional Fastener Supplier

Data Created by
TORKSense Program from Bolt Science

Customer: Rough and Ready Manufacturing Co.

Part description: 3/4-10 x 6, Gd 8, HHCS, Zinc

Data Entered

Nominal Thread Diameter:	0.75 inches
Thread Pitch:	0.1 inches
Bolt Yield Strength:	130000 Lbf/in ²
Percentage of Yield Used:	75 %
Nut Factor Used:	0.295

Results

Torque Value	601.2478 Lbf-ft
Preload Value	32610.0527 Lbf

Additional Information

Basic Thread Pitch Diameter	0.6850 inches
Basic Thread Minor Diameter	0.6201 inches
Stress Diameter of Thread	0.6526 inches
Stress Area of Thread	0.3345 in ²
Force required to Yield Bolt	43480.0703 Lbf

Torque Value Conversions

Torque Value	601.2478 Lbf-ft
Torque Value	7214.9742 Lbf-in
Torque Value	115439.5867 Oz-in
Torque Value	815.1827 Nm
Torque Value	815182.6540 Nmm
Torque Value	83.0971 Kg-m

Preload Value Conversions

Preload Value	32610.0527 Lbf
Preload Value	145056.6888 N
Preload Value	14786.6143 Kgf

erty classes that appear in SAE, ASTM, and ISO standards for most ferrous and non-ferrous materials. The nut factor database lists the factors of over 50 common fastener finishes.

After either filling in the three boxes or selecting the application factors from the three drop-down menus, the user presses a button entitled "Calculate Torque Value" and the desired torque calculation immediately appears in the box below the button. The user can select any one of five units of measurement for the torque values to be expressed in: inch-ounces, inch-pounds, foot-pounds, Newton-meters, Newton-meters squared, or Kilogram-meters. If the user changes the unit of measurement, the program automatically makes the proper conversion.

After the torque value is displayed in the box, the user can press a button immediately below the torque box entitled, "Display Full Results", a complete listing of the calculation variables that were selected and the torque value expressed in all five available units is presented on a new screen. The user can type in any additional information they need on the report such as the customer's name, part number, or anything else they feel would be valuable to have on the report. As soon as the print icon is pressed, the report is immediately printed out.

For the fastener supplier who wants to put a little more of a professional appearance on their report, they can copy all of the data from the "Full Results" screen and paste all of the information onto their letterhead. Any other relevant information can then be easily added to the report to provide the customer with a more thorough report.

The TORKSense program provides several additional screens that have very valuable information including complete dimensional size data on all of the inch and metric thread sizes that are in the database and additional material information such as hardness ranges and ultimate tensile strength values for all of the listed material grades and classes. The "Help" menu is very thorough and is full of useful information.

Within minutes of opening the TORKSense program, users feel completely comfortable with its use. No extensive training or manuals are required to gain excellent proficiency.

TORKSense, developed by Bolt Science, is one of the neatest technical tools I have encountered in my 35 years in the fastener business. Questions about recommended torque values are frequently asked of fastener suppliers. This tool can enable any fastener supplier to look like an expert by giving them the capability to provide customers very professional looking torque recommendation reports in minutes. This is a \$100 tool no fastener supplier should be without.

For more information or to order TORKSense, call 800-435-2657, or send an email to joegreenslade@direcway.com. ☎