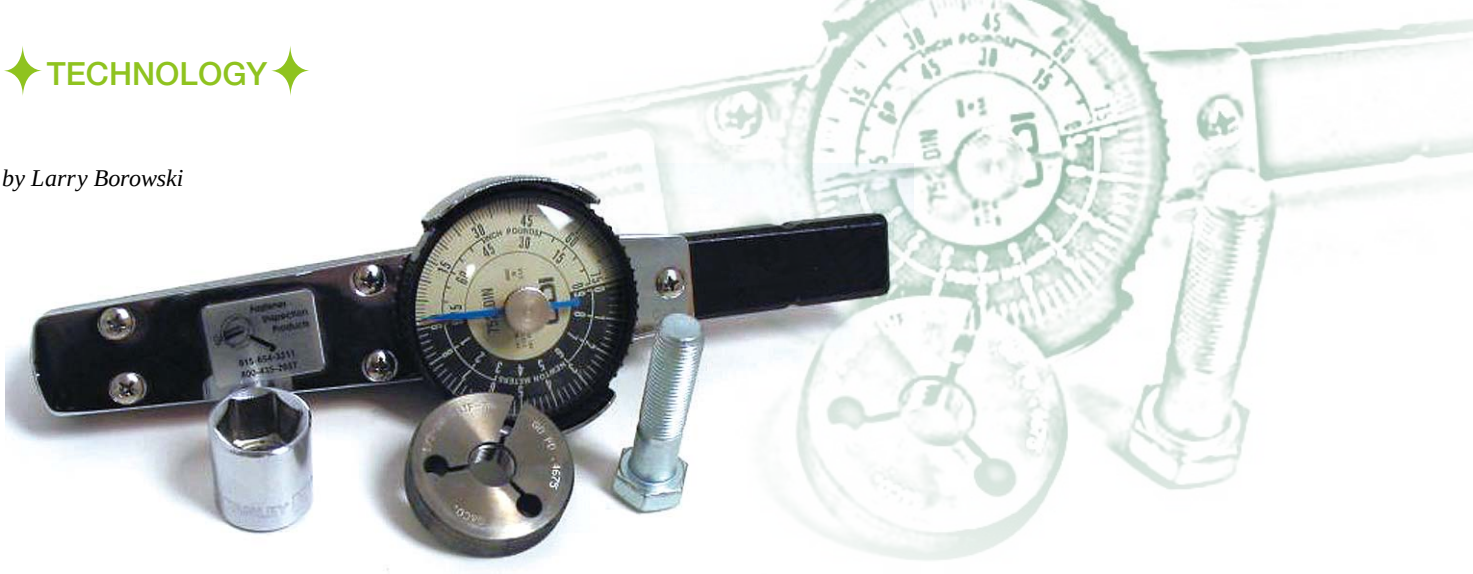
by Larry Borowski



Your product does not freely pass through a Go thread ring gage, no problem there are standards for acceptance!

Often I receive calls from threaded fastener suppliers asking me if there is an inspection rule for the acceptance of bolts and screws that do not freely enter a GO thread ring gage. Furthermore, the word "freely" is very subjective, and can mean a wide variety of things to different people. These questions generally arise with threaded products that are plated or coated, and/or have slightly nicked threads. Fortunately, there are a few international standards that are in agreement on this issue. These standards are:

- ISO 6157-3.
- DIN 267, part 19.
- DIN EN ISO 26I57-3.

In addition to these three international standards, Ford Motor Company has adopted the same criteria in its standard WA-990, published in 1993.

These standards present the same formula for calculating the acceptance torque values. The formulas for deriving the maximum allowable Go thread ring torque values are as follows:

For metric parts:	For inch parts:
T = 0.001 x d^3 **T** = maximum torque in Nm **d** = nominal diameter in mm	**T** = 145 x d^3 **T** = maximum torque in in-lb **d** = nominal diameter in inches

These formulas can be applied to any size thread. The chart below contains the computed and rounded torque acceptance values for the most commonly used inch and metric thread size ranges. To determine if a threaded part is acceptable using these values parts are driven through a "basic size" (3A for inch parts and 6h for metric parts) GO thread ring gage using a calibrated torque wrench. If the test yields a lower torque reading than the allowable value in the chart above the parts are considered acceptable for the Go functional check.

Inch Threads	Inch Pounds	Metric Threads	Newton meters
1/4	2	M6	0.2
5/16	4	M8	0.5
3/8	8	M10	1.0
7/16	12	M12	1.7
1/2	18	M14	2.7
9/16	26	M16	4.1
5/8	35	M18	5.8
3/4	61	M20	8.0

Many specialized platings and coatings that provide high corrosion resistance are typically applied unevenly and are somewhat thicker than more common platings like electroplated zinc. Many of these platings and coatings are relatively soft and even though parts having these finishes may not freely enter into a GO thread ring gage, they will go through with a relatively small amount of torque.

The threads on metric bolts starting at size M10 and inch bolts starting at 3/8 inches have a higher tendency to become nicked as they go through the thread rolling, heat treating, and finishing processes. This happens because of the bulk handling techniques that are generally employed, where it is common for parts to tumble over one another many times. Even though most slightly nicked threads are perfectly functional some do not freely enter a GO thread ring gage. Using this Go ring torque acceptance test provides fastener suppliers and users

Rotate the GO thread ring gage over the full length of the bolt thread

Observe the maximum torque value on torque wrench

with a practical, objective means of evaluating nicked threads and uneven plating applications for determining their acceptability. It also removes the subjective element from the inspection because a maximum value is given.

There have been concerns that if a part requires the maximum torque acceptance value, this might adversely affect the clamping force generated when the bolts are seated in the application. When these acceptance torque values are compared to the recommended seating torque values, it becomes immediately clear how insignificant these values are.

To illustrate this point, consider the case of a 3/4 -10 Grade 5 bolt. The recommended seating torque for a 3/4 - 10 zinc plated Grade 5 bolt is 317 ft-lbs. This torque acceptance test allows a 3/4 -10 bolt to be accepted if the torque required to enter a 3A GO thread ring gage does not exceed 5 ft-lbs. The acceptance torque of 5 ft-lbs. is less than 2% of the recommended seating value in this example. This allowable torque is completely irrelevant when one considers the widely accepted fact that the clamp force created in a joint under standard assembly conditions varies ±25% due to all of the variables in the assembly process.

The torque evaluation approach to the acceptance of threads that do not freely enter a GO thread ring is both practical and reasonable. Threaded component suppliers and users should be aware of and adopt these international standards for determining the acceptance of externally threaded products.