"Chasing Threads" – Be Careful When Chasing those Threads on Your Gas Cylinder & Gas Cylinder Lock Screw!

By Eric A. Nicolaus

Have you ever thought about "chasing" those threads (i.e., using a thread chaser or a thread tap) on your gas cylinder or gas cylinder lock screw? What follows is what I initially thought would be a short paragraph or two on the subject, after I saw several comments made on the CSP (Culver's Shooting Page) M1 Garand & M14/M1A Collectors Forum (www.jouster.com/cgi-bin/garand/garand.pl).

Some Historical Background

Much has changed in the machinist's world since the late 1930s & 1940s, when the M1 Garand gas cylinder and gas cylinder lock screw were both first designed and manufactured. One of these changes occurred in 1948, when the **Unified Screw Thread** standard was adopted by the United States, Britain and Canada. This standard unified the major industrial nations in the west after WWII as to how they designated (and designed interchangeable) screw threads. This newer standard replaced the **American National** threads standard that is referenced on the M1 Garand gas cylinder and gas cylinder lock screw drawings (Figures 1 & 2) cited below.

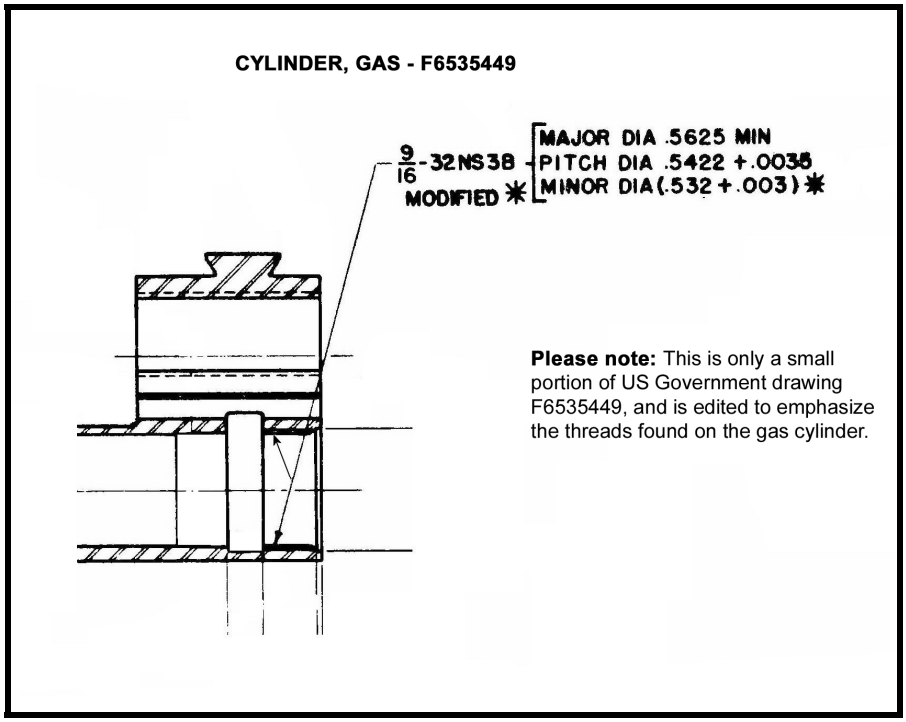

Figure 1: M1 Garand Gas Cylinder

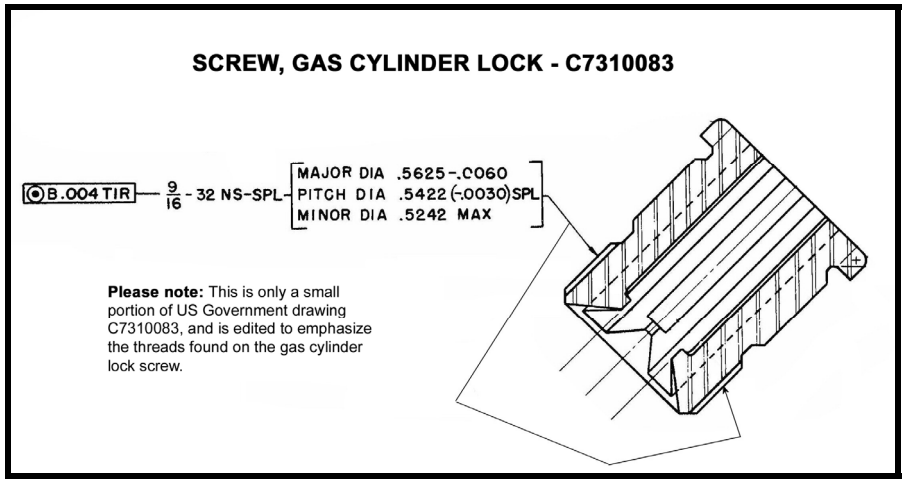

Figure 2: M1 Garand Gas Cylinder Lock Screw

Understanding Screw Thread Designations

Referring to Figures 1 and 2, the "old" **American National** thread standard used the designation "NS" (special threads) in the thread designation. This was not the only designation used by the old thread standard, but it's the one noted here in the two figures. Figure 3 below allows us to better understand the "new" and "old" screw thread designations. The "UN" (unified thread) series designation is one of several thread types used in the **Unified Screw Thread** standard. This "new" standard appears to be very close to the "NS" standard used before 1948 and found in the M1 gas cylinder and gas cylinder lock screw.

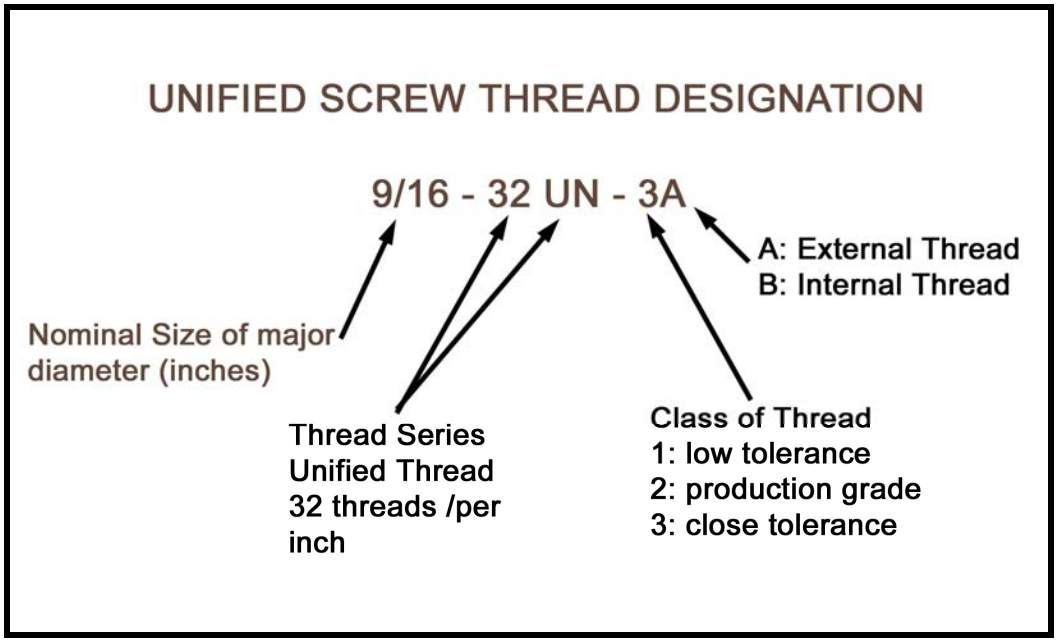

Figure 3: Understanding the Screw Thread Designation

Comparing the Two Standards – Your M1 Garand Gas Cylinder & Gas Cylinder Lock Screw

Spreadsheet 1 (below) gives an excellent comparison between the "old" and "new" thread standards. This can help us to better understand what type of "thread chaser" or "tap" we could purchase today to clean up or "chase" those threads.

Gas Cylinder Lock Screw					
NOMINAL SIZE, TPI, & SERIES DESIGNATION	**EXTERNAL MAJOR DIAMETER MAX**	**EXTERNAL MAJOR DIAMETER MIN**	**EXTERNAL PITCH DIAMETER MAX**	**EXTERNAL PITCH DIAMETER MIN**	**EXTERNAL MINOR DIAMETER**
9/16 - 32 NS SPL ("old" American National)	0.5625	0.5565	0.5422	0.5396	0.5242
9/16 - 32 UN 3A ("new" Unified Screw Thread)	0.5625	0.5565	0.5422	0.5396	0.5242

Gas Cylinder					
NOMINAL SIZE, TPI, & SERIES DESIGNATION	**INTERNAL MAJOR DIAMETER**	**INTERNAL PITCH DIAMETER MAX**	**INTERNAL PITCH DIAMETER MIN**	**INTERNAL MINOR DIAMETER MAX**	**INTERNAL MINOR DIAMETER MIN**
9/16 - 32 NS 3B ("old" American National)	0.5625	0.5457	0.5422	0.535	0.532
9/16 - 32 UN 3B ("new" Unified Screw Thread)	0.5625	0.5456	0.5422	0.5344	0.529

Spreadsheet 1: Comparing the "Old" & "New" Thread Standards Allows for Thread Chaser Selection. Source: US Government Drawings Noted in Figures 1 & 2 and Machinery's Handbook, 21st Edition, Industrial Press, 1980.

Referring to Spreadsheet 1, note that for the gas cylinder lock screw the "new" 9/16 – 32 UN 3A **Unified Screw Thread** designation is exactly the same as the "old" **American National** standard used before, during and after WWII. However, for the gas cylinder, there are some slight differences between the old and new standards – the differences do not appear large enough to the author to damage the gas cylinder threads or make the gas cylinder unusable. Then again, the author has not tried it yet! The differences between the old and new standards do result in a: (1) slight variation of tolerances with size (i.e., Spreadsheet 1: gas cylinder differences); (2) difference in allowable pitch diameter tolerance (see below) on both external and internal threads; and (3) as we've seen in Figure 3, update the thread designations used. A special note about the "Class of Thread"; be aware that 3A or 3B class threads are commonly found in high vibration, rotating machinery, or thin wall special applications. There is good reason why this thread designation was used for the high pressure and high vibration application found in your M1 rifle gas cylinder and lock screw!

Understanding the Terminology – Pitch Diameter, Major Diameter, and Minor Diameter

Figure 4, shown below, gives a visual example of how to measure or understand what the terms "major" and "minor" diameters on an external thread screw (gas cylinder lock screw) or internal thread screw (gas cylinder) actually mean. These terms are used in Spreadsheet 1 to describe the characteristics of the screw threads used.

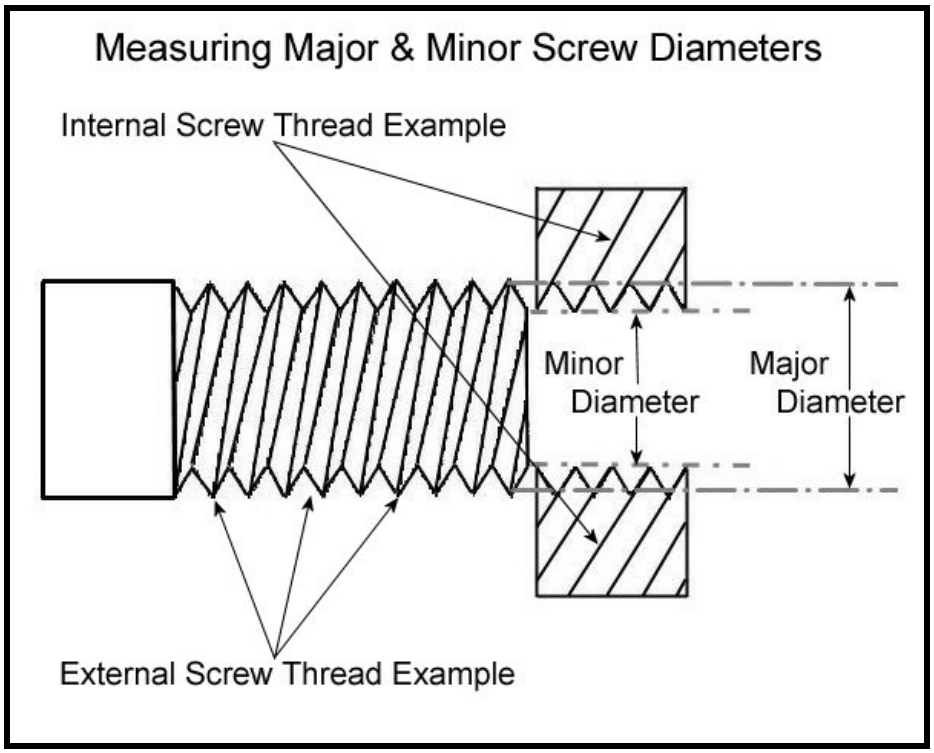

Figure 4: Major and Minor Screw Diameters

Pitch diameter is a hard concept to grasp, but in the Figure 4 example above (and for both the gas cylinder lock screw and gas cylinder) the pitch diameter is an imaginary cylinder of such diameter and location, that its axis would pass through a thread to make the width of the thread ridge equal the groove. Therefore, it appears that the pitch diameter will fall between the minor and major diameters shown in Figure 4. There are many nuisances to defining pitch diameter – the best source for understanding this concept is to open a metalworking or machinery handbook and investigate! Also, the term "TIR", referenced in Figure 2, stands for "total indicated runout". If I were to place the gas cylinder lock screw properly in the chuck of a lathe and then mount a dial indicator against the round screw surface, the maximum TIR (out-of-round) would equal 0.004" as I rotated the chuck by hand through a full 360 degrees.

The Bottom Line

There is at least one vendor that now sells thread taps and/or thread chasers to the M1 Garand collector – and many more machinist dealers that carry similar taps and/or thread chasers. If you should purchase a "new" external or internal thread tap or thread chaser, make sure that the screw thread designations are either 9/16 - 32UN - 3A for the gas cylinder lock screw, and/or 9/16 - 32 UN - 3B for the gas cylinder. All taps and thread chasers are not created equal! Remember, if you use the wrong class of thread (i.e., 2A, 2B, 1A, or 1B) you will expand the thread tolerances (i.e., you'll get a looser fit) which could result in loss of gases, backing off of the lock screw, or much worse. Also, if you should use the wrong tap size or number of threads per inch (TPI), your gas cylinder or gas cylinder lock screw would be rendered unusable.