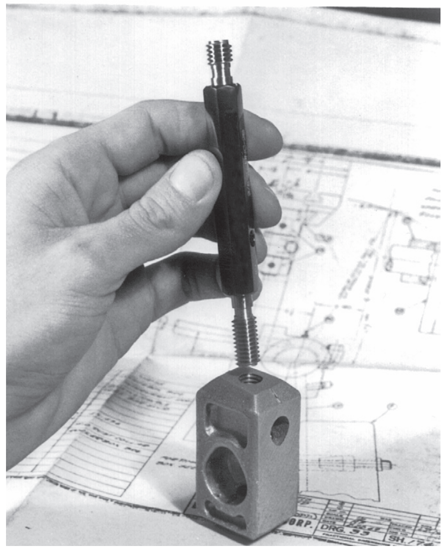
CLASSES OF THREADS AND TAP SIZE: There is a direct relationship between the size of a tap and the size of the thread that it cuts. Size refers to pitch diameter and its relationship to the class of fit required. If two threaded parts are assembled, the looseness or tightness of the fit is determined by contact on the flanks of the threads only. This contact is controlled by the pitch diameters of each part.



CLASSES OF THREAD: When threaded parts are mated, the two parts must assemble with a degree of tightness dictated by the use of the fastener. In addition, the internal thread must be large enough to allow the external thread to enter it for the required length of engagement. A system of thread classes, each representing a comparative degree of tightness, has been established and universally adopted, to provide manufacturers and users of threaded products with a common language of specification. The thread classes designate minimum and maximum pitch diameters for internal and external threads. It is important to remember that classes of thread actually represents manufacturing tolerances. The closer the tolerance required, the higher the cost involved in producing the parts. Therefore, designers and engineers should always try to select the class of thread with the widest permissible tolerance.

TAP SIZE: Due to material variability and machining conditions, taps rarely cut their own size. The thread size produced is usually larger, but can be smaller due to shrinkage. Tap manufacturers realized that to tap a specified class of thread, several different ground thread tap limits would be required. These limits represent small, defined variations in tap size. A numbering system was developed to designate each series of limits, but these limit numbers are not to be confused with the classes of threads. Ground thread tap limits are designated by the letter H (high) above basic pitch diameter, or L (low) below basic pitch diameter, and these numbers establish the tolerance range in relation to basic pitch diameter. As an example, in sizes 1” and smaller, an H1 tap has a tolerance range of from basic to .0005” over basic; an H2 tap from .0005” over basic to .001” over basic, (see Chart 1A on this page). In addition, metric threads are also designated in much the same way. The thread tap limits are designated by the letter D (ground, high) above basic pitch diameter, or U (ground, low) below basic pitch diameter. As an example, in sizes M25 and smaller, a D1 tap has a size of .0005” over basic to tap max. P.D.; a D2 tap has a size of .001” over basic to tap max. P.D., (see Chart 1B). The Tables on pages 57-59 list recommended limit numbers for different classes of thread. Several different limit numbers are available for each diameter and pitch combination. Consequently, it is possible to select the “H” or “L” limit, or the “D” or “U” limit most suitable for the required tapping operation. Please contact Allen Benjamin for questions regarding tap limits and their relation to classes of fit.

CHART 1A

Pitch Diameter Limits for taps to 1” diameter inclusive:

L1 = Basic to Basic minus .0005
H1 = Basic to Basic plus .0005
H2 = Basic plus .0005 to Basic plus .0010
H3 = Basic plus .0010 to Basic plus .0015
H4 = Basic plus .0015 to Basic plus .0020
H5 = Basic plus .0020 to Basic plus .0025
H6 = Basic plus .0025 to Basic plus .0030

Taps larger than 1” dia. are ground to a .0010” tolerance on the pitch diameter and are, for example,
H4 (Basic plus .0010” to Basic plus .0020”).

CHART 1B

Pitch Diameter Limits for taps to 1” diameter inclusive:
(Metric taps generally have more manufacturing tolerance than .0005 to the minus side.)

U1 = Basic minus .0005 = min. tap P.D.
D1 = Basic plus .0005 = max. tap P.D.
D2 = Basic plus .0010 = max. tap P.D.
D3 = Basic plus .0015 = max. tap P.D.
D4 = Basic plus .0020 = max. tap P.D.
D5 = Basic plus .0025 = max. tap P.D.
D6 = Basic plus .0030 = max. tap P.D.

On Charts 2A and 2B (below), examples of the relationship of Class of Fit to various tap limit sizes is shown for both Imperial and Metric sizes. In chart 2A, using a 1/4"-20NC or UNC thread size, it is obvious that an H5 limit (+.0025" over basic pitch diameter) can be used to cut the tightest class of thread in most machining situations, as can the H1 limit (+.0005" over basic P.D.). However, tool wear would force the discarding of the H1 tap long before the H5 would be worn to an undersize condition. **The rule is obvious: always select the largest "H" limit possible to achieve proper class of fit, and maximum tool life.**

CHART 2A

COMPARISON OF PITCH DIAMETER LIMITS TO CLASS OF FIT

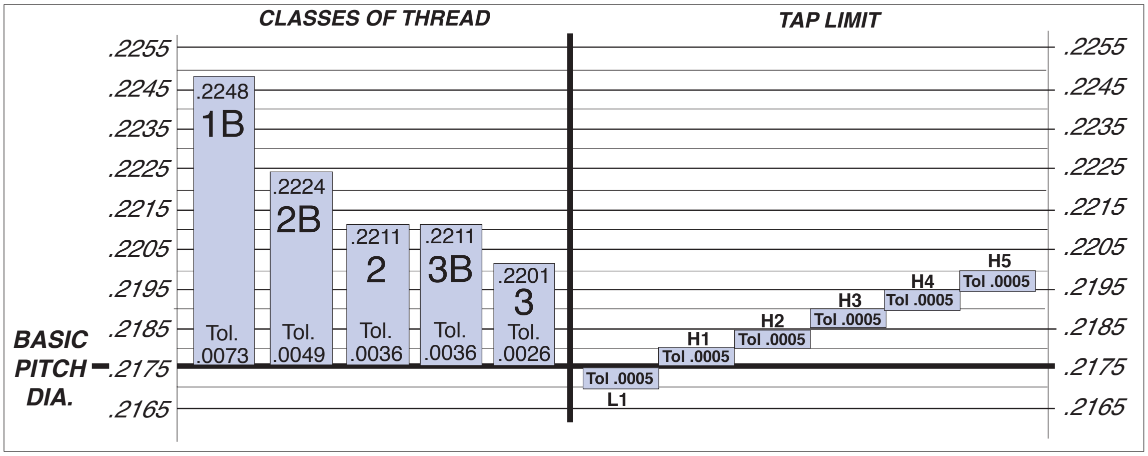
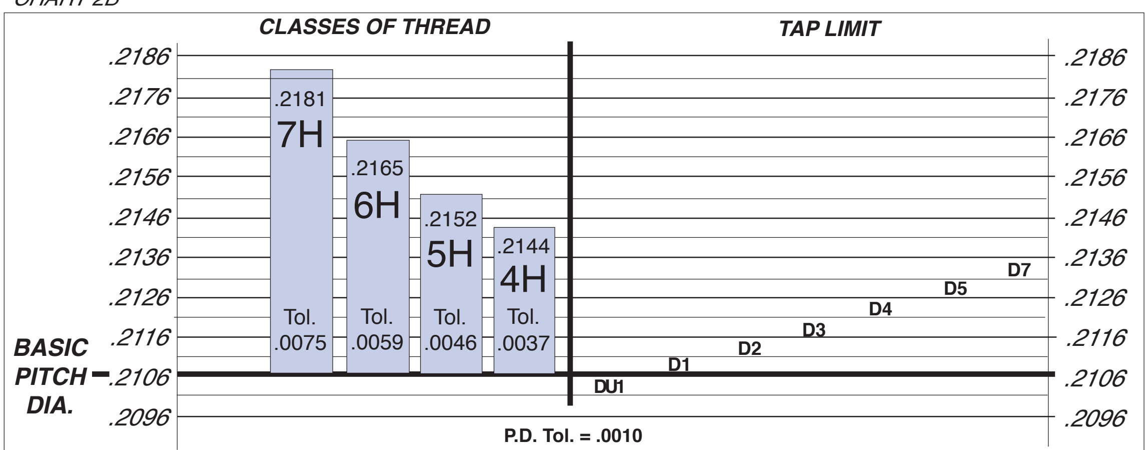


Chart 2B shows the same relationship with a metric thread. Using a M6 X 1.0, it is obvious that a D5 limit (+.0025" over basic pitch diameter) can be used to cut the standard class of thread in most machining situations, as can the D1 limit (+.0005" over basic P.D.). However, tool wear would force the discarding of the D1 tap long before the D5 would be worn to an undersize condition. **The rule is obvious: always select the largest "D" limit possible to achieve proper class of fit, and maximum tool life.**

CHART 2B

COMPARISON OF PITCH DIAMETER LIMITS TO CLASS OF FIT



SCREW THREAD CLASSES OVERVIEW

Screw thread classes are distinguished from each other by the amount of tolerance and allowance.

Class 1A and Class 1B: The combination of Class 1A for external threads and Class 1B for internal threads is intended to cover the manufacture of threaded parts where quick and easy assembly is necessary or desired, and an allowance is provided to permit ready assembly.

Class 2A and Class 2B: The combination of Class 2A for external threads and Class 2B for internal threads designed for screws, bolts and nuts, is also suitable for a variety of other applications. A similar allowance is provided which minimizes galling and seizure encountered in assembly and use. It also accomodates, to a limited extent, plating, finishes or coatings.

Class 3A and 3B: The combination of Class 3A for external threads and Class 3B for internal threads is provided for those applications where closeness of fit and accuracy of lead and angle of thread are important. These threads are obtained consistently only by use of high quality production equipment supported by a very efficient system of gauging and inspection.
No allowance is provided.