MORRIS J.I. MORRIS COMPANY
394 Elm Street • Southbridge, Massachusetts 01550
TEL: 508-764-4394 | FAX: 508-764-7350

TORQUE EVALUATION AND TESTING MINIATURE SCREW THREADS

07/15/2009

Torque testing of miniatures has become more essential as product size reduction many times requires increased relative fastener strength performance. MORRIS has had developed a unique system especially for dealing with small screw threads.

Making the minor diameter (also called core or root) of the screw thread as big as possible is most important to gain maximum torque strength. This was recognized in the developement of the UNM stamdard which significantly increased the root flat (automatically increasing the minor diameter). This was also considered by MORRIS when establishing dimensions for the miniature number sizes.

While the maximum core values could be further increased without interfering with the largest recommended tap drill diameters, production using dies or chasers will limit the maximum root flat to that which will allow the threading tool to cut cleanly and not "plow". Single point threading in multiple passes allows larger root diameters but at substantial extra cost. Thread rolls can provide bigger roots, but the blank diameter before threading must be closely controlled at extra cost to pass gaging. MORRIS screws are produced to offer maximum strength at a cost acceptable for the majority of uses.

Thread fit does play some part in determining torque value. This is why Unified Screw Thread tolerance formulas are not practical for miniatures as the allowed minimum external and maximum internal dimensions might not allow sufficient flank engagement to keep from stripping the weaker crest of the screw. This is also the reason for gaging both components to assure maximum thread engagement. Finer pitches also improve core strength, but smaller flank engagement and manufacturing difficulties on larger diameters limit their practicality. Coarser pitches reduce the core diameter and also present manufacturing problems at some point of the core reduction.

Torque failure values for these small thread sizes run in INCH OUNCES or NEWTON CENTIMETERS (conversion: 1.416 x Ncm = in-oz / .7062 x in-oz = Ncm). There are two values to consider for miniatures depending on the application. First is TORSIONAL which is when the screw thread will be engaged far from the head. This creates a greater twisting motion and reduces torque strength. Next is FULL ASSEMBLY in which the part is screwed into a tapped hole with the head bearing on the tapped part. This allows for greater strength as the full engagement of the thread as well as other elements contribute.

We can offer general values for popular screw sizes, lengths and materials, but tests can be performed on a specific application for a charge. Due to the fact that very small differences in factors can cause large changes in values, it is not practical to provide a chart of recommended limits for specific sizes. Also, trying to determine values using traditional means of calculating torque do not produce meaningful results. The values we offer are the actual ultimate failure values and assembly tightening settings should be 40% lower than the average failure values for a specific project.

As a guide in assessing needed torque failure values, miniatures range from 3 to 35 inch ounces for sizes up to 0-80 (.060"/1.5mm) and a maximum of 192 inch ounces (12 in-lbs) for 0-80 thru 2-56 (.086"/2.18mm)- the largest size we make. Results are based on size with a specific minor diameter, material and thread length as well as point of

394 Elm Street • Southbridge, Massachusetts 01550
TEL: 508-764-4394 | FAX: 508-764-7350

engagement. Full assembly runs aroung 15% to 40% more than tortional. In most cases a 65% (even 50% in high strength materials) tapped thread with 2-3 or more pitches engaged will not strip before the external part fails.

Copyright J.I. Morris Company 2009