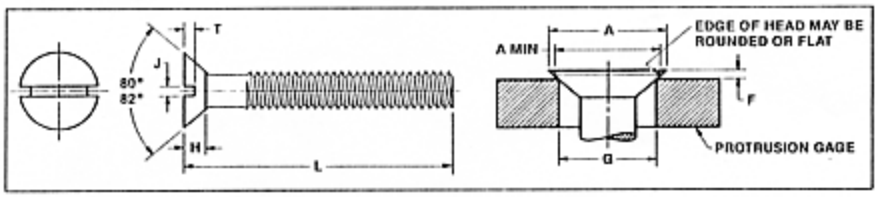
(Prepared exclusively for Fastener Technology International)

by:
Joe Greenslade, President
Greenslade & Co Inc
5279 Zenith Parkway
Rockford, IL 61111



Measuring Flat Head Screws Correctly

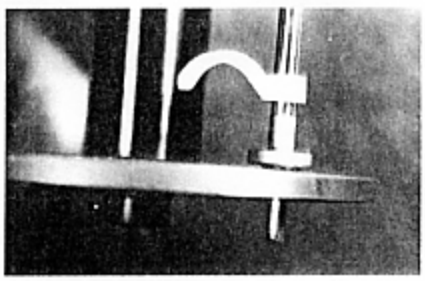
The measurement of flat head screws continues to cause confusion among fastener producers, resellers, and users. The reason for this confusion is that flat heads cannot be measured directly with calipers, micrometers, and optical comparators as can the features of most other head styles. The critical measurement of the flat heads of screws is what is referred to as the "flat head protrusion".

Flat head screws are specified by users so that the heads will be at or slightly below the end product's surface after screws are installed. This is usually to eliminate component interference, such as in window tracks and hinges. Flat heads are also the predominant head design of fasteners used on aircraft exterior to minimize air friction and wind drag which affect the vehicles's performance and fuel economy. It is important when inspecting flat head fasteners that it be accurately determined if the heads will lay at or below the product's surface when the fasteners are installed.

Many people still try to measure flat head screws from the top of their head to the juncture of the head to shank area to determine the acceptability of the head. This is not an acceptable procedure. Anyone looking at any dimensional standard will see that this dimension is listed as "reference" meaning that this is not a controlled feature. Part of the reason this dimension is not controlled as such is that the flat heads cannot be economically cold headed with the edge of the heads at absolute sharp. When this is attempted the tool life is very low. The punch must be kept away from the die face to allow some material to form above the head angle providing a kind of cushion between the punch and die to improve die life. This part of the head above the angle is very difficult to measure accurately. It is also very difficult to make an accurate measurement to the exact theoretical point where the head intersects with the screw body. This is usually in a generous radius making that precise location a guess at best.

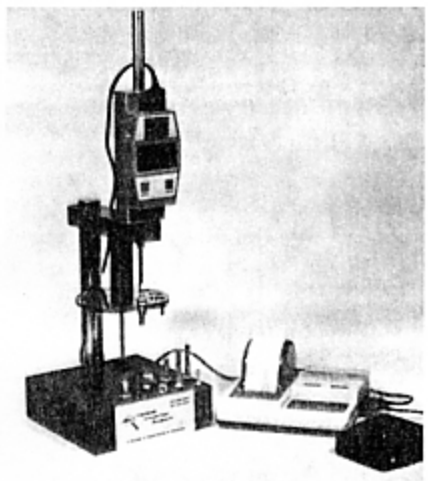
The correct head acceptability feature to be measured is the "protrusion". The head protrusion is the amount that a given head protrudes (projects) above a gaging surface when the head is placed in a precise gage diameter. Most flat head screw specifications designate the "gage diameter" and the protrusion height.

These protrusion values are derived from a formula that is shown in ANSI/ASME B18.6.4. The protrusion height limits are derived by plugging in the values of the screw's theoretical maximum and minimum sharp head diameter dimensions along with the maximum and minimum head angle and selected gage diameter.



Protrusion height measurements were difficult to make in the past because every manufacturer and user had to produce their own gage. In recent years gages have become available specifically for measuring standard 82-degree, 100-degree, and 90-degree heads in accordance with the ANSI and ISO standards. One simply rotates a gaging dial with the correct gage diameter under an indicator, places the screw head in the hole, sets the indicator foot on the head and reads the protrusion measurement. The use of these protrusion gages has helped to improve the correlation of measurement results between suppliers and users.

Unlike the other screw specifications, ANSI/ASME B18.3 which covers socket flat heads requires a countersunk gaging hole instead of a cylindrical hole, which makes the gage much more difficult to produce. By using the formula described above, the protrusion limits can be derived for using the same cylindrical gaging diameters specified for standard 82-degree flat heads. This approach makes the inspection of socket flat heads simpler and correlation between suppliers and users much better. The adoption of this measurement approach has been suggested to the ANSI/ASME B18.3 committee who are working on the revisions of this document now.



All military fastener flat heads are measured in cylindrical gage diameters. One minor difference is that the indicator foot (stylus)is to be of a forked design so that the foot will straddle the recess unlike the commercial approach with a flat foot that rests across the entire screw head. The military specifications sometimes refer to this head feature as "flushness" instead of "protrusion".

The correct measurement of flat heads is an area where there is still confusion between suppliers and users. The resolution of this confusion is simple. Suppliers and users must simply read the applicable specifications and use the appropriate gages. Flat head protrusion is a critical fastener characteristic which must conform to requirements if the fastener is to perform its intended function properly.