

# Measuring Hex Wrenching Height

by:

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## ...Made Easier With New Gage

One of the most critical characteristics affecting driving performance on a hex washer head screw or a hex flange bolt or nut is the hex wrenching height. The wrenching height is the distance from where the hex portion of the head first exceeds the minimum across the corners specification of the hex to the top side of the washer or flange. This characteristic indicates whether or not the hex is filled out sufficiently so the hex driver socket will engage the head in a manner to drive the fastener instead of rounding off the corners of the hex. If the wrenching height is not within specification, it is likely the torque applied through the driver will damage the fastener's hex instead of tightening it.

In spite of the fact that it is such a critical characteristic, hex wrenching height is not routinely gaged by fastener suppliers or end users. This is because the method of gaging shown in ASME, ISO, DIN, JIS, and other standards is too cumbersome. All of these specifications call for the use of one, two, or three precisely made gaging rings that are stacked on the head to determine wrenching height acceptability, as shown in Figure 1.

Most of these methods are attribute (Go/No Go) methods that are not applicable for use in statistical process control (SPC) programs. Micrometers for obtaining wrenching height measurements (like the one illustrated in Figure 2) have never been commercially available. Previously, anyone wishing to follow these standards had to have a gage specifically made for this purpose. When all suppliers and users have gages made for themselves to different designs, there is little chance for broad agreement on the measurements being made on a given characteristic.

Using the hex wrenching measurement approach shown in the standards, the measurement is one that is the result of calculating the difference between two separate measurements. An inspector must subtract the thickness measurement of the washer or flange from the measurement of where the gaging ring stops on the hex to the bearing surface of the fastener.

### New Wrenching Height Gaging Technology

A recently developed gage called WrenCHgt® (patent pending) makes the measurement of hex wrenching height fast, easy, accurate, and repeatable. This gage provides a direct-reading, digital readout of the wrenching height characteristic on hex washer and hex flange products.

The WrenCHgt gage consists of a gage body having a gaging hole diameter in one end for gaging a given hex size. Protruding from around the gaging hole are three gaging pins (see Figure 3). These pins are positioned so that they clear the maximum allowable radius at the junction of the hex to the washer or flange, but are close enough together to prevent the hex from rotating between them during the measurement process.

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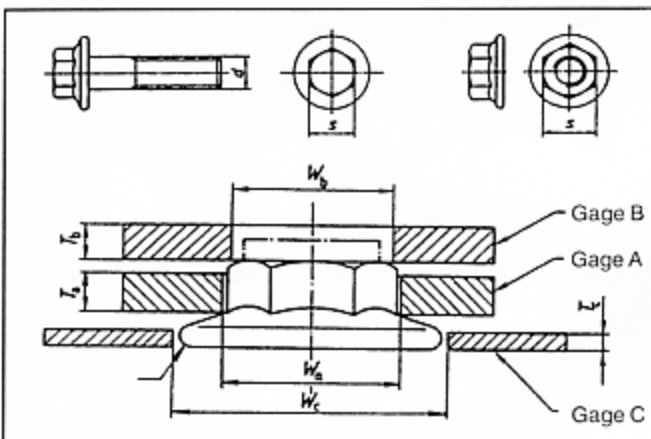


Fig. 1 — Specifications for gaging this hex flange head fastener involve three stacked gaging rings.

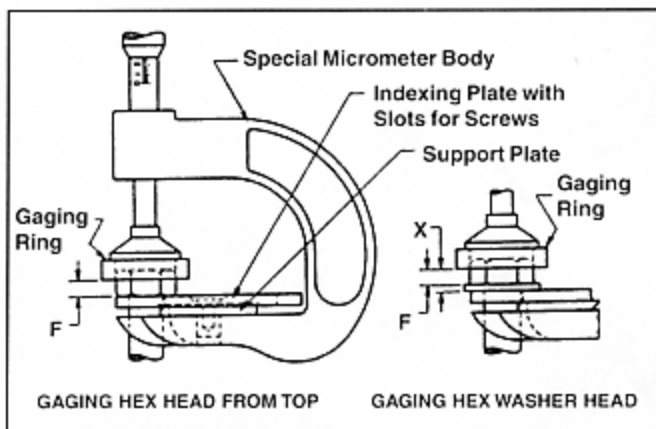


Fig. 2 — Example of micrometer gage made specifically for measurement of wrenching height.

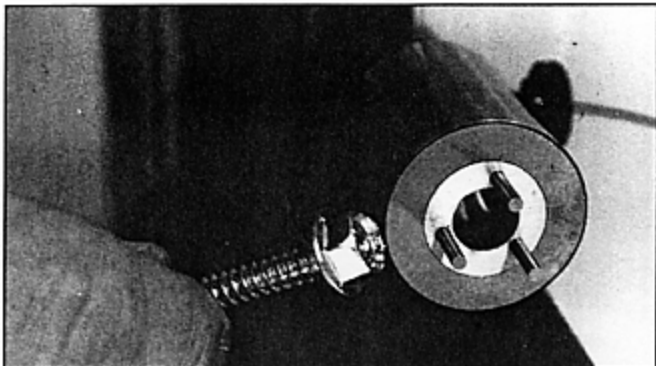
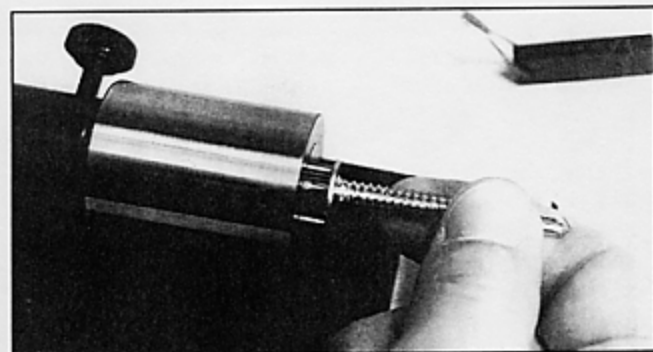


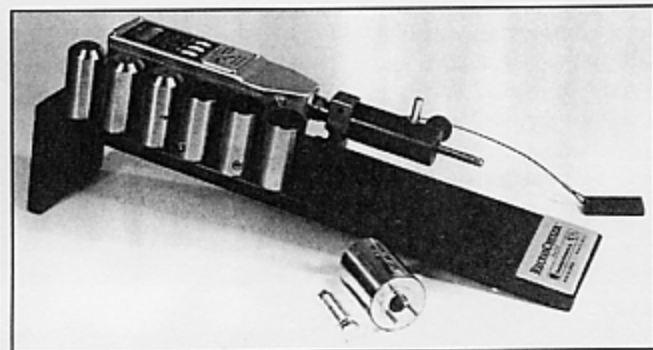
Fig. 3 — The WrenCHgt gage incorporates a gaging hole with three gaging pins protruding.

To measure a hex's wrenching height, first the fastener's hex is positioned between the pins, with the pin ends resting on the top surface of the washer or flange. The top of the fastener is then pushed into the gaging hole until it stops at the point where the gaging diameter intersects the hex's corners (see **Figure 4**). In this position, the pins are protruding beyond the gage's face and are resting on the top surface of the washer or flange. The hex wrenching height is directly indicated on the gage's readout.

The other end of the gaging body can be connected permanently to its own digital indicator, or it can be used with the quick-change RecessCheker® system allowing several hex sizes to be gaged using a single indicator (see **Figure 5**). The gage is easily calibrated by pressing the ends of the pins flush with the gage body face and then setting the indicator to zero.



**Fig. 4** — The top of fastener is pushed into the gaging hole until it stops at the point where the gaging diameter intersects the hex's corners.



**Fig. 5** — Gage bodies can be connected permanently to its own digital indicator, or it can be used with the quick-change RecessCheker® system..

A fastener's correct wrenching height is critical for ensuring proper fastener performance. Since it is a free-flow characteristic, it is an ideal choice for SPC monitoring. The previous cumbersome methods have not lent themselves to use in SPC or final inspection. However, the ease of use and accuracy of this new gaging approach makes the control and inspection of the hex wrenching height much more practical and efficient.

For additional information regarding how this new method of measuring hex wrenching height affects screw or bolt driving performance, contact the author at Greenslade & Co., Inc., or Circle 449.



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