



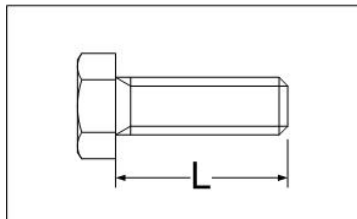
MEASURING FASTENER LENGTHS

by Larry Borowski

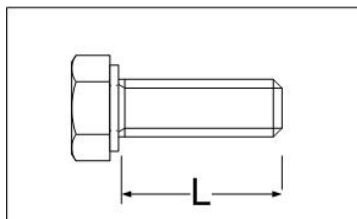
Q **uestion:** How do I measure fastener lengths?

A **nswer:** That really depends on the fastener. A good rule of thumb is that if you have a flat under head bearing surface, then length is measured from under the head to the end of the thread. If you don't have a flat bearing surface under the head, then length is measured from the top of the head to the end of the thread.

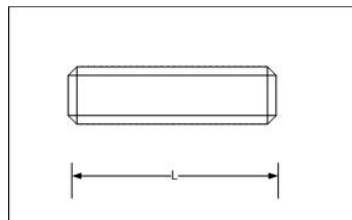
ASME B18.2.1 for square and hex bolts states: The bolt or screw length shall be the distance measured parallel to the axis of product from the bearing surface of the head to the extreme end of the bolt or screw, including point if the product is pointed.



On a washer faced hex bolt, bolt length does not include the thickness of the washer face.

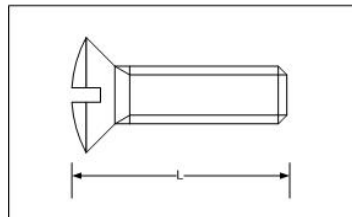
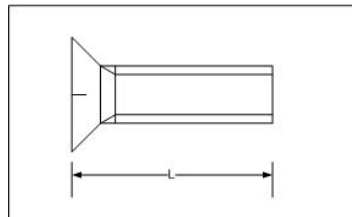


Stud length is defined as the distance measured parallel to the axis from the first thread to the last thread.

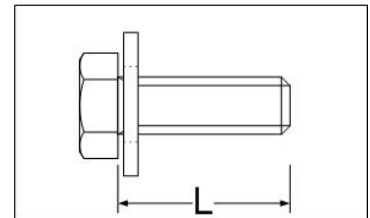


ASME B18.6.4 for flat and oval countersunk head screws states: The nominal length of screw L shall be measured parallel to the axis of the screw from the extreme point to the theoretical intersection of the top surface of the head with the head diameter for screws having countersunk type heads.

In the case of the oval or round head screw, the dome part of the head is included in the overall length of the fastener L_o .



Sems screws are assemblies with independent components primarily being screw and washer(s). These are to be treated as independent parts when it comes to inspection. ASME B18.13 on Sems screws (captive washers) states; for each style the screw component shall conform to its particular specifications. In other words length is measured without influence of the captive washer.



While on the subject of fastener length measurements, grip length is another common criterion for inspection. Grip length is defined in several of the ASME B18 standards as: The distance measured parallel to the axis of a bolt or screw from the under head bearing surface to the face of a non-counterbored, non-countersunk, standard Go thread ring gage assembled by hand as far as the thread will permit.



Now that we know how fastener lengths are defined, what is the best way to actually take the measurements? Fastener length tolerances are fairly liberal from a dozen or so thousandths of an inch up to a couple hundred thousandths of



an inch depending on the size and type. One way these measurements can be done is optically on an optical comparator or tool makers microscope, but this can be time consuming when there are large quantities and different sizes to check. Caliper length measurements are probably the most commonly used method, because it is relatively quick, however it is often difficult to get good repeatability. There are also several specialty type length gages that will help increase speed and repeatability.

When looking at prints or standards, take note on which length dimensions are reference dimensions and which length dimensions are considered inspection criteria with associated tolerances. Reference dimensions are either calculated or approximate numbers, and are not required to be inspected, nor are they to be used for pass/fail results.

The important part is that you understand the type of screw you have, know how the length is defined, and have a gage or equipment that can make that measurement. How you actually obtain that measurement depends on what equipment is accessible, its ability to do the job, and whether you need something better based on your company's quality program. For instance, if all you have is a tape measure, you might find it difficult to get a good length measurement on a small socket head cap screw; however it may work great for a 2" diameter, 24" long hex bolt. If you are measuring a bunch of small parts or ones with a tighter length tolerance, you may opt for a fastener length gage to get the job done quickly and accurately. Do your homework and choose the best tool for the job at hand.

