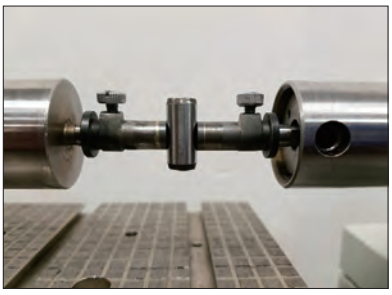
Measuring Dowel Pins

by Larry Borowski

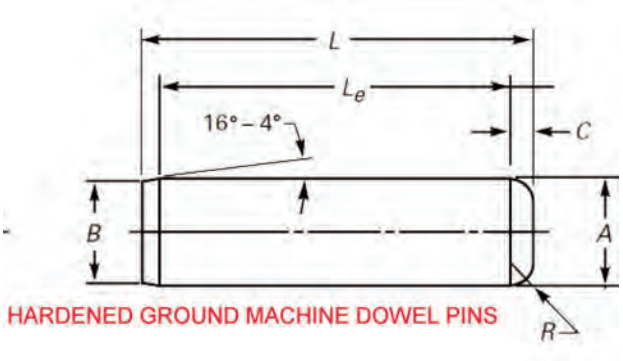
Recently, I've fielded several calls asking for help on the proper measurement of dowel pins. Most of these requests come in due to discrepancies between pin manufacturers, distributors, and end users.

At first glance most people assume that a dowel pin should be very easy to inspect because its basic dimensions are a simple diameter and a simple length that can be taken using basic hand tools like a caliper or micrometer. This assumption is incorrect because of the fact that the standard tolerance on a dowel pin is only .0002 inches (.005mm). This tolerance is more like a gage tolerance than a product tolerance and therefore the measurements should be treated as such. Good measuring practice tells us that the measuring instrument resolution or accuracy should be 10 times better than the item being measured. This 10:1 rule is suggested so that you have enough measurement increments to clearly determine whether the measurement is inside or outside of the required specifications. Resolution and accuracy are two different terms, and that is a subject for a later time. For now we will assume they are close enough in meaning to better explain our topic of measuring dowel pins. Generally speaking, higher resolution means higher accuracy. So to be 10 times better, it means our optimal measuring instrument must have a resolution of .000020" (20 millionths of an inch) or better. Most micrometers, calipers, indicators, and hand tools do not have this kind of high resolution or accuracy. They are therefore not acceptable to measure dowel pins accurately.



The most practical instrument set up to measure dowel pins accurately is what most people call a bench comparator or super-mic. Essentially a highly accurate, rigid, linear measuring machine with a digital readout and the ability to regulate measurement pressure similar to the unit pictured below.

The ULM (Universal Linear Measurement machine) shown above has a resolution of .000010" and can be connected to a computer to electronically capture measurements as they are being taken. One of the key features of such equipment is not only the resolution, but the ability to provide a consistent measuring pressure which is very important when dealing with extremely small tolerance ranges.



Such equipment can be quite costly which is why most people just assume a good micrometer will do the trick.

Measurement of the dowel pin itself should be done across (2) flat anvils as shown below.

It is also a good practice to measure in the orientation shown, then rotate the pin 90 degrees and measure again to check for any out of round condition that might be present. Dimensional conformity does not allow for an out of round condition.

An additional precaution that should be taken when measuring dowel pins is the environmental conditions. If a supplier and a purchaser of dowel pins measure the same pins with the same instruments, but have differing environmental conditions of 10 degrees F or more, they will obtain differing results. All critical or high tolerance measurement should be taken in a temperature controlled environment. The universally acceptable measurement temperature is 68 degrees F, +/- 2 degrees F, and it is highly recommended that suppliers and purchasers of dowel pins work within this calibration type environment. It is also recommended that the dowel pins be allowed to normalize to the room temperature for 2 to 24 hours so that they can stabilize before taking measurements.

It does seem like a lot of expense and trouble to measure a simple dowel pin; however the facts remain that products having a total tolerance of only .0002 inches require this kind of care to obtain accurate measurements that can be correlated between two or more parties. Many suppliers of dowel pins have not taken this kind of care to measure these products in the past. As long as instruments of insufficient resolution without pressure control are used in uncontrolled environments, dowel pin controversies will continue to arise for suppliers.