



**Production Part Staging for Surface Finish  
George Schuetz, Mahr Federal Inc.**

In designing gages to make dimensional measurements in a production environment, speed and high precision are the names of the game. Thus the popularity of instruments like snap gages for ODs and air plugs for IDs. They are designed to measure a single size, there is virtually no operator involvement, and they provide precise results in some of the toughest conditions.

The same demands are true for surface finish gaging. Now that more and more monitoring of surface finish on the shop floor is being required, similar gage designs are needed to ensure fast surface finish measurements with little operator involvement and precision results.

Some of the most common features requiring surface finish measurement are machined bores, outside diameters of shafts, and flat machined surfaces used for sealing/mating surfaces. Measuring these types of surfaces can be completed rather easily if the surface is fully accessible, unobstructed, and large enough to accommodate a surface finish instrument.

But, not all machined surfaces are in plain view for an operator to perform these measurements. They are often visually obstructed, small in diameter, have an interrupted surface, or the feature to be measured is deeply machined within the part.

Deep bore measurements are particularly difficult. Sometimes measurements can be made by bringing the part over to a surface finish gage, staging the part on the gage, then finding a probing system small enough and long enough to get into the hole to make the measurement. This typically does not meet the requirements of being out on the floor at the manufacturing point, being fast, or easy to use. The results may be good, but it is not a production environment check.

To design gages to do this type of surface finish measurement requires the same type of thinking that went into the snap gage and air plug. This is counter to the usual way of thinking about surface finish gaging—going from versatility in gage design to dedicated gaging—but just like the air plug, the results can be dramatic.

Just as an air plug is made close to the measuring size, a portable surface finish plug can also be made to nearly the size of the hole to be measured. And instead of an air orifice being the measuring source, a surface finish probe can be built into the plug for performing the surface finish check at a specific location.

However, there is a bit more involved in order to get the best performance and eliminate operator involvement. The plug holding the surface finish probe can be made to expand using an air cylinder. This basically locks the plug into position to make it a hands-free operation. Also, the probe can be protected from hitting the part (and potentially breaking) while being inserted. As part of the process of expanding the plug into the bore, the probe can be brought into position only when the plug is in the measuring position.



By taking the concepts of high precision shop floor gaging and applying them to surface finish measurement these measurements can be brought to the point of manufacture, right where they belong.



Designing gages to measure surface finish on difficult to access surfaces in a production environment requires the same type of thinking that went into the design of snap gages and air plugs. This is counter to the usual way of thinking about surface finish gaging—going from versatility in gage design to dedicated gaging—but the results can be dramatic.