



PHOTOGRAPHS BY KURT HERTZOG

# Measuring turnings

Kurt Hertzog looks at the variety of measurements needs, the aids available, the processes used to measure and the implications of workholding devices

For the most part, woodturning isn't a precision process. Not that fits and finishes aren't important. I mean only that in the grand scheme of things, measuring is usually done with callipers and not micrometers. Of course there are a few woodturners that really need accurate measurements requiring precision but they are in a small minority. For the rest of us, we are usually only worried about two parts fitting together and in any measurement the absolute number isn't needed. It isn't a requirement that we have our gauges calibrated periodically. Our only real need is that two pieces go together with whatever type of fit we determine is appropriate. Or perhaps that part number 20 is the same, or actually pretty similar, to parts 1 through 19 when making multiples of some turning. There are other reasons to take a measurement when you are woodturning. Most often these are in-process measurements. Does the workholding tenon you've cut fit into the jaws on the chuck you plan on using or must you remove more

wood? Will the taper you've cut be close enough to the Morse taper standards to be able to seat properly in the headstock or tailstock as needed? In the next article in this series, we'll explore some of the various measurement needs through the turning process, the tools that lend themselves to those measurements, and some opportunities to simplify the entire measuring aspects in woodturning.

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## DIFFERENT MEASUREMENT NEEDS

Let's avoid going into definitions and a treatise on measuring systems and standards. Suffice to say that most turners measuring needs fall into three categories. It can be to measure to get a numerical result, it is sort of equal to result, or how does the fit 'feel'. A measure for a numerical result, in whatever units you are working in, or is it bigger or smaller than compared to some fit into or through gauge system is objective, repeatable, and universal. The third type or feel is a very subjective measurement. This can be the fit of the lid of a lidded box or the 'feel' of the removal of that lid. It falls into the 'I like or don't like the feel' categories. This is extremely difficult to document or convey.

One reason for measuring is to ensure proper fits in the end product. That can be balusters into a stairwell railing assembly, chair legs into a seat, tenon fit into a set of chuck jaws, or the fit of a lidded box lid. Each of those issues comes with their own needs. Balusters need to be visually identical as they

stand side by side with relatively close spacing. Their diameters, lengths, relative positions and characteristics of the detail features, and the mounting points need to meet the physical and visual standards. Chair and table legs, while needing to be alike are much more forgiving in their need to be identical. Seeing only a couple of legs at a time and with some distance and different perspective between them, it is not necessary to make them identical. However, the tenon to fit into the seat drilling and the diameter of each of the spreader tenons is important. You have a huge advantage to having the entire end product in your shop. If the chair leg tenon or the fit of a baluster is far too snug, you can reduce the tenon diameter or increase the hole as needed, but it not possible if you are producing parts for a furniture shop or a custom homebuilder.

If the workmen are installing the balusters you've turned and find that every third one doesn't fit or look enough like its neighbours, it is a catastrophe. For production style parts, a template and a drawing with tolerances are usually in order. This protects both parties. You make things to print and you get paid. You don't make things to print and you redo the job until it is right. As such, you'll want variable measuring devices in the proper style and accuracy required to give you the measurement specified. That variable gauge, that is one that reads out numbers in the units you are working in, can be your final quality check. A transfer measuring system, that is holes in a measurement block, can also be your gauge. Fit through hole 'A' and not fit through hole 'B' is a perfectly acceptable gauge and can lend itself in some situations.

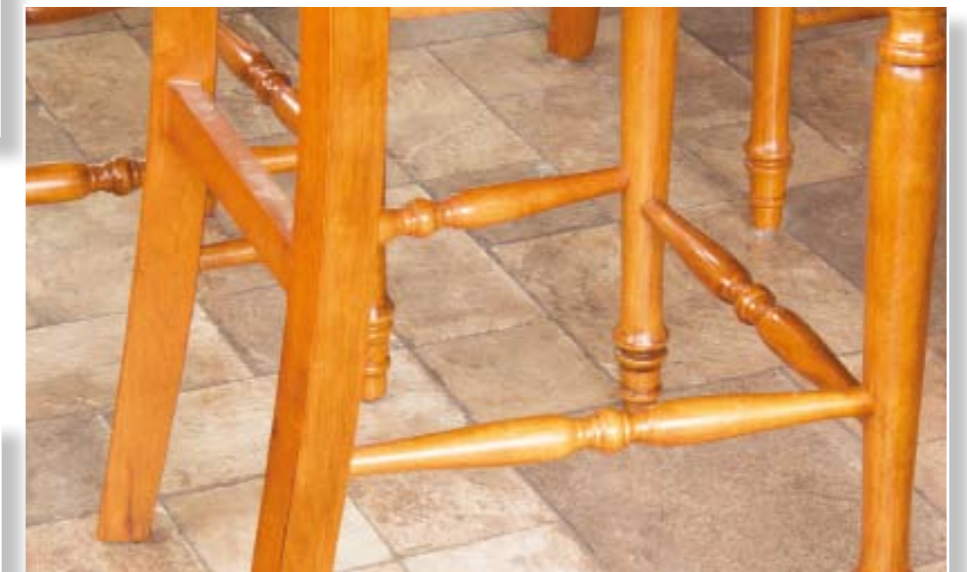


There are many types of measuring tools that can be used by the woodturner. While gauges yielding measurements are sometimes needed, more often the appropriate gauges are transfer gauges



An example of fits where the diameter needs to be close so it can be seated with sufficient glue space but the tolerance isn't that critical. Fit allowing for glue but the spreader will lock it into place

'Identical' items that are close together are difficult for most hobby turners. Even with templates, care must be taken since the eye isn't fooled easily. Can you spot the flaw in this chair back?



Not an excuse for poor workmanship but rather an explanation as to the level of care required. Table legs, chair legs, and other identical turnings need to be alike but distance apart makes for some easing of tolerances



◀ **IN-PROCESS MEASURING AIDS**

There are many 'in-process' measurements and techniques to make them that will not only improve your final results but often speed up your workflow. If you are prepping stock for a bowl, which lathe are you going to use? What size would you like the bowl blank? If you only want to make certain it will fit, you can simply lay a tape measure on your blank. If you are cutting something to a size to either create a finished piece in that ball park or you are cutting your blank to be certain it will fit on the lathe you intend to use, a great method is cardboard templates. You can lay it on a blank and trace around the outside to cut on the bandsaw. Better yet, use a small tack to locate it where you want and then cut on the bandsaw with the cardboard template in place. Works great for split logs

since it can sit on top of the half round with the flat safely on the bandsaw table. If you cut into the cardboard, nothing is lost or damaged. You also have the extra benefit of having the true centre marked.

Putting a tenon on work that fits your chuck can be done in many ways from cutting and measuring with callipers with either measurement units or preset to an opening. An easier and quicker way is to make a 'go/no go' gauge. To make one of these, simply take a piece of cardboard, wood, light gauge metal, or whatever you have at hand to make two cutouts. You will need to make one cut for the smallest that your jaws can clamp and one cut for the largest you can grip. Now you can simply turn your tenon using the gauge as a quick check to be certain of your

ability to fit that particular set of chuck jaws. Between the two limits is allowed. Outside of the two limits is a no go. You can make many of the items you need for turning quite simply. Many are created on a Morse taper block you'll turn yourself. A Morse taper is just two diameters spaced a certain distance apart with a smooth taper between them. The numbers are available in the reference books but you can easily get them from any of your current equipment with a Morse taper. If you do enough of these, it is helpful to have two inexpensive wrenches of the proper size so you can mark the spacing and then quickly turn to the diameters needed using the wrenches as your guide. Some even sharpen one edge of the wrench and use it as the cutting tool to quickly achieve the necessary diameter.



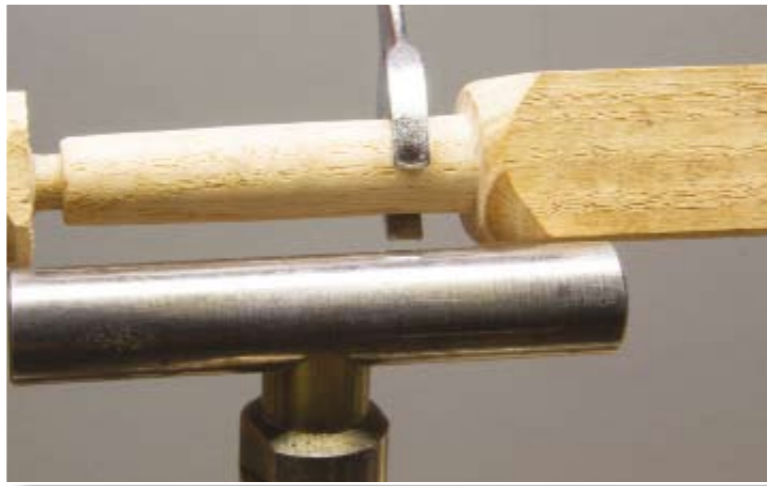
Whether flats or split logs, a cardboard template of the desired diameter will allow for the flat side on the bandsaw bed and a safe way to cut the bowl blank. Low cost, easy to use and replaceable



You can set your callipers as needed or perhaps set aside two callipers that are always set to the min and max for a chuck tenon. Much easier and less expensive is a cardboard or wood template



Looking up industry standards isn't usually required. You most likely have an example of the needed dimensions already in your shop. Transfer the necessary dimensions from one of those to your turning



A set of wrenches makes great diameter gauges for either in-process or final measurement. Depending on the accuracy needed, these can be used as the final result or just as a quick method of getting close

**PROCESSING AND FINAL MEASUREMENTS**

In-process measuring often blurs into final measuring for the most part. When turning pens, there are bushings available to not only hold the parts but to allow you to size your parts. When you match the bushing, theoretically you are at the proper dimension. While I don't believe this yields the best results, let's just use it as an example of process and final measurement.

You can use a story stick to layout your work, set your callipers for in-process and final gauging, and also use it as a visual gauge too. Far too few turners take advantage of a story stick. A simple cutout with all of the critical features positioned and sized as needed. Furniture makers make extensive use of story sticks. One simple stick will contain all of the information to replicate that piece of furniture in the future. Give it a nail hole and hang on the wall with its name marked on it and that particular piece can be created for generations. Much like a story stick, a template can perform very similarly. It can provide layout and planning aides, help with the in-process measurements, and be the final measurement check along with visual comparison. Simple to make and easy to store, templates are a valuable measuring tool to add to your repertoire.

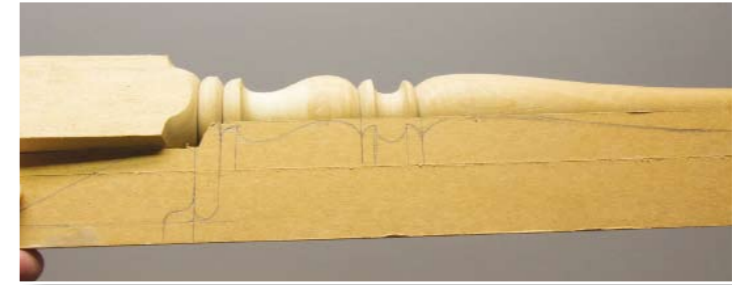
**“Another need most bowl turners have is to check the wall thickness”**

Bowl turners have a couple of needs. First is preventing the inside meeting the outside. In the effort to have thin walls, there is often that occurrence where the bottom is a funnel. Setting a depth gauge helps to indicate where the bottom is with respect to the material still available. It can be used to do the initial hollowing and also when the bottom is thinned to its final result.

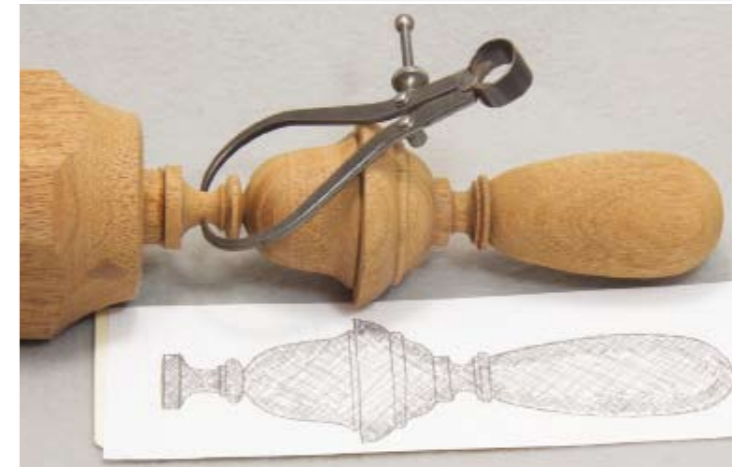
Another need most bowl turners have is to check the wall thickness. The goal usually being to be relatively uniform wall thickness unless intentionally varying for need. There are many tools available to help assess this wall thickness and any variances. These range from a low cost of a piece of welding rod bend into a circle with a gap to a higher cost of custom purpose gauges. These tools are also very useful for those making hollow forms. If you are turning without the aid of a laser, you'll need to periodically check your wall thickness. Like the bowl turner, when the inside meets the outside it is all over but the crying. Periodic assessment of the wall thickness is a wise idea to help prevent this.



Pen turners often use bushings as their workholding mechanism and their gauging method. The wood is turned until it matches the bushing indicating that the proper diameter has been achieved



Not truly a story stick as a furniture maker might use but close enough to present the idea. It is a simple piece of wood that contains the necessary information to create the entire part



A full size pattern has the advantage of being a work layout aid, a measurement transfer mechanism, and a visual comparison check at the end. Much like a story stick, easily made, used, and stored



This homemade bowl gauge is useful both on the inside and the outside in helping keep them where they belong. It can show progress in hollowing as well as material remaining



Just a few of the various gauges available to do wall thickness on bowls and hollow forms. They range from a bend wire or rod to purpose made thickness gauges with relative or units based scales



## ◀ IT'S ALL RELATIVE – USUALLY!

For the most part, nearly all of the measuring needs are relative. Does the tenon fit into the hole properly? Does the spindle look sufficiently like its neighbour to pass scrutiny? Angles, lengths, diameters, wall thicknesses, and straightness are pretty undemanding. Gauges that help speed the process of getting the work on the lathe and getting it close to size are useful time savers. Gauges that assure that the final result will meet the 'customer's' approval or needs are also items that the turner must have and be proficient with. These can be as simple as a pair of callipers that were purchased at a garage sale along with a piece of coat hanger or welding rod. You can get much more exotic but knowing what is needed of your turning and using the simplest and fastest, yet sufficient measuring method to get there will save you time and money. The best thickness gauges I've run across are at the end of your arm. Your fingertips are sensitive to the thickness variations and surface abnormalities in the wall of a bowl. You can also use them on hollow forms too, for as far as you can reach inside. Of course, if you can't reach there, can anyone else? You may not be able to gauge the absolute thickness in units but you certainly can make a qualitative judgment in relative thickness, variability, and surface finish.

Probably the most subjective of them all is the fit of two pieces in items such as a lidded box. It is very qualitative versus quantitative. How does the lid fit? Is it a snap fit, a slip fit, a piston fit, or other? The fit will often change with the season. Regardless, achieving the different fits isn't usually a measurement thing. It is more often trial and error and a one sided adjustment. A taper cut on one side and burnishing the mating part allows for the transfer of dimensions with fine-tuning of the fit to follow. There are several techniques used by box makers to create the various lid fits. All that I am aware of aren't measured with gauges as much as they are test fitted and tuned to the desired result.

## CONCLUSIONS

The topic of measuring can continue with more material and tips and tricks but let me plant the seed about the 'guzinta'. If this part goes into that part as you wish it to, then you've succeeded with your guzinta. For the few of the turners needing parts that are 4.25mm +.00 -.05 in diameter, you are stuck with measurement techniques in variable gauging and the requisite calibration standards. For the rest of us, I think you've seen many of the simple measuring methods and pieces of equipment that will allow you to



For nearly all of us, our measurements are 'transfer' type measurements. Copy an angle, size, shape, length, diameter, curve, or other feature from one version to the one under construction



One of the most effective measurement tools available is at the end of your arm. For most of us, our fingertips are incredibly sensitive to dimensional change as well as variations in surface finish



Not lending itself to measurement other than in-process methods, the final result is very subjective. Either you are pleased with the fitting or you are not

make this piece guzinta that piece or the inside staying inside where it belongs with a pleasingly uniform wall thickness. Don't get so serious and lost in all of this that you forget that if you mess up, there is another piece of wood growing on a tree somewhere. ●

With these few tools, I can do most of my measurements, including precision fits of pen parts, quick in-process workmounting, checking flatness/parallelism and keeping the inside from meeting the outside

