

Measure Angles the Digital Way

Little electronic gauges go anywhere you need a reading

BY BEN BLACKMAR



If you haven't seen them before, digital angle gauges, also called inclinometers, measure the angle of tilt after being zeroed to a reference surface. They have a magnetized base that attaches easily to most machine tables, fences, and blades in the shop.

Wixey was the first to market one of these magic little cubes to woodworkers, in 2006, and other brands and models followed. Soon they were appearing in the pages of *Fine Woodworking* as woodwork-

ers found a host of uses for them, from setting the bevel on a sawblade to setting up a honing guide.

The appeal is powerful: having one easy-to-read digital gauge that will guarantee any angle, from square to level to everything in between. But I found myself wondering exactly how accurate these little angle gauges are. Are they better than my usual tools for setting angles: a good square, drafting triangles, or a bevel gauge?

I started by interviewing *FWW* authors who use these gauges. I also reached out to our online readers in a recent blog. I heard opinions on all sides, and discovered uses aplenty, but no one had done any real testing.

Accurate to a point (0.1 actually)

My next move was to order all the digital angle gauges I could find. There are a dozen or more, but not all are relevant to woodworkers. I stuck to those with mag-

netic bases, small enough to fit on the part of an angled tablesaw blade that sticks up above the throat plate.

As soon as the gauges arrived, I gathered with my fellow editors and started designing tests (see “Testing reveals two favorites,” p. 77). It didn’t take long to figure out which ones were the most accurate, and just how good those are. The most sensitive models are accurate to plus or minus $\frac{1}{10}$ of a degree. But what does that mean in real woodworking terms?

Ultimately we determined that these digital gauges are best for any place where a good square won’t work. They will get you extremely close to the perfect setting, but not quite as close as bending over and looking for that sliver of light along the edge of a square. For angles other than 90°, however, a digital angle gauge is a wonderful tool. It will get you at least as close as a drafting triangle will, for example, and closer than the protractor head you can buy for most combo squares.

In any case, test cuts are the only real way to guarantee success. But it is a real benefit to be able to get a machine setup extremely close to start with, so just a little bump one way or the other delivers a gap-free joint.

Tips and techniques

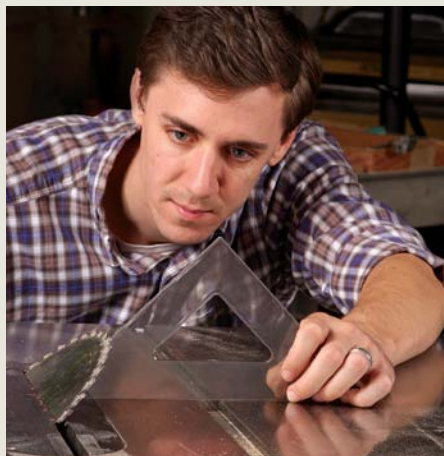
These are simple tools, but there are tricks to using them accurately. Some units have magnets on the side as well as the base, but those magnets were not square to each other in our tests. So one tip is always to reference the gauge off the same side, both when zeroing it and placing it on whatever is being tilted.

Stick it on sawblades—The bevel scale on most machines, like tablesaws and miter saws, is just a rough series of graduations that only gets you in the neighborhood of the angle you want. By zeroing a digital angle gauge on the table and then sticking it to the blade, you can dial in any angle to a very close degree of accuracy. Be sure to zero the gauge by placing it on the cast-iron top, not the throat plate, which probably isn’t perfectly flat. This is how *FWW* author Craig Thibodeau sets up his tablesaw for cutting the long miters on his veneered casework, and how he dials in his chopsaw blade when tilting it to miter moldings and frame parts. Of course, he still

Best for angles off 90°



Not quite as good as a good square. You can tilt a tablesaw blade enough to see a tiny sliver of light in both directions without changing the numbers on the screen, demonstrating the margin of error inherent in these gauges.



Better than some other tools. For angles other than 90°, a digital gauge will get you at least as close to 45° as a drafting triangle (left), and closer than the protractor attachment for a combo square (right).



Often need test cuts anyway. No matter what setup tool you use, only test cuts will tell the whole truth. The trick is to get as close as you can beforehand, and a digital angle gauge does a very good job at that, with no bending over or squinting required.

A host of helpful uses



Dial in bevel angles on any blade. Zero the gauge on the saw's table (above), avoiding the throat plate. Then stick it on the blade in a plumb position (right) and adjust the tilt to any number you need.



Fine-tune fences.

A jointer can mill smooth bevels on the edge of any workpiece. Keep the gauge aligned in its two positions, in other words square to the fence when zeroing it on the table, and square to the table when placing it on the fence (as shown).



A trick for miter gauges. Zero the gauge on the saw's table, and then place the miter gauge's fence facedown. With the gauge stuck to the miter bar, you can now read any fence angle.



Sometimes it's the table that tilts. In this case, when angling a bandsaw table to cut dovetail pins, you zero the gauge on the blade (top), not the table. Stay clear of the teeth for a true reading. Then move it to the table (above) and dial in the angle.

Guide your honing. A digital angle gauge is the perfect tool for setting up a honing guide, ensuring that you return to the same angle every time.



cuts test pieces to be sure his joints will be square with no gaps.

A few more tips will help with accuracy. When you place the gauge on the blade of any tool, make sure it is as plumb as possible. It won't read as accurately if it is tilted backward or forward. Contributing Editor Roland Johnson also suggests dialing in your angle, and then taking the gauge off the blade and turning on the saw for a second. This lets any backlash in the adjustment mechanism settle, which might change the reading. Now check it again.

Works great for fences and tables, too—The same principles apply for setting fences on various machines. To set up tables that can be angled, like the ones on a drill press, bandsaw, or sanding machine, you first zero the digital gauge on the blade, bit, or platen, and then put it on the table. Be sure to keep the gauge exactly vertical. When angling a table, check the machine again once everything is locked down, because tightening can slightly change things.

Readers and authors weighed in with many other uses. What you see on this page is just the beginning. And no matter what you use your digital angle gauge for, you'll enjoy being able to read any angle at a glance. Try one for yourself, and I think you'll like it. □

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Works on workpieces, too. Michael Fortune uses his angle gauge to cut square edges on curved panels. He zeroes the gauge on the sled, and then puts the curved panel in place. Then he places the gauge halfway across his cutting line and tilts the panel to bring the gauge level.

Testing reveals two favorites

There are all sorts of digital angle gauges on the market these days, for a variety of industries, so I focused on those most relevant to woodworkers. That meant they had to be small enough to fit on the side of a sawblade without hitting the arbor or teeth, and magnetized on at least one edge. I also ignored a few models that were identical to one in my test group but included features not useful to most woodworkers.

One simple test did the best job of determining accuracy. I placed each gauge on a 12-in. steel ruler, resting on a flat jointer bed, and zeroed it. Then I stacked slips of paper (each 0.004 in. thick) under one end of the ruler until the screen changed from zero. This quickly separated the group into two categories of sensitivity. The setup also created a triangle with three sides of known lengths. A little trigonometry then gave me the exact angle of tilt, in degrees. I repeated this test 10 times on each gauge, zeroing it again each time.

The results matched manufacturers' claims, so full marks to them for truth in marketing. Those that claimed 0.1° of accuracy in both directions delivered



Best of the bunch. We tested 10 digital angle gauges but these five were the easiest to use and delivered the highest degree of accuracy: +/- 0.1°.

just that. Same for those that promised +/- 0.2°.

The rest of the review came down to features. For example, some gauges offer an absolute-level button. However, my tests showed a traditional bubble (spirit) level to be at least as accurate or sensitive as the best gauges in our group. Other gauges offer magnets on two sides, but since their sides were a bit out of square, we didn't find that feature helpful.

However, the Wixey WR365 does have a couple of unique features that matter (see photos, right).

WIXEY WINS OUT

Among the most accurate gauges, the Wixey WR365 (\$40 at various websites) has two stand-out features: a tilting screen for easier reading, and a V-groove on the bottom. It is a toss-up among the rest of the group, with the Wixey WR300 edging out the rest simply on price.



Newest Wixey has standout features. The tilt-up screen helps to defeat glare and saves you from bending over. A V-groove on the bottom registers the gauge accurately on a drill bit, and is surrounded by narrow magnets that fit nicely on the side of a typical bandsaw blade.



Our best test. With the gauge on top of a steel ruler, we then zeroed the ruler on a jointer table and began slipping strips of paper under one end. The best gauges allowed on average just four layers of paper before the reading changed from zero to 0.1°.