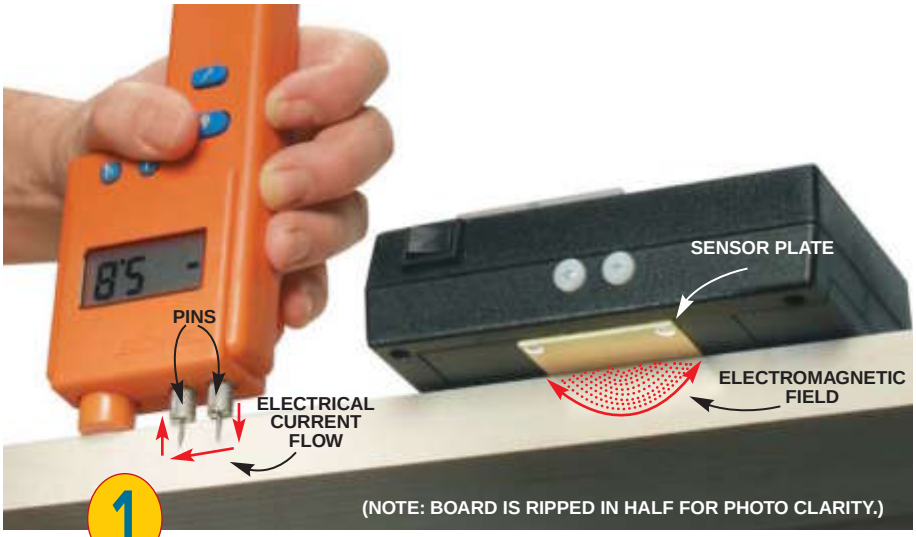
Moisture Meters

By Dave Munkittrick

ART DIRECTION: VERN JOHNSON • PHOTOGRAPHY: LEAD PHOTO: BILL ZUEHLKE, ALL OTHERS STAFF, UNLESS OTHERWISE INDICATED

Think of a moisture meter as cheap insurance. Spend $70 and you'll never have to wonder whether that lumber you bought is too wet or too dry. You can tell if the "kiln-dried" pine you bought from the home center was dried to 9-percent moisture content (about what you need for indoor projects) or 19-percent (what most construction-grade pine is kiln dried to). Knowing the moisture content (MC) of your wood helps you determine when the wood is stable enough to use.



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Pin and pinless meters measure moisture differently. Pin meters have a pair of nail-like probes that are inserted into the wood. An electric current is sent between the two pins. Because water is a good conductor of electricity and wood is a poor conductor, the meter can tell how much water is in the wood by how much current travels between the pins.

A pinless meter has a sensor plate that's held against the surface of the wood. The plate projects an electrical field into the wood. The meter can sense changes in the field caused by moisture and wood. The meter then converts the change to a moisture content reading.

A moisture meter is an ounce of prevention that's worth much more than a single cracked tabletop!

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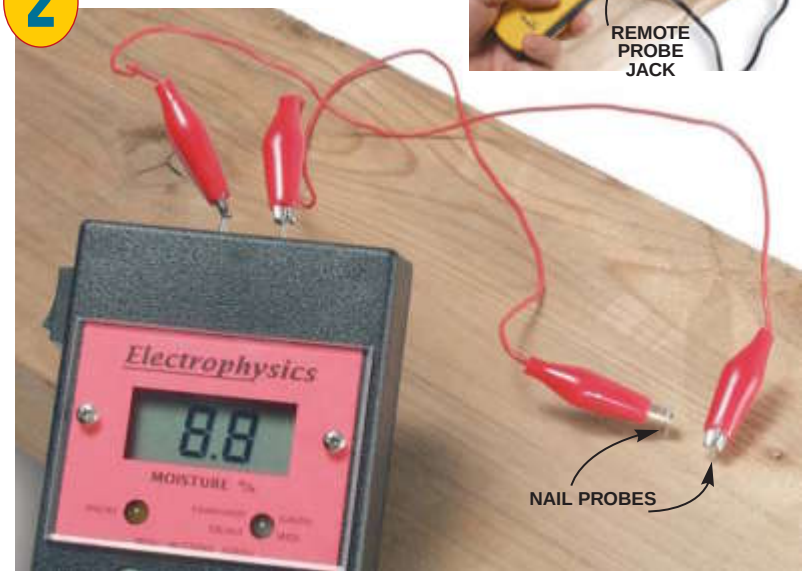

External probes extend the reach of your meter. External probes driven to the center of a board allow you to get a core reading in stock that's too thick for the pins built into the meter. The probes can also be left in a stack of green wood where readings can be taken to monitor the wood as it dries. Some meters have built-in jacks for aftermarket probes, but a pair of nails and alligator clips are an effective, low-cost alternative for all pin-type meters.

MOISTURE METERS

Pin vs. Pinless Meters

How They Work

There are two types of meters on the market, pin and pinless. Both types of meters measure the effect of moisture on an electric current (pin type) or an electromagnetic field (pinless) to determine the moisture content (MC) of the wood (Photo 1). The beauty of a pinless meter is that it can quickly scan an entire board without putting holes in the wood. You can even take it to the lumberyard to test the wood before you buy; try that with a pin meter! One concern about pinless meters is that the sensor pad must be in good contact with the wood for accurate readings. Very rough or warped stock may leave too many air pockets under the sensor pad. I've found a few swipes with a block plane creates a nice flat spot to take your readings.

Pin meters can take readings in wood no matter what the shape, size or degree of roughness. All that's required is that the two pins make contact with the wood. Pin meters also allow you to use remote probes (Photo 2). Nails or probes can be driven to the center of thick lumber for core readings that are out of reach for pinless meters. If you dry your own wood, the probes can be left in a sample board in the stack to monitor the wood as it dries. Plus, pin meters can take readings on the edge of a board stacked for drying (Photo 3).

Species and Temperature Correction

Temperature and wood density affect the readings given by moisture meters. All meters are calibrated to read the MC of Douglas fir at about 68 degrees F. (The Timber Check is the only exception; it is calibrated for red oak). That means if you're using a meter on something other than Douglas fir and the temperature is above or below 68 degrees F, you'll need to make adjustments to the meter reading. Manufacturers include charts that adjust for species and temperature variations. More expensive meters have built-in species correction and a couple have built-in temperature correction as well (see chart pages 88 and 89). Just set the meter to the desired species and the meter automatically corrects the readings. This is a huge benefit when you have a lot of wood to test.

Pin meters are more sensitive to temperature variations than pinless meters. That's

why pin meters always come with temperature correction charts. Some manufacturers include corrections for pinless meters should you need a very precise reading.

Pinless meters, on the other hand, are more sensitive to differences in density, or "specific gravity" of different species than pin meters. That's why pin meters with built-in species correction can get away with grouping species into a handful of settings while pinless meters generally require you to set the specific gravity of each species into the meter.

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Taking readings from the edges of boards in a stack is a task better suited to pin meters. Most pinless meters have sensing plates that are too big to read the edge of a 4/4 board.

Should I Buy a Pin or Pinless Meter?

That's the first question everyone asks when looking to buy a moisture meter. The question is best answered by identifying what you want a meter for and comparing that need to the advantages unique to each type of meter.

If you tend to buy surfaced stock and can't bear the thought of poking holes in expensive lumber, then a pinless meter is probably your best bet.

If you buy rough stock, dry your own wood, use wood thicker than 2 in. or have a weakness for piles of rough lumber discovered in some old barn, a pin meter is for you.

Important Features

Pin Length

A rule of thumb states that the average MC of a board can be found at a depth equal to 1/5 to 1/4 the thickness of the board. For example, 5/16-in. pins are long enough to get an average MC reading on a 1-1/2-in.-thick board and 1/2-in. pins will work for 2-in. stock. Remember, however, that this rule works only when the board has an even moisture gradient where the surface is drier than the core.

It's tempting to think that a pin meter measures the MC of the wood at the ends of the pins. In reality, the uninsulated pins measure the wettest layer of wood they come in contact with. Wood that's been stored in a shed or shop can have a higher MC on the surface than the core. In this case, the reading only reflects the MC of the wetter outer surface, regardless of how deep the pins penetrate. To get an accurate core reading with uninsulated pins you can crosscut the board and take a reading of the core on the freshly exposed end grain.

Insulated pins only measure the MC of the wood at the tips of the pins. They come with the external probe accessory that's available with some meters (see the chart, pages 88 and 89.

Minimum Sample Size

Pinless meters have a minimum sample size that's dictated by the size of the sensor plate. The entire plate must be touching the wood you're testing. So, a meter with a 2 in. x 2 in. sensor pad can't be used on a board that's only 1-1/2-in. wide. This precludes using most pinless meters to scan the edges of 4/4 boards stacked in a pile.

Moisture Content Range

A range of 7 to 20 percent is all you need to check air-dried or kiln-dried wood. You can pay extra for a meter with a range that exceeds 30 percent, but keep in mind that accurate readings higher than 30 percent are impossible because there is just too much water in the wood. People who dry their own wood use the higher readings to get a

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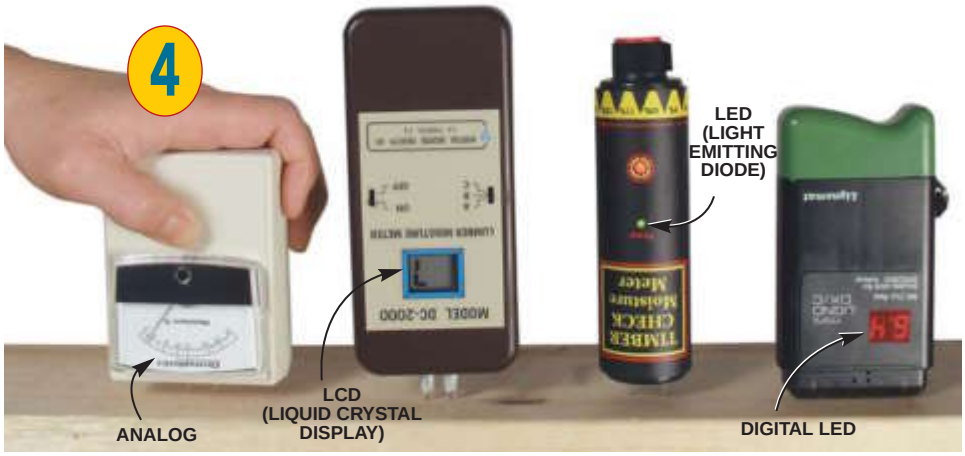

Four types of displays are available on moisture meters. We liked the digital LED and LCD displays the best. Analog displays are the hardest to read. LCD models show the moisture content value on a little screen. This type of display is easy to read in full sun but hard to read in dim light. LED models turn on when the right moisture setting is dialed in on the meter. With a digital LED, the numbers themselves light up. A digital LED is easy to read in the dim light of a storage shed, but difficult to see in full sun.

relative sense of how wet the wood is to start and how fast it's drying. Turners and carvers who work with green wood may benefit from a meter with an extended range.

At the low end of the MC scale, pin meters are accurate down to 7 percent and pinless, down to 5 percent. Readings below these levels are unreliable because there is just too little water in the wood.

Displays

Both types of meters come in one of four types of displays (Photo 4): analog, LED (light emitting diode), digital LED and digital LCD (liquid crystal display). We like the digital LED and digital LCD best. Analog displays are inconvenient.

A "hold" feature on the display is nice to have. Sometimes readings have to be taken in an awkward position or in poor light where it's difficult to read the display. Being able to hold the reading until you can actually see the display can be quite handy.

Some of the more expensive meters give MC readings with a resolution of 1/10 percent. The less expensive meters generally read out larger increments. But, that may be all you need for a go/no-go decision on your wood.

Built-In Species and Temperature Correction

We think that built-in species correction is a feature you can live without unless you typically need to take readings on a large quantity of wood. A chart can be a bit of a hassle, but it's no big deal if you're dealing with just a few boards. Even with built-in correction, you may have to use a chart to find the right setting.

Carrying Cases

Sensor pads and pins need protection when they're being carried around. That's why we liked Delmhorst's toolbox type of carrying case best. It also gives you a place to store charts and manuals that need to travel with your meter. Second best are the ballistic nylon pouches on the Wagner MMC210 and 220. Electrophysics and Moisture Register do not come with carrying cases.

Recommendations

The good news is that all of these meters will do a great job for you. But for most of us, there's no need to spend more than $90 for a pin meter or $140 for a pinless. Meters in this price range can tell you all you need to know about the moisture content of wood that's been kiln or air-dried. That's why all of our picks are Best Buys.

Our Best Buys are simply the least expensive pin and pinless meters. If you want built-in convenience features that the low-cost meters don't offer, check the chart for features and prices that best suit your needs. If you dry your own wood, you may want to spend a little more for a meter that reads above 30-percent MC.

Best Buy, Pin Meters

Electrophysics MT90; $69

This no-nonsense meter is simplicity itself. Insert the pins and turn the dial until the LED turns from red to green. At that point the dial points to the moisture content of your wood. This meter is not limited to 1-percent increments but is capable of fractional readings like 6-1/2 percent. The meter comes with complete, full-size charts and a pair of alligator-clip leads to use with external nail probes. Our only complaint is the lack of a carrying case that can hold the meter, manual and charts.

Brand	Model	Price	Pin or Pinless	Pin Length or Sensor Pad Size	Range	Display
Comprotech (613) 256-5437	Timber Check	$65	Pin	9/16 (2)	6-25%	LED (3)
Delmhorst	Accuscan	$295	Pinless	2-1/2"x3-1/2"	6-40%	Analog
(800) 222-0638	J-LITE	$135	Pin (1)	5/16" (2)	6-30%	LED
	J-4	$190	Pin (1)	5/16" & 1/2" (2)	6-30%	Analog
	J-2000	$260	Pin (1)	5/16" (2)	6-40%	Digital LCD
Electrophysics	CT33	$155	Pinless	2"x2"	0-30%	Analog
(800) 244-9908	CT100	$198	Pinless	2"x1-1/2"	0-30%	Digital LCD
	CT808	$266	Pinless	2"x2"	0-99%	Digital LCD
	MT90	$69	Pin	1/2"	6-16%	LED (3)
	MT110	$88	Pin	1/2"	6-40%	LED
	MT270	$110	Pin	1/2"	4-30%	Analog
	MT700	$150	Pin	1/2"	4-80%	Digital LCD
	MT808	$244	Pin	1/2"	4-99%	Digital LCD
	CMT908	$330	Both	1/2" & 2"x2"	0-99%	Digital LCD
Lignomat	Mini-scanner L	$175	Pinless	1-3/4" x 3"	4-99%	Digital LCD
(800) 227-2105	Mini-Ligno Original	$110	Pin	1/4" & 7/16"	6-20%	LED
	Mini-Ligno DX/C	$200	Pin (1)	1/4" & 7/16"	5-65%	Digital LED
Moisture Register (909) 392-5833	DC2000	$88	Pin	5/16" (2)	5-65%	Digital LCD
Protimeter	Mini BLD2000	$235	Pin (1)	3/8" (2)	6-90%	LED
(800) 321-4878	Timbermaster BLD5601	$348	Pin (1)	3/8" (2)	6-99%	Digital LCD
Tramex	Wood Encounter	$339	Pinless	2-1/2"x4-1/4"	3-35%	Digital LCD (3)
(303) 972-7926	Compact	$169	Pin (1)	5/16"	7-42%	Analog
	Professional	$247	Pin (1)	5/16"	6-44%	Digital LCD (3)
Wagner	L606	$260	Pinless	1-1/2"x2-1/2"	5-30%	Analog
(800) 944-7078	L609	$140	Pinless	7/8"x2-1/2"	4-22%	LED
	MMC205	$180	Pinless	1-1/2"x2-1/2"	5-20%	Digital LCD
	MMC210	$260	Pinless	1-1/2"x2-1/2"	5-30%	Digital LCD (3)
	MMC220	$290	Pinless	1-1/2"x2-1/2"	5-30%	Digital LCD (3)

Moisture Register DC2000; $88

For those who want a little more than a bare-bones meter, the DC 2000 offers the most features for the least money. For $88 you get a meter with built-in species correction and the largest MC range (6 percent to 65 percent) of any meter under $150. Wood species are grouped into three different categories, A, B and C. If you really want precise readings, the DC2000 also comes with species correction charts. The Moisture Register also features an easy-to-read digital LCD display. Unfortunately, a carrying case is $20 extra.

Timber Check; $65

Rugged and simple are the operative words for this meter. It can tell you all you really need to know about air-dried or kiln-dried wood. It's the only meter out there that's calibrated to read red oak instead of Douglas fir.

The Timber Check works when you insert the pins and turn the knob on the base until the LED light goes on. Each click of the knob represents 1-percent intervals from 6 percent to 12 percent and 4-percent intervals from 14 percent to 25 percent. The readings are printed clearly on the body of the meter.

Best Buy, Pinless Meters

Wagner L-609; $140

Easy to use and compact, the L-609 has been in the Wagner stable for many years. What we really liked about this meter, besides the price, is that it comes with an extensive species correction chart with over 170 species, including tropical exotics. If you can't find your wood on this list, then you've really got a rare specimen. We also liked the fact that the sensing pad is small enough to allow for readings on the edge of 4/4 boards. *AW*

Temp. Correction	Species Correction	Auto Shut-Off	Carrying Case	Comments
chart	chart	N	cardboard tube	Only meter calibrated to read red oak without chart corrections.
n/a	chart	Y	tool box	New on the market; available 05/02.
chart	chart	Y	tool box	Pins are easy to change; 3-year warranty.
chart	chart	Y	tool box	Handy temp. correction slide rule; easy-change pins.
built In	built in	Y	tool box	Display reads to 1/10%; stores and averages 100 readings; easy-change pins.
n/a (4)	chart	N	bubble pack	Correction charts for readings taken in wood less than 1-in. thick; exposed power switch can inadvertently be turned on; extensive species charts.
n/a (4)	built-in	N	bubble pack	Correction charts for readings taken in wood less than 1-in. thick; go/no-go alarm; exposed power switch can inadvertently be turned on; extensive species charts.
n/a (4)	built-in	N	bubble pack	Built-in thickness correction from 1 in. down to 1/4 in.; go/no-go alarm; exposed power switch can inadvertently be turned on; extensive species charts.
chart	chart	N	bubble pack	Includes a set of alligator-clip wires for remote or deep sensing using nail probes; extensive species charts.
chart	chart	N	bubble pack	Includes a set of alligator-clip wires for remote or deep sensing using nail probes; extensive species charts.
chart	chart	Y	bubble pack	Includes a set of alligator-clip wires for remote or deep sensing using nail probes; extensive species charts.
chart	chart	Y	bubble pack	Includes a set of alligator-clip wires for remote or deep sensing using nail probes; extensive species charts.
built in	built-in	N	bubble pack	Includes a set of alligator-clip wires for remote or deep sensing using nail probes; 1/10% readings below 10%.
chart	built-in	N	bubble pack	Includes a set of alligator-clip wires for remote or deep sensing using nail probes; extensive species charts.
n/a	built-in	Y	pouch	Display reads to 1/10%.
chart	built-in	Y	pouch	Contoured pin cover slips on base for comfortable 1-handed operation; power switch between pins hard to engage in dense wood.
chart	built-in	Y	pouch	Display reads to 1/10% below 10%.
chart	built-in	N	bubble pack	Chart included for more accurate species corrections.
chart	chart	Y	pouch	Includes external probe that plugs into meter.
built-in	built-in	Y	pouch	Uses a temp. probe for auto. temperature calibration.
chart	built-in	Y	pouch	Built-in thermometer measures ambient temp. in degrees C; corrections chart on meter.
chart	chart	Y	pouch	Species and temp. chart on back of meter.
chart	chart	Y	pouch	Species-correction charts feature European woods, plus basic North American species; 1/10 % readings.
n/a	chart	Y	tool box	Extensive species chart.
n/a	chart	Y	pouch	Extensive species chart.
n/a	built-in	Y	pouch	Extensive charts; specific gravity settings from .30 to .70.
n/a	built-in	Y	pouch	Extensive charts; specific gravity settings from .30 to .70; ballistic nylon pouch.
n/a	built-in	Y	pouch	Meter can be set for the specific gravity of different species for .20 to1.0; ballistic nylon pouch.

(1)-external probe accessory available
(2)-spare pair included
(3)-display has hold feature
(4)-charts provided for precise measurements in extreme temps.
= Best Buy