

User Instructions for Ligno-Scanner S and D Moisture Meter



Lignomat USA Ltd.
14345 NE Morris Ct
Portland, OR 97230

E-mail: sales@lignomat.com
www.lignomat.com
Tel: 503-257-8957
800-227-2105
FAX: 503-255-1430

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Ligno-Scanners S and D, Meter Functions

If the display is blank and the SET/HOLD key is pressed, the active setting is displayed:

- wood species #30-100
- or reference scale #0

If the display shows a measured value and the SET/HOLD key is pressed repeatedly:

- Scanner is put into Hold mode
- Scanner is put into Set mode,
- wood species setting can be changed.

On the left side of the display, the active wood species setting and measuring depth are indicated:

Ligno-Scanner D 3/4"
Ligno-Scanner S 1/4"

For measurements press the READ key. Automatic shut-off after 3 minutes.

Two measuring pads are mounted on the back of the meter. The measuring pads cover an area of:
2.75" L x 1.75" W
(6.8 x 4.2 cm)

Overall size of Meter:
4.5" x 2.4" x 1"
(12 x 6 x 2.5 cm)

Measured value.

% sign is only present, if the indicated value is a moisture percentage. If % sign is missing, the value is a reference number (setting #0).

Press up or down key to change settings for Wood Species.

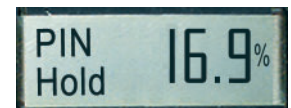
Battery cover is located at the back of the meter. Battery: One 9V battery.

A low battery symbol will appear on the display, when the battery is drained to 25%.



Hold Function

The HOLD key is used (while taking readings) to "freeze" measured values for one minute. During that time you can switch back to measuring by pressing the READ key again. This feature is helpful when taking notes or when measuring in areas, where the display cannot be read.



Warranty: All Lignomat meters have a 2-year warranty. Accessories have a 1-year warranty. Battery and pins are excluded.

Ligno-Scanner S and D

The Scanners S and D are capacitance-type meters for wood with a reference scale for other materials. The sensor plates on the back emit and pick-up very low-powered electromagnetic signals.

The readings generated by the Ligno-Scanners S and D are average values for the entire measuring field between the surface and the maximum depth of penetration. Moisture closer to the surface has a greater effect on the average than the moisture closer to the maximum depth of penetration.



All Lignomat meters internally check and adjust the calibration. Manual recalibration is not needed.

Wood Range 5*-60%. Readings above 25% fiber saturation point are less accurate. *To check the lowest possible reading, hold the meter in the air and push the READ key. The range for hardwoods with high specific gravity is lower than 5%. The range for softwood with low specific gravity is higher than 5%.

Settings: #30-100. The most common wood species are listed on the laminated pocket guide included with each Scanner. Gravity Range is 0.3 to 1.0. For unlisted species the specific gravity can be entered as species setting. Example, for specific gravity of 0.42 the setting is #42. Values for specific gravity can be found on the internet by entering <specific gravity...> followed by the name of the wood. For calculations see page 10.

For unlisted species or new products Lignomat offers testing to determine the correct setting.

Reference scale:

Code #0: Sensitivity level for laminates and products made out of wood.

Measuring Depths:

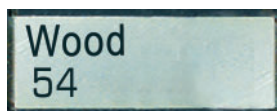
- Ligno-Scanner S 1/4" (7mm)
- Ligno-Scanner D 3/4" (20mm)

Battery: One 9V battery (included). To exchange battery, slide battery cover off on back of instrument. A low battery symbol will appear on the display, when the battery has been drained to 25% of its capacity.



Check and Change Wood Species Settings

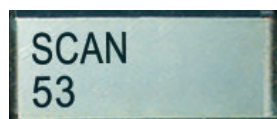
Settings for wood species are listed on the laminated pocket guide included with each meter.



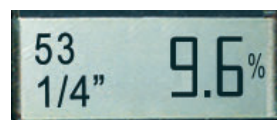
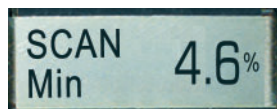
- If the display is blank push the SET/HOLD key once to display the active wood species settings or reference number 0.
- If the display shows a moisture value, push the SET/HOLD key twice to display the active wood species settings or reference number

Use ▲ or ▼ keys to change settings.

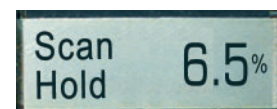
Taking Measurements



After settings have been checked / changed, press the READ key to obtain moisture readings. The active settings appear briefly. Then, if the measuring pads are not in contact with any material, the lowest possible value for the active wood setting appears: SCAN/min is 4.6 for setting #53.



If measurements are taken, the measured value (9.6%), the active wood species setting (53) and the measuring depth is displayed. (1/4" for Ligno-Scanner S, 3/4" for Ligno-Scanner D)



The HOLD key is used to freeze the indicated value for one minute. Helpful when taking notes or when measuring in places, where the display cannot be read while measuring. At any time you can switch back to measuring by pushing the READ key again.

While taking measurements:

- If the material is too dry to be measured, the meter will show the lowest possible value indicated by SCAN/Min on the left side of the display.
- If the material is too wet to be measured, the meter will show the highest possible value indicated by SCAN/Max on the left side of the display.

The lowest possible moisture percentage is different depending on wood species, for hardwoods the value is below 5%, for softwoods the value is above 5%.

The meter turns off automatically after three minutes.

To obtain accurate measurements:

Turn the meter on and place it on the test sample (for wood in the direction of the grain). **Press down lightly**, holding the outer sides of the meter without touching the test sample with your hand. It is important to put light pressure on the meter towards the test sample.

For accurate measurements:

- The test sample should be big enough to cover both measuring pads. (If seams cannot be avoided when measuring flooring, seams should run parallel to long edge of meter.)
- The test sample should be at least as thick as the selected measuring depth.
- If the surface is not smooth and flat, several readings should be taken. Select the highest value.

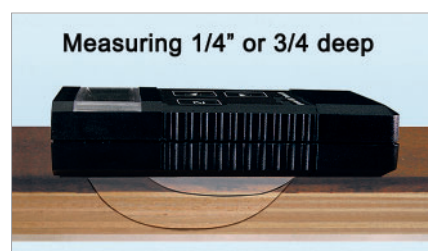


Note, all materials within the measuring field contribute to the value indicated. If the test sample is composed of different materials, the value indicated may not be a true moisture percentage, but may only be a reference number. Page 7: Find Settings for Composite and Engineered Boards.

To make sure the material underneath the test sample is not influencing the measurements, arrange an air space underneath the test sample. For example: Elevate one end of the test board to create an air space underneath the board.

Measuring Depth matters:

Accurate measurements with a Scanner can only be obtained if the material to be measured is at least as thick as the measuring depth (Scanner D 3/4", Scanner S 1/4"). If the wood is thicker than the measuring depth, the deeper sections are not measured. If measurements are required for wood thicker than 1.5", the better choice would be to use a pin meter with Slide Hammer Electrode.



If the material is thinner than the measuring depth, measurements could be too low, because not enough material is within the measuring field.

The Ligno-Scanner S works great for checking dryness of waterborne finished for its

Measuring Veneer

We recommend placing a lightweight material such as Styrofoam under the veneer. It not only prevents inaccurate reading, but also helps to create a flat measuring platform for the veneer. To obtain accurate readings for very thin veneer it may be necessary to make a stack of several sheets.

Wood Floor Installation

Wood moisture meters and thermo-hygrometers are essential tools for floor installers. Lignomat offers the Thermo-Hygrometer PN or a combination pinless/RH meter Ligno-DuoTec BW. (Summary last pg)



First: Take measurements when the floor is delivered, to make sure the floor is dry.

Next: Take measurements (moisture and RH) before, during and after acclimation.

Mark sample boards and take readings of the same spot repeatedly.

Last: The moisture content of a floor should be documented at the time the customer signs off on the installation. Select several moisture sensitive areas, under windows, inside doors, by the refrigerator, etc. Take readings with both depth levels and document the measurements with moisture content, species setting, measuring depth and location. Take a photo to pinpoint the location. Use a thermo-hygrometer to take relative humidity and temperature measurements.

Keeping track of moisture conditions may in the end protect you from unwarranted claims and help find the cause of a problem. If you ever have to go back to check out a complaint, you can measure the same areas again and compare with the original measurements. The dual-depth readings can indicate if moisture was absorbed from the down-side of the floor or from the up-side of the floor. See EMC chart on page 8 for equilibrium moisture contents and the corresponding relative humidity and temperature. If EMC and MC are kept in close range, wood floors are absolutely stable.

Find Settings for Composite and Engineered Boards

If the sample to be measured is composed of different wood species or different materials (linoleum glued on to wood, plywood, bamboo flooring with a wood core, etc...) or if no wood species setting exists a setting can be found by using a dry sample board.

The dry sample could come from your office or from an area that has already dried out or from a place where excess moisture never reached. Estimate the moisture content. An acclimated sample from a home, office or show room should be at or around 7.5%.

Start by selecting setting #50. Then take a measurement.

- If the reading is below 7.5%, choose a setting lower than #50.
- If the reading is above 7.5%, choose a setting higher than #50.

Then take another measurement. Change settings until you find a setting, which gives a value of 7.5%. This setting can be used in the future for the same product.

Relative Humidity, Wood Moisture and EMC Chart

Recommended ambient conditions in buildings are 30-50% relative humidity at 60-80°F. If ambient conditions stay within this range, the amount of expansion and contraction of wood floors and furnishings at 6-9% moisture content is limited. (Table from US Dept of Agriculture "Wood Handbook, Wood as an Engineering Material")

EMC CHART

Temp.	Relative Humidity in %																			
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	98
30	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.8	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3	26.9
40	1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.8	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3	26.9
50	1.4	2.6	3.6	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.2	12.3	13.4	14.8	16.4	18.4	20.9	24.3	26.9
60	1.3	2.5	3.6	4.6	5.4	6.2	7.0	7.8	8.6	9.4	10.2	11.1	12.1	13.3	14.6	16.2	18.2	20.7	24.1	26.8
70	1.3	2.5	3.5	4.5	5.4	6.2	6.9	7.7	8.5	9.2	10.1	11.0	12.0	13.1	14.4	16.0	17.9	20.5	23.9	26.6
80	1.3	2.4	3.5	4.4	5.3	6.1	6.8	7.6	8.3	9.1	9.9	10.8	11.7	12.9	14.2	15.7	17.7	20.2	23.6	26.3
90	1.2	2.3	3.4	4.3	5.1	5.9	6.7	7.4	8.1	8.9	9.7	10.5	11.5	12.6	13.9	15.4	17.3	19.8	23.3	26.0
100	1.2	2.3	3.3	4.2	5.0	5.8	6.5	7.2	7.9	8.7	9.5	10.3	11.2	12.3	13.6	15.1	17.0	19.5	22.9	25.6

Example: For a relative humidity of 35% and a temperature of 70°F, the EMC is 6.9%. A wood floor at 6.9% moisture content is stable, if the surrounding air has a relative humidity of 35% and a temperature of 70°F. In short a floor is stable, when MC and EMC are the same.

Dimensional Stability of Wood: Wood moisture and relative humidity are crucial factors for dimensional stability of wood. Use moisture meter and thermo-hygrometer to measure both. If wood shrinks, warps, cups, checks or delaminates, it always has to do with changes in wood moisture and/or relative humidity. No shrinking and warping occurs, when an equilibrium (see EMC chart) with the surrounding air has already been reached, which means wood is not losing or absorbing any more moisture.

Predictions and Explanations: Measure relative humidity, temperature and moisture content. Compare the measured values with the EMC chart above to predict, if wood is stable or will loose or gain moisture.

- A hardwood floor shows gaps from shrinking. The moisture content at the present time measures 6.2% and the rel. humidity is at 30%. The only explanation for the gapping is, that the floor was installed at a higher moisture content. Once exposed to the dry air, the floor dried out and the gapping occurred.
- If a dry floor with a perfect moisture content of 6.2% is exposed for a long time to air with a relative humidity of 60% at 70°F, it can be predicted that the floor will absorb moisture until 11% has been reached. Depending on the wood species, a 5% increase in moisture content can be accompanied by a substantial amount of expansion.

No more surprises! Use the EMC chart and your Ligno-Scanner to predict problems. The chart is also helpful to explain to your customers, why relative humidity in their home matters.

Function and Calibration Check for Ligno-Scanners

All pinless meters from Lignomat are built with high quality components, micro-processor based, to guarantee stable calibrations for many years of usage. All meters from Lignomat internally check and if necessary adjust the calibration before each reading. Therefore, the meters are not set up to be re-calibrated manually by the user.

Before the battery is drained completely and the meter will not give any more values, a warning sign appears in the middle of the display, indicating the battery should be replaced soon.

Function Test: Pinless measurement functions can be tested for open and closed circuit connections manually without using the check block.

Calibration Verification: Pinless measurements can be tested for calibration accuracy with check block TS available from Lignomat.

For sensitive testing we recommend using the check block before and after a test series. Every time you check, the indicated value should be within +/- 1% of the test standard.

Manual function check for pinless meters: Step 1 and 2

Calibration verification for pinless meters: Step 3

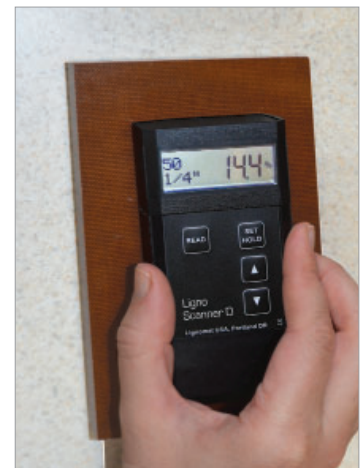
Step 1: Open circuit check. Set the meter to pinless mode, choose code # 50. Hold the meter in the air to make sure no material is touching the measuring plates. When the READ key is pressed, a low moisture value of 5.4% should be indicated with SCAN/Min to the left side of the display. For 1/4" and the 3/4" depth the same value should appear.



Step 2: Closed circuit check. Place the pinless meter on your forearm and press the READ key. A high moisture value should be indicated. An additional meter check can be performed by measuring a ream of paper. If the paper test is done repeatedly with the same setting, the indicated value should not vary significantly over the course of a year. This can be used to check consistency / accuracy of the pinless calibration.

Step 3: Lignomat offers an external calibration check block TS for all Lignomat pinless meters. The check block for pinless meters from Lignomat is a material plate which produces a defined reading, when the meter is lightly pressed against its surface.

If step 1, 2 or 3 fail either the battery needs to be replaced or the meter is defective. Call customer service 800-227-2105.



Calculating Specific Gravity

Specific gravity can be found on the Internet by entering <specific gravity> followed by the wood species. Specific gravity can be calculated by dividing:

$\frac{\text{Dry Weight} \times 1.73}{\text{Length} \times \text{Width} \times \text{Heights}}$	→	enter Dry Weight in ounces
	→	enter Length, Width and Heights in inches
$\frac{\text{Dry Weight}}{\text{Length} \times \text{Width} \times \text{Heights}}$	→	enter Dry Weight in grams
	→	enter Length, Width, Heights in centimeters

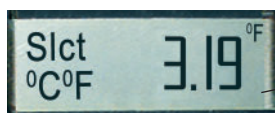
If the specific gravity is 0.42, the Ligno-Scanner SDM should be set to #42 in pinless mode. For unlisted species or new products call customer service at 800-227-2105. If no listing is available, Lignomat offers testing to determine the correct setting.

Change Measuring Depth from US to Metric System Check Software Version

To change from US to metric system, disconnect the battery and press the SET key twice. Connect the battery again. Display shows software version as a 3-digit number. Example 3.19. To the right side of the software number in the upper or lower corner °C or °F appears. By changing from °F to °C, the measuring depth will change from mm to inches.

Use ▲ or ▼ keys to change settings.

The setting can only be changed, while the 3-digit software number is displayed.



To switch the setting from °F to °C, use down key.

To switch the setting from °C to °F, use up key.

Summary of Pinless Meters offered by Lignomat.

Summary of all Pinless Meters	Item	Depth 1/4"	Depth 3/4"	Bamboo	Gypsum Sheetrock	Concrete Pinless Mode	Reference Scales	RH In-Situ Concrete	Pin Mode
Ligno-Scanner S	S	✓							
Ligno-Scanner D	D		✓						
Ligno-Scanner SD	SD	✓	✓						
Ligno-Scanner SDM	SDM	✓	✓	✓	✓	✓	✓		
Ligno-DuoTec BW	BW	✓	✓	✓	✓	✓	✓	✓	
Ligno-VersaTec	V-0	✓	✓	✓	✓	✓	✓	✓	✓

SPECIFICATIONS: Ligno-Scanner S, D, SD, SDM, Ligno-DuoTec BW and Ligno-VersaTec

All pinless meters from Lignomat indicate wood moisture in percent, corrected by 71 wood group settings or by the specific gravity between 0.3 to 1.0 (Settings 30 -100). Moisture Range: 5-60%. Resolution 0.1% . HOLD function. The calibration is internally checked and adjusted before each reading. Function and calibration can be verified with the pinless test block TS. Page

Additional calibrations for

Ligno-Scanner SDM, DuoTec BW, Ligno-VersaTec:

- Bamboo and other strand woven products
- Sheetrock scale from 0-2%
- Reference scales with 3 sensitivity levels:
concrete, standard bldg materials, laminates

Size of meter: 2"x 5.5"x1/2". Weight 8 oz.

Measuring pad 1 5/8" by 2 5/8".

Test sample should be as large as the measuring pads and as thick as the measuring depth of the meter.

Ligno-VersaTec ■ Pin - Pinless- RH ■ All-in-one



- Ligno-VersaTec
- Electrode E12
- Electrode E14
- RH Thermo-Hygro probe
- in-situ concrete testing