

User Instructions for Ligno-VersaTec Moisture Meter



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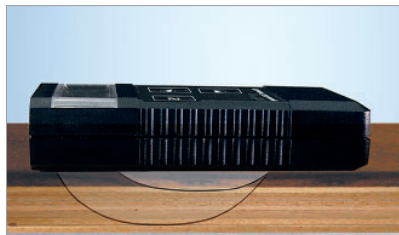
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Ligno-VersaTec, a Multi-Function Meter: Pin - Pinless - RH

PIN The Ligno-VersaTec comes with 250 built-in corrections for measuring different wood species, bamboo, panel products, sheetrock, wall boards and reference scales (page 6) for measuring concrete and other building materials.

RH The Ligno-VersaTec with RH BluePeg probe and adapter RH can measure relative humidity, temperature, dew point and GPP. Accessories are available for in-situ RH moisture testing of concrete slabs and wall cavities.



1. Use as Pinless Meter: You can use the Ligno-VersaTec meter by itself as a dual-depth pinless meter with selectable measuring depth 3/4" and 1/4". The pinless mode of the Ligno-VersaTec has the same features as the Ligno-Scanner SDM.

2. Use as Thermo-Hygrometer: Add fast-responding, precision RH BluePeg probe. The connection between meter and probe can be made by the adapter RH or an extension cable. Ligno-VersaTec indicates ambient relative humidity and temperature, GPP and dew point.

3. Use for in-situ RH Testing in Concrete: Add RH cable, sleeves and the removable RH probes for in-situ RH testing. The Lignomat system complies to ASTM F2170. Pin or pinless mode can be used to take qualitative moisture measurements in concrete. ASTM F2659. Page 19.

4. Use as Pin Meter:

- Add slide hammer electrode E12. Teflon-coated pins allow measuring up to 2" deep. Differences between surface and core moisture can be detected with the electrode E12.

- Add inspector electrode E14V. The E14V is a tool used in construction and restoration to track moisture problems. Easily measures in corners, behind moldings, under base boards and other hard-to-reach places. The handle can be elongated by a broom stick to reach high up or down low. Add EL pins 7" long.

E14V with EG pins 3/4" is also used to measure hard materials (bamboo). Page 9.

- Add specialty electrode E16 to measure concrete and other hard building materials. Page 4.

The pin mode of the Ligno-VersaTec has the same features as the Lignometer K.

Accessories



Slide-Hammer Electrode E12 measures surface and core up to 2" deep. Detects a moisture gradient within the board.

Pins: DZ, DA, DB



Drive-in Electrode E10 shown with EL pins up to 7" deep.

Pins: EL, EG coated
EV, EA, EC uncoated



Inspector Electrode E14V, slim to reach corners. For hard materials such as bamboo. Can be extended.

Pins: EL, EG coated
EV, EA, EC uncoated



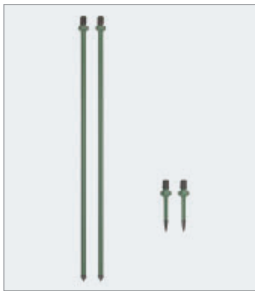
Specialty Electrode E16 for hard building materials (concrete).

Pins: EL, EG coated
EV, EA, EC uncoated



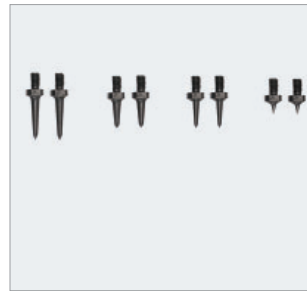
Coated pins:
DZ, DA, DB
up to 2" deep.

For electrode E12



Coated pins:
EG up to 3/4" deep
EL up to 7" deep.

Electrodes E10, 14, 16



Uncoated pins:
EA, EV, EC
up to 5/8" deep.

Electrodes E10, 14, 16



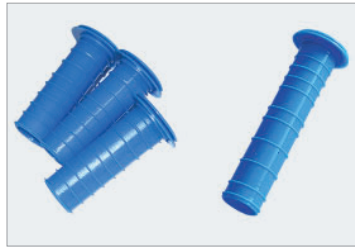
Thermo-Hygrometer:
Add RH BluePeg probe
and RH adapter to measure
RH/T/DP/GPP.



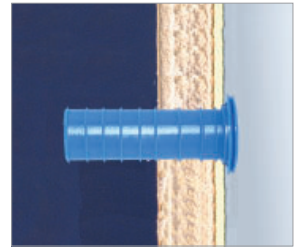
RH BluePeg probes for concrete test and relative humidity of air.



RH-CC cable with sleeve-seal for RH in situ concrete testing. RH adapter.



Sleeves 1.8" and 3" long for in-situ moisture testing in concrete.



Sleeve with RH probe to measure moisture in wall cavities with or without insulation.

Calibration Check:

Pin and pinless meters from Lignomat internally check and adjust the calibration before each reading.

Check blocks are used to verify calibration and functions of pinless meters and pin meters, cables,...

Salt solutions are necessary to check RH BluePeg probes.

More info on pages 20, 21.



TS check block for all Lignomat pinless meters.



TP check block for all Lignomat pin meters including cables and electrodes.



Salt solution to check RH BluePeg probes, RH 75%.

Ligno-VersaTec, the Meter

If the display is blank and the SET/HOLD key is pressed repeatedly, active settings are displayed:

- pin or scan mode.
- wood or material setting.
- wood temperature (pin)
- measuring depth (pinless).

If the display shows a measured value and the SET/HOLD key is pressed repeatedly, the meter is put into HOLD mode first. Then, the active settings are recalled. See above.

Press up or down key to change settings.

For measurements in pin, pinless or RH mode, press the READ key.

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)

BNC connector. Plug-in for:

- cable from electrode.
- adapter for in-kiln cables.

3.5mm stereo connector. Plug-in for:

- RH Adapter
- RH cables

Used to connect RH BluePeg probes.

Once the RH probe is connected, the meter switches automatically into RH mode.

Measured value.

% sign is only present, if the indicated value is a moisture percentage. If % sign is missing, the value is a reference number

Press up or down key to change settings.

The up or down key can also be used to change depth settings in pinless mode while taking measurements. Toggle mode. Page 13.

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

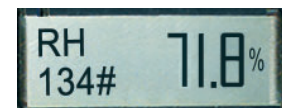
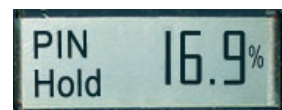
A low battery symbol will appear on the display, when the battery is drained to 25%.



Hold Function for all Modes: Pin - Pinless - RH

The HOLD key is used (while taking readings) to “freeze” measured values for three minutes. 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. The HOLD function for RH mode is indicated by toggling the number sign “#” and the letter “H”. BluePeg number and mode are still displayed.

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



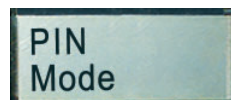
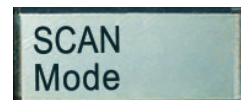
Check and Change Settings for Pin / Pinless Mode

Before using the Ligno-VersaTec, the active settings in the meter need to be checked and if necessary changed to fit the material to be measured. When the Ligno-VersaTec is turned on, the previously chosen settings are active.

To recall active settings, press the SET/HOLD key repeatedly.

To change settings use up or down keys.

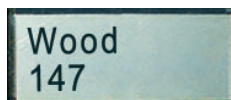
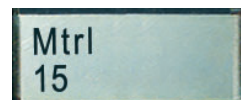
1st Measuring mode: Pin or scan (pinless).

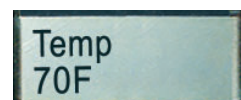
2nd Settings for wood and non-wood materials:

0-250. Corrections for different wood species and non-wood materials are needed in pin and scan mode. Check table below and

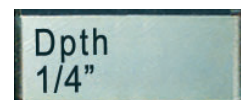
pocket-guide for available settings for pin and/or pinless mode.

3rd Setting for wood temperature: Wood temperature corrections are only needed in pin mode. It is difficult to determine the temperature of the wood at the depth of the pins. Page 7(2).



4th Setting for measuring depth: 1/4" and 3/4". Measuring depth is only used in pinless mode. Page 12.



The settings for the most common wood species, bamboo products and different building materials are listed on the laminated pocket guide included with the meter. For unlisted species or new products call customer service at 800-227-2105. If no setting is available, Lignomat offers testing to determine the correct setting.

See table below: Not all settings #0 - 250 are available for pin **and** pinless mode.

If the wood or material setting is not available in pin **and** pinless mode, the meter will automatically select the available mode. If the number is not defined at all, the mode indicated at the left side of the display toggles between PIN and SCAN.

Example: Setting #30 is only available in SCAN mode. When the meter is in PIN mode and the setting #30 is selected, the meter automatically switches to SCAN mode.

SUMMARY FOR AVAILABLE WOOD AND MATERIAL SETTINGS	Pin	Scan
Settings for moisture measurements of individual wood species	111-230	111-230
Settings for measurement of wood species with known gravity	-	30-100
Settings for EMC measurements with Lignomat's EMC sensor *Depending on EMC wafer. Any changes are noted on wafer package.	129*	-
Settings for wood moisture measurements of woodgroups #1-4 #1-4 is used in old Lignometers. #2 and #3 is used in all mini-Lignos	101-104 1-4	- -
Settings for bamboo, verticle, horizontal, strand and engineered	170-180	11-24*
Settings for wallboards: interior, exterior, water resistant, light-weight	107-109	-
Settings for sheetrock (light-weight) and gypsum	15 (109)	15
Reference scale for concrete and other similar materials	25 (105)	25 (105)
Reference Scale for bldg materials other than concrete and sheetrock	10	10
Reference Scale for laminates and composites made of wood	0	0

*For settings #11 - 24 for bamboo choose 1/4" depth for scan mode.

The Ligno-VersaTec functions as a resistance-type moisture meter in pin mode. The conductivity between the pins is measured and the moisture content is calculated according to the active settings for wood species and wood temperature. The meter indicates the highest moisture value within the small measuring area between the tips of the teflonized pins.

The Ligno-VersaTec pin measurements have to be corrected for:

- (1) Wood species and other materials being measured.
 - (2) Wood temperature.
- Settings for measuring depth do not affect pin measurements.

(1) The settings for the most common wood species, bamboo products and different building materials are listed in the laminated pocket guide included with the meter. For unlisted species or new products call customer service at 800-227-2105. If no setting is available, Lignomat offers testing to determine the correct setting.

Settings for Pin mode (Undefined numbers do not work in pin mode. Page 6)	
Moisture measurements of individual wood species, 5-99.9%	111-230
Bamboo in pin mode within wood settings, 5-99.9%	170-180
Reference scale for laminates and composites made of wood, 0-99.9	0
Sheetrock (light-weight) and gypsum, 0.1-22%	15 (109)
Wallboards: interior, exterior, water resistant, light-weight	107-109
Reference scale for concrete and other similar materials, 0-99	25 (105)
Reference scale for bldg materials other than concrete or sheetrock, 0-99	10 (110)
Wood groups used in older Lignomat pin meters, 5-99.9%	1-4, 101-104

(2) The meter needs to be set for the correct wood temperature. Different ambient airtemperatures do not affect the readings. However, measuring hot or cold lumber will affect the readings. The Ligno-VersaTec has corrections for different wood temperatures built-in. Once you set the meter for the wood temperature and for the wood species, the corrected moisture value is displayed. Temperature adjustments are not necessary if the meter is set for a wood temperature of 70°F and the lumber is within 55-85°F.

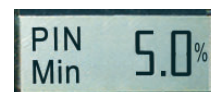
It is difficult to actually measure the wood temperature at the depth, where the tips of the electrode pins are measuring. If the wood has been acclimated to the ambient (air) temperature, choose the ambient temperature. If the wood is not acclimated, choose the average temperature over the last few hours.

Measurements

After settings have been checked and changed, press the READ key to obtain readings. The active settings appear briefly.

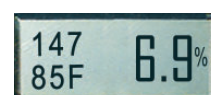


If no electrode is connected or if the electrode is not inserted into any material, the lowest possible reading for the active material and temperature settings appears. Example: PIN/Min is 5% for setting 147 for 70°F.



If an electrode is connected and inserted into material, the moisture value and the active settings for material and wood temperature are displayed.

Example: Wood species 147, wood temperature 85°F, measured value 6.9%.



While taking measurements:

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

Obtain stable Readings at low Moisture Contents

- Minimize electro-magnetic interference: If you measure close to computers, electrical wires or power tools in use, readings could become erratic. To avoid the interference, take measurements in a different location.
- Reduce static electricity: In dry climates and at low moisture contents static electricity may cause erratic readings. The wood, the meter and the person holding the meter should not move while taking measurements. Best results are achieved, when the meter is placed on the board to be measured.

Measuring Wood

Select the correct setting for wood species and wood temperature. Page 7.

Range for Wood: 5-99%. Measurements above fiber saturation point (25-30%) are less accurate.

The slide-hammer electrode E12 with teflon-insulated pins is most commonly used for wood. As the pins are hammered towards the core, consecutive readings indicate any changes between surface and core moisture. For core readings at least a third of the board needs to be penetrated.

If the pins on the electrode E12 do not seem strong enough for hammering into hard wood or strand bamboo, use the electrode E14V with EG pins. The E14V and the EG pins are built sturdy enough for hard pounding. Some customers only have the electrode E14V. Measurements in wood can be taken up to 1/2" deep with the electrode E14V.

The ability to measure a moisture gradient up to 2" deep is one important reason why customers still use pin electrodes for quality control of wood products.

In pinless mode, you can measure only up to 3/4" deep. If high moisture levels are suspected deeper down, the **only option** to measure deeper than 3/4" are pin electrodes:

- Electrode E12 with DB pins can measure up to 2" deep.
- Electrode E14V, E10 or E16 with EL pins measure up to 7".

One of the advantages of the Ligno-VersaTec is having both options pin and pinless mode. For every application you can choose the optimum measuring mode or use the pin and pinless mode side by side.



Measuring Building Materials

Pin Mode

For Sheetrock (light-weight), Gypsum:

Select material setting #15 or 109

Range: 0-22% (based on oven dry weight)

- 0.1% to 0.7% is considered dry
- 0.8% to 0.9% are questionable
- 1% and higher is considered wet.

If values between 8-12% are listed for dry sheetrock, they are based on WME percentages (Wood Moisture Equivalent) and not on oven dry weight.

For interior, exterior and water resistant wall boards use settings #107, 108 or 109, as listed in pocket guide.

Use inspector electrode E14V or electrode E10 for measurements. Teflon-insulated pins EG and EL allow pin-pointing the source of moisture problems, differentiating between moisture in the sheetrock panels and moisture in the structure behind the panels. Length of EL pins 0.5" to 7".

- Electrode E14V is the ideal tool for water restoration jobs. Designed extra slim to fit into tight places, under baseboards, around pipes, in corners, etc. The handle can be extended to reach ceilings without a ladder or floors without crouching. You can hammer on top of the E14V to insert pins in a precise location at a precise depth into soft and extremely hard materials.
- The electrode E10 is another option. Sturdy enough to hammer on top to insert pins.



For Concrete and Other Hard Building Materials: Select material setting #25 (105). Instant readings can be obtained with the electrode E16. These readings do not give moisture percentages. Page 19. However, problem areas of high moisture can be located instantly by comparing readings from different areas. A chart is enclosed with the electrode E16, which lists measured values and the target value for material acclimated to 65% relative humidity and 70°F.

- The Electrode E16 consists of two separate posts, which makes inserting into hard materials easier.

Warning: Test results from pin or pinless meters are not accurate enough to decide whether or not to lay a wood floor over a concrete slab. An RH in-situ probe test and/or a Calcium-Chloride test is recommended by most wood floor manufacturers.

See page 19 for RH in-situ probe test in concrete with the Ligno-VersaTec.



Comparative Measurements:

Finding settings for all building materials and the numerous new engineered products is almost impossible.

To evaluate moisture conditions in these materials, comparative or relative measurements are used. Select a setting (ref scales page 6) and take measurements (at least 2), compare the values. Higher values represent areas of more moisture. If you had an acclimated, dry piece, you could use that piece to establish a value for dry. Make sure the measurements were taken from the same materials, same composition of materials and at the same measuring depth.

Monitoring using the Ligno-VersaTec

Pin Mode

Extension cables and probes can be installed to monitor remote areas, which are otherwise unreachable. Install probes, connect cable and leave the open cable end easily accessible. The Ligno-VersaTec can be connected via adapter H (1), and measurements can be obtained at any time to check for changes in moisture content.

Restoration - Leak Surveillance: An easy way to check the drying progress or to make sure that a leak is not happening again. Depending on structure and thickness of materials, screws, pins or wood probes can be used (3).

Wood Floors: Metal screws are placed on the underside of floor planks or in the subfloor. Works well during acclimation and for long-term monitoring after the floor is installed.

Lumber Drying - Air Drying - Storage:

Teflon-coated PK wood probes (2) and extension cables are placed in areas, which cannot be reached otherwise. Enables moisture readings from the center of a kiln charge without entering a hot kiln, air drying yards, storage sheds.

- 1 Adapter H connects split cable ends to Ligno-VersaTec.
- 2 PK wood probes
- 3 EG teflon-coated pins and screws
- 4 PK-H cable with connectors for PK probes and adapter H.
- 5 EMC sensor: VersaTec is set up to show EMC values using EMC sensor.

The PK wood probe and cable system has been used for many years to monitor lumber drying, to make drying more efficient and optimize drying schedules.

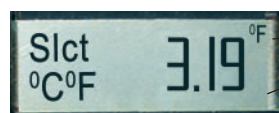
Lignomat offers everything necessary to monitor and control lumber drying from a one-cable in-kiln monitor to a fully automatic kiln control system. Contact customer service at 800-227-2105 to find a solution for your application. Pg 18.



Check Software Version. Change from US to Metric System

Temperature is indicated in °F or °C. Measuring depth is indicated in inches or mm. To change, 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.

The active °C or °F setting appears on the right side of the display in the upper or lower corner. The setting for temperature 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.

The setting for inches or mm cannot be changed manually, it follows the temperature setting:

- If °C is set, the measuring depth is automatically indicated in mm.
- If °F is set, the measuring depth is automatically indicated in inches (").

Pinless Technology

The Ligno-VersaTec functions as a capacitance-type meter in pinless (scan) mode. The measuring pads on the back of the meter emit and pick-up low-powered electromagnetic signals. The reading generated by the Ligno-VersaTec is an average of the entire measuring field between the surface and the maximum depth of penetration. Moisture closer to the surface has a greater impact on the average than the moisture closer to the maximum depth of penetration.

Pinless Mode



Pinless measurements need to be corrected for

(1) Wood species, bamboo products and other materials.

- Settings for wood temp do not affect pinless measurements.

(2) Measuring depth is important for pinless meters.

Selectable depth for Ligno-VersaTec is 1/4" and 3/4".

(1) Settings for the most common wood species, engineered products and building materials are listed in the laminated pocket guide included with the meter.

Settings for unlisted wood species can be determined by using specific gravity (SG). For example, if the SG is 0.42, the code would be 42. Values for SG can be found on the Internet: Search for <specific gravity... > followed by wood species. The SG can also be calculated from weight, length, width and height of sample. Page 16. For undefined species or new products call customer service at 800-227-2105. If no setting is not available, Lignomat offers testing to determine the correct code number.

Pinless mode (Undefined settings do not work in pinless mode. Page 6.)	
Moisture measurements of individual wood species, 5-60%	111-230
Measurements of wood with known specific gravity (same as Ligno-Scanners)	30-100
Bamboo, vertical, horizontal, strand, etc., 5*-60%	11-24
Reference scale for concrete and other similar materials, 0-99	25
Sheetrock and gypsum, 0.1-2%	15
Reference Scale for bldg materials other than concrete or sheetrock, 0-99.9	10
Reference Scale for laminates and composites made of wood, 0-99.9	0

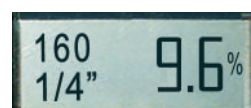
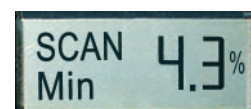
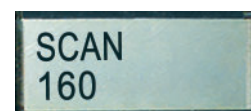
(2) Measuring depth is affecting pinless measurements. You can choose between 1/4" (7mm) and 3/4" (20mm) depending on material thickness. More info on page 12.

Measurements

After settings have been checked /changed, press the READ key to obtain moisture readings. The active settings appear briefly.

- If measuring pads are not in contact with any material, the lowest possible value for the material setting appears: SCAN/Min is 4.3% for setting 160.
- If measurements are taken, the measured value (9.6%), the active setting for material (160) and measuring depth (1/4") are displayed.

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 highest possible value is indicated by SCAN/Max on the left side of the display.



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.

- The test sample should be big enough to cover both measuring pads. When measuring floors, the long edge of the meter should be placed parallel to seams or grooves.
- The test sample should be at least as thick as the selected measuring depth. Page 13.
- If the surface is not smooth and flat, several measurements should be taken.
Select the highest value.

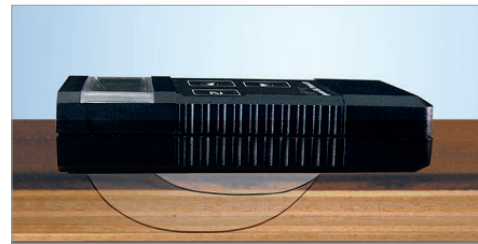
Note, all materials within the measuring field contribute to the value indicated. If the test sample is composed of different materials, the value indicated may not be a true moisture percentage, but may only be a reference number. It can be hard to find the correct code number for engineered or composite materials. Page 14: 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. If this is not possible, make sure the Ligno-VersaTec is set for the correct measuring depth. Measuring veneer, page 14.

**Dual-Depth 1/4" and 3/4"**

Lignomat introduced the dual-depth measuring technology many years ago. Since then, our customers have found this feature to be very helpful for many different applications from flooring to wood working to restoration...

Lignomat offers 4 dual-depth pinless meters: Ligno-Scanners SD and SDM, Ligno-DuoTec BW and Ligno-VersaTec. All dual-depth meters from Lignomat have 2 independent sets of calibrations, one for 1/4" deep and one for 3/4" deep.



Measuring depth is crucial for all pinless meters. Pinless meters have a defined measuring field and pinless meters give accurate moisture percentages only, when the entire measuring field is within the material to be measured.

Most pinless meters are calibrated for a fixed material thickness of 3/4". Lignomats dual-depth meters have a measuring field reaching 3/4" deep and a measuring field reaching 1/4" deep. This allows the meters to be used for measuring thicker and thinner materials:

If test samples are thinner than the measuring depth, readings may be inaccurate:

- If not enough test material is underneath the measuring pads, values will be too low.
- If material underneath the test sample is included in the measuring field, values could be too high.

If test samples are thicker than 1.5", core measurements are only possible with a pin electrode.

If test samples are composed of different materials, a product specific setting maybe required to produce accurate moisture percentages. Page 14.

- **Measuring products less than 3/4" thick:** Many panel and floor products are only 5/8" thick, which does not work well for a 3/4" measuring depth. For example: When floor planks 5/8" thick are installed and measured with a pinless meter at 3/4" depth, you cannot be sure that the subfloor or concrete underneath is not affecting the readings. With the Ligno-VersaTec on 1/4" depth, you definitely only measure the floor planks.
- **Measuring engineered products:** You can find the moisture content of the thin top layer made from hardwood by using the corresponding species setting and 1/4" depth. Using those results, a setting can be found for the entire floor plank. Page 14.
- **1/4" depth setting** allows for checking dryness of waterbased finishes. Works great for veneer or for measuring moisture close to the surface.
- **Many building materials** including drywall are less than 3/4" thick. For those materials the 1/4" depth works better and gives true measurements without including structural elements behind the drywall.

Toggle between 1/4" and 3/4": Toggling enables you to obtain 2 moisture values from different depth levels in the same location, without moving the meter. This is the best way to compare surface and core moisture with the pinless measuring technology. Use the Ligno-VersaTec with a pin electrode to measure a moisture gradient in thicker wood.



To toggle: Place the meter on the test sample and press READ. The active measuring depth is indicated on the left side of the display. Hold the meter with one hand and put light pressure on the meter to obtain accurate measurements. Use the other hand to alternate between pressing the up and down key:

- Press the up key to switch to 3/4".
- Press the down key to switch to 1/4".

Measuring Wood

Check/change wood species setting #111-230 or 30-100.

Settings #111 to 250 are used in the Ligno-VersaTec for pin and pinless mode.

Settings #30-100 are based on the specific gravity. For example, for a specific gravity of 0.42, choose #42. All pinless meters from Lignomat including the Ligno-VersaTec are programmed for settings #30-100.

Check/change depth setting according to the thickness of the wood. Page 13: Dual-Depth.

To measure, press the READ key and place the meter on the wood in the direction of the grain.

Measuring range for wood is 5%*to 60%**.

- * The lowest measurable moisture value depends on the specific gravity of the wood species. To find the lowest measurable moisture value for a species setting, hold the meter in the air and press READ. The lowest values for hardwoods are usually lower than 5%. The lowest values for softwoods are usually higher than 5%. For example, the lowest value for setting #160 is 4.3%.

** Measurements above fiber saturation (25-30%) are less accurate.

Measuring Bamboo: Lignomat developed a unique set of calibrations for different types of bamboo floors and engineered bamboo products, settings

#11-24. The values indicated by the Ligno-VersaTec are WME percentages. WME is the wood moisture equivalent. The following example shows what WME means: If bamboo is acclimated to ambient condition of 42% relative humidity, the Ligno-VersaTec on the correct bamboo setting indicates 8%. If wood is acclimated to the same 42% relative humidity, the wood moisture content is also 8%. EMC chart page 17.

Bamboo products are usually less than 3/4" thick, therefore the measuring depth is limited to 1/4". Make sure that the selected depth is 1/4", when using settings #11-24. When the meter is set for a 3/4" measuring depth, measurements are not defined and the meter will toggle between PIN and SCAN. Change depth to 1/4" and if you have the newest software, the meter will work. If you have an older software, the meter may still not work, contact Lignomat 800-227-2105 for an up-date on your meter. (At the time the meter was sold, the active setting had not been defined yet.)

Measuring Veneer: We recommend placing a lightweight material such as styrofoam underneath the test sample when measuring veneer or other thin materials. It not only prevents inaccurate readings, but also helps to create a flat measuring platform. To obtain accurate readings for very thin veneer it may be necessary to make a stack of several sheets.

You can also find a setting for single veneer sheets. See below, start with step 2, if you have a veneer sheet with a known moisture content. Otherwise, start with step 1b, if you have a sheet acclimated to a known relative humidity.

Find Settings for Composite Materials and Engineered Boards

Follow steps 1 and 2 to find settings for products not listed on the species card.

For best results, the test sample should be acclimated to a uniform moisture content.

Step 1: Determine the moisture content (MC value) of the test sample using 1a) or 1b).

1a) If the top layer is wood, find the MC value by taking readings. Set the meter to the wood species of the top layer at 1/4" depth, even if the top layer is thinner than 1/4".

1b) If the top layer is not wood or the product is less than 1/4" thick (veneer), the test sample has to be well acclimated in a known relative humidity. Then you can find the MC value in the EMC chart. Moisture measurements with the meter are not needed. Look up the relative humidity and find the corresponding EMC value. For a test sample acclimated in 40-50% rel. humidity, the MC value is 8.5% . Page 18.

Step 2: Determine the new setting using the MC value found in step 1.

Select setting # 50 and 3/4" depth. Use 1/4" depth for test samples less than 3/4" thick. Then, take a reading.

--If the reading is lower than the MC value found in step 1, choose a setting lower than 50.

--If the reading is higher than the MC value found in step 1, choose a setting higher than 50.

Then, take another measurement. Change the setting, until you get a reading close to the MC value determined in step 1.

The new-found setting can be used in the future for the same type of product.

When dealing with engineered floors, the thickness of the top layer and the composition of the core have an impact on the moisture value. When a setting has been found, this setting should only be used for the exact same panels or floor boards.

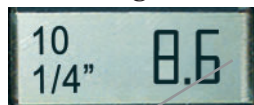
Measuring Building Materials:

Pinless Mode

Select the correct material setting. If the material is not listed on the laminated species card, use one of the reference scales:

- for laminates and composites made from wood code #0
- for concrete and building materials with a similar specific gravity..... code #25 (105)
- for drywall and building materials with a similar specific gravity..... code #15 (109)
- for building materials in between concrete and drywall code #10

Measuring with a reference scale is best done when a dry sample is available. Measure the dry sample and use the number as base value for comparing readings. Even if no dry sample is available, higher values indicate more moisture.



Note, no % sign. Reference scales do not indicate moisture percentages.

When taking measurements, make sure the surface is clean. If surfaces are uneven, try different orientations of the meter and use the highest value.

Water damage restoration: Pin and pinless measurements are crucial when tracking moisture problems. The Ligno-VersaTec can scan large areas quickly up to 3/4" deep. If the problem is buried deeper down, pin measurements with electrode E14V and long EL pins are the only option to reach the problem areas. In addition, the electrode E14V can measure areas a pinless meter cannot reach such as corners, around pipes and window sills, under base boards, etc.

Sheetrock: Setting #15 (Range: 0-2.0%). The indicated moisture percentages are based on dry weight. Meters indicating moisture values of 8-12% for dry sheetrock, use scales based on WME, wood moisture equivalent (EMC chart page 17).

- Dry sheetrock ranges from 0.1% to 0.7%.
- Values for 0.8% and 0.9% are questionable.
- Any value 1% and higher is considered wet.

Sheetrock is often thinner than 3/4". The Ligno-VersaTec, a dual-depth pinless meter has 1/4" measuring depth, which is ideal to measure thinner sheetrock. If the sheetrock is installed, the 1/4" depth gives true moisture percentages, without including material behind the sheetrock.

Concrete: Setting #25 (105) (Range: 0-99.9). Moisture readings are given on a relative scale comparable to relative humidity readings in concrete. Readings indicate high and low moisture levels, but not moisture percentages of concrete. The measuring depth is limited to 3/4" deep.

Measurements with pinless meters provide a preliminary evaluation of moisture conditions. Moisture meters are not able to indicate moisture percentages in concrete (ASTM F2659). Concrete mixtures, additives and aggregates affect moisture measurements. Page 19.

Warning: Test results from pin or pinless meters should not be used to decide whether or not to lay a wood floor over a concrete slab. An RH in-depth probe test and/or a Calcium-Chloride test is recommended by most wood floor manufacturers.

Follow the floor manufacturer's installation instructions and perform the required testing to guarantee the manufacturer's warranty.

Comparative Measurements:

Finding settings for all building materials and the numerous new engineered products is almost impossible.... continued page 9.

Wood Floor Installation:

Pinless Mode

Wood moisture meters and thermo-hygrometers are essential tools for floor installers. Adding Lignomat's humidity probe RH BluePeg allows using the VersaTec as pin/pinless meter and as precision thermo-hygrometer. Page 18. Whenever possible, wood moisture and relative humidity should be measured.

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 moisture sensitive areas, under windows, inside doors, by the refrigerator and 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 the VersaTec with the RH BluePeg probe 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 18 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.

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Calculating Specific Gravity

The settings #30-100 correct for different wood species, the numbers correspond with the specific gravity. If the specific gravity is 0.42, the meter should be set to #42 in pinless mode. The specific gravity can be found on the Internet by entering <specific gravity> followed by the wood species. Specific gravity can also be calculated as dry weight by volume:

$$\text{Specific Gravity} = \frac{\text{Dry Weight} \times 1.73}{\text{Length} \times \text{Width} \times \text{Heights}} \quad \begin{array}{l} \text{(enter Dry Weight in ounces)} \\ \text{(enter Width, Heights, Length in inches)} \end{array}$$

$$\text{Specific Gravity} = \frac{\text{Dry Weight}}{\text{Length} \times \text{Width} \times \text{Heights}} \quad \begin{array}{l} \text{(enter Dry Weight in gram)} \\ \text{(enter Width, Heights, Length in centimeters)} \end{array}$$

The settings for the most common wood species and materials are listed on the laminated pocket guide included with the meter. For unlisted wood species you can find the specific gravity on the Internet or calculate the specific gravity using the formulas listed above. If no listing can be found, call customer service at 800-227-2105. If no listing is available, Lignomat offers testing to determine the correct setting.

Relative Humidity, Wood Moisture and EMC Chart

The moisture content of wood and the relative humidity of the surrounding air determine whether or not wood is dimensionally stable and whether or not wood is susceptible to mold growth. Recommended ambient conditions in buildings are 30-50% relative humidity at 60-80°F, with in 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)

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, 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 the Ligno-VersaTec 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 with the surrounding air has already been reached.

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

- 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-VersaTec to predict problems. The chart is also helpful to explain to your customers, why relative humidity in their home matters.

Mold in Building Materials

Mold has become a great concern in the building and restoration industry. Mold can grow almost anywhere, if the relative humidity rises above 80% and temperatures are moderate (not screaming hot or icy cold). The critical moisture percentage is above 16% for mold growth in wood. This critical moisture percentage can be exceeded, when water infiltrates a structure by leaks, floods and broken pipes or when buildings are not sealed properly. Repair work is necessary to avoid lasting damage.

The Ligno-VersaTec can measure moisture content and relative humidity. Compare both values. Establish the extent of damage and monitor progress until all repairs are done.

RH Technology

The Ligno-VersaTec functions as RH meter or thermo-hygrometer, when the RH BluePeg probe is connected. The RH BluePeg probe uses a single micro-chip factory calibrated to NIST standard.

Applications include:

- measuring ambient air conditions
- in-situ moisture test in concrete, next page.

Specification of RH BluePeg Probe:

Relative Humidity: Range 0% to 99.9%

±2% for 10% to 90%, ±3% for below 10% and above 90%

Temperature: Range 5°F to 160°F (-15°C to 70°C)

±0.5°F for 32°F to 120°F (±0.3°C for 0°C to 50°C,)

±1°F for below 32°F, over 120°F (±0.5°C for <0°C and > 50°C)

Measuring Range for DPT: -17.8°F to 160°F (0°C to 70°C)

Measuring Range for GPP: 0-99.9

Resolution for entire range all values: 0.1°F (0.1°C)

Size of RH BluePeg probe: Ø 0.5" (1.27cm), L 1.35" (3.8cm),

Connection: 3.5 mm stereo jack or stereo cable up to 50 ft long



Measurements

As soon as the RH BluePeg probe is connected, the Ligno-VersaTec automatically switches into RH mode and indicates RH values. All values for RH, temperature, Dew Point and GPP can be obtained by first pressing READ, then HOLD and then using the up or down keys to scroll between RH/T/DP/GPP. The number sign “#” and the letter “H” toggle, while the HOLD function is active.

RH: relative humidity

T: ambient temperature

DewP: dew point temperature

GPP: grains per pound

#: RH probes have individual 3-digit numbers



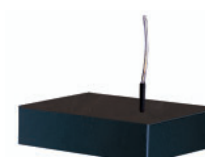
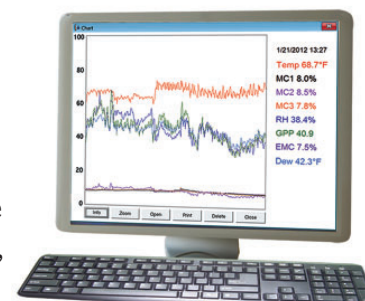
Monitoring RH and MC with Data Loggers

The Ligno-VersaTec can be used as an accurate and reliable thermo-hygrometer. However, a thermo-hygrometer provides only at-the-moment measurements. For monitoring over time, we offer the BL 2 data logger.

The **BL2** data logger comes with the precision RH BluePeg probe. 32000 Data sets can be sampled in time intervals 30 seconds to 24 hours. Audible alarms can be set. A great watchdog for restoration work, floor installation, job-site surveillance, long term recordings of storage facilities.

The **BL2 with MC Tracker** allows recording wood moisture and relative humidity. It is like continuously taking readings with **3 wood moisture meters and 1 thermo-hygrometer**.

Lignomat also offers **wireless** transmitters for measuring moisture, humidity, external and internal temperature. Data is at any time available at a PC and can be viewed from anywhere remotely.



In-situ RH test for Moisture in Concrete

The in-situ RH test gives the most reliable results for concrete moisture testing to determine, if a floor covering should be installed or adhesive or epoxy can be applied. See separate instructions for in-situ probe test with RH BluePeg probes. Instructions are available online or as booklet from Lignomat (800-227-2105).

ASTM standard F2170 describes equipment and procedure. The duration of the test is now 24 hours, a time limit set by the ASTM standard. All of Lignomat's RH parts comply with the latest standard F2170.

The in-situ RH concrete test has gained recognition over the past few years. Many floor covering manufacturers have added the RH concrete test to their warranty requirements. Check the floor manufacturers manual to guarantee the manufacturer's warranty.

If you own a Ligno-VersaTec the following accessories are needed to perform in-situ RH moisture testing in concrete:

RH Probes, RH Sleeves, RH Cable with cable-end-cover
Also needed drill, brush, vacuum attachment.



Measuring Concrete Moisture with the Ligno-VersaTec

The Ligno-VersaTec offers three different technologies to measure moisture in concrete.

Pin: Adding the Electrode E16 allows measuring up to 7" deep into a concrete slab. This was the preferred method several years ago. However, it has been proven, that the results are only qualitative measurements. Only high and low moisture areas can be found.

Pinless: Using the pinless mode of the Ligno-VersaTec, the measuring depth is limited to 3/4". Within that 3/4" depth high and low moisture levels can be determined. The 3/4" depth does not include the middle section of the slab and therefore cannot be used to determine whether or not a resilient floor covering can be installed. A correct percent value is hard to establish because of the difference in concrete mixtures. High and low moisture areas can always be found.

In-situ RH testing: Use the RH mode of the Ligno-VersaTec with the RH BluePeg probes, and measure the relative humidity and temperature inside a hole in the concrete. The relative humidity values obtained from inside the hole are directly related to the moisture condition of the concrete.

Why RH testing at 40% gives the most reliable results: Moisture distribution within an open concrete slab is often not uniform, especially when the slab has not dried completely or when the slab is on grade. The surface shows low moisture levels, whereas higher moisture levels are found in the middle of the slab or towards the bottom (especially for slabs on grade). Once the open concrete slab is covered by the floor covering, moisture will be pulled up from the bottom towards the drier surface until an even moisture distribution has been reached. The increase in moisture close to the surface can cause problems with epoxy, adhesives and floor coverings.

It has been shown that moisture measurements taken at 40% of the slab thickness give the same results when the slab is open and later-on when the slab is covered. Therefore, test results from the open slab at 40% depth can be used to predict what the moisture content will be once the slab is closed. This allows manufacturers of adhesives, epoxy and floor coverings to set a permissible range for their products. If the slab is not on grade, the ASTM standard F2170 allows testing at 20% depth.

Function and Calibration Check for Pin and Pinless Mode

All pin and pinless meters from Lignomat including the Ligno-VersaTec 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: Pin and pinless measurement functions can be tested for open and closed circuit connections manually.

Calibration Test: Pin and pinless measurements can be tested for calibration accuracy with check blocks provided by Lignomat. Using the calibration check blocks confirms that all connections function properly:

- in pinless mode from the measuring pad to the display.
- in pin mode from the tip of the pins to the display (including pins, hand probe or electrode, cable, meter and all connections)

For sensitive testing we recommend using the check block before and after a test series.

Pin Mode

Manual function check: Step 1 and Step 2

Calibration check: Step 3

Step 1: Short circuit test: Set the meter to pin mode, select setting #103 and a wood temperature of 70°F. First check the meter only. Press the READ key and a low moisture value of 5.0% should be indicated with PIN/Min on the left side of the display. Next connect the cable. Press the READ key again and a value of 5% should be indicated. Last check the meter with cable and electrode (do not touch the electrode pins).

Your equipment passed the open circuit check if the 5% value is indicated every time. If the 5% value cannot be confirmed at the first check, the meter is defective, at the second check the cable is defective, at the third check the electrode is defective.

Step 2: Function test: Connect meter, cable and electrode. When the READ key is pressed and the metal tips of both pins are touched with two fingers, a reading should be higher than 12%. If that is not the case, disconnect the electrode (electrode is defective). To check the cable, put your thumb on the open cable end. The cable is ok, if a reading higher than 12% is indicated.

Step 3: Lignomat offers an external calibration check block TP. The block is used to confirm the calibration of all Lignomat pin meters. Connect meter, cable and electrode. Set the meter to pin mode. Select code # 103 and a wood temperature of 70°F. Place pins on screws for a value of 12% and 20%. Test confirms that meter, electrode and cable work, and the calibration is correct.

Note: Step 3 can be done instead of Step 2.
However, Step 1 should always be performed.

If steps 1, 2 or 3 fail either the battery needs to be replaced or the electrode, the cable or the meter are defective.

Contact customer service at 800-227-2105.



Pinless Mode

Manual function check for pinless meters: Step 1 and 2

Calibration check for pinless meters: Step 3

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

Step 2: Function test: 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 is used to check calibration consistency and accuracy.

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.



Function and Calibration Test - RH Meters

Function Check for RH measurements: Step 1

Accuracy check for RH BluePeg probe: Step 2

Step 1: Connect the RH BluePeg probe to the Ligno-VersaTec using the RH adapter and also the RH cable. Press the READ key. A value for either RH, T, DT or GPP appears. Press the HOLD key and then the up key repeatedly to recall the other values. Check if the indicated values are within the expected range. If you read a temperature of 150°F, you know something is wrong. We recommend this test before using RH BluePeg probes for the first time.

Step 2: The accuracy of the RH BluePeg probe needs to be checked periodically. This check can only be performed by exposing the sensor on the circuitboard to a known relative humidity. For on-site checking we sell salt solutions for 75% and for 33% RH.

Accuracy check for in-situ RH probes for concrete moisture testing: ASTM standard F2170 sets the rules for test equipment, procedure and frequency of accuracy testing. Since the standard is still modified periodically, we recommend to purchase the latest F2170 standard to be up-to-date with all requirements. Available from the ASTM web-site. Lignomat offers to check RH probes three times free of charge during the first year.

If step 1 or 3 fail either the battery needs to be replaced or the meter, RH BluePeg probe, RH adapter or RH cable are defective. Call customer service 800-227-2105.



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.

V24-KML Package with RH Accessories

