

NIGOS
ELEKTRONIK·NIŠ

RVD-905

Prenosni vlagomer
Portable moisture meter




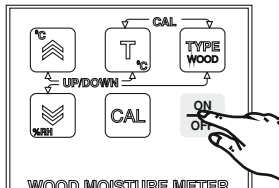
TABLE OF CONTENTS

1. QUICK REFERENCE GUIDE FOR RVD-905	2
2. TECHNICAL SPECIFICATION	5
3. DESCRIPTION OF MOISTURE METER AND ADDITIONAL EQUIPMENT	6
4. DEVICE SET-UP AND ADJUSTMENT FOR MEASUREMENT	8
4.1 WOOD / CONCRETE / SAWDUST TYPE parameter setting	8
4.2 WOOD / SAWDUST TEMPERATURE parameter setting	9
5. WOOD MOISTURE CONTENT MEASUREMENT	10
5.1 General notes regarding wood and sawdust MC measurement	11
6. AIR TEMPERATURE AND RELATIVE HUMIDITY MEASUREMENT (OPTIONAL)	12
6.1 Air temperature and relative humidity measurement procedure	13
7. CONSTRUCTION MATERIALS MOISTURE CONTENT MEASUREMENT (OPTIONAL)	14
7.1 Construction materials MC measurement procedure	15
8. SAWDUST MOISTURE MEASUREMENT USING VP-02 DEVICE (OPTIONAL)	16
9. SAWDUST MOISTURE MEASUREMENT USING VP-01 DEVICE (OPTIONAL)	17
10. ADDITIONAL ADJUSTMENTS	18
11. TESTING MEASUREMENT ACCURACY AND USERS CALIBRATION	19
12. APPENDIX - WOOD TYPES TABLE	20
13. APPENDIX - CONSTRUCTION MATERIALS MC TABLE	23
14. NOTES	24




1. QUICK REFERENCE GUIDE FOR RVD-905

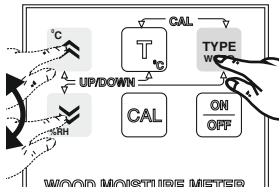
1. Turning the meter ON

- Press the button  briefly
- Shortly after powering on, the device is ready for parameter setting and measurement



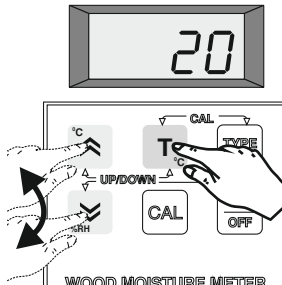
2. Wood/sawdust/concrete type adjustment

- Press and hold button  ; use  and  and %RH to adjust parameter **WOOD / SAWDUST / CONCRETE TYPE**



3. Wood / sawdust temperature adjustment

- Press and hold button **T °C** ; use **°C** and **%RH** to adjust parameter **WOOD/SAWDUST TEMPERATURE**




4. Probes setting and connection

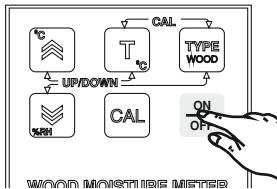
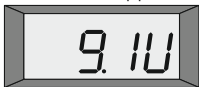
- Place the probes (electrodes) perpendicularly to wood fibers and hammer them in timber board using action hammer to the depth of 1/3 of the timber board
- Connect probes (electrodes) on hammer and moisture meter RVD-905 using measurement cable

5. Measurement - moisture content reading


- Turn the meter on and wait for reading to stabilize. Read the measured value.

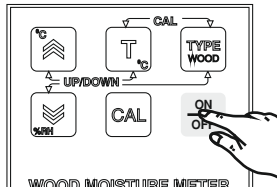
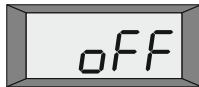
6. Battery test

- Briefly press the button  and the display shows the battery voltage in volts as shown on picture
- Replace the battery below 8V immediately!
(Do not wait for **LO BAT** to appear on the display)



7. Turning the meter OFF

- To turn off the moisture meter, press and hold button  until the *OFF* appears on the display



2. TECHNICAL SPECIFICATION



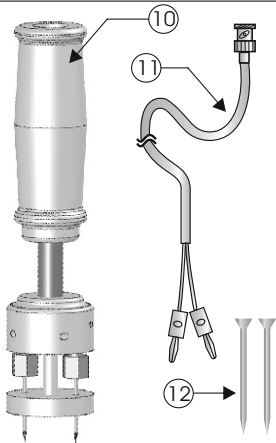
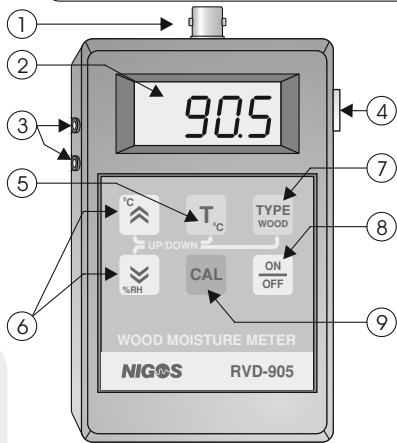
GENERAL CHARACTERISTICS

Power supply	9V battery, Alkaline or NiCd Aku.
Display	LCD, digital
Operating conditions	T: 5 ÷ 50 °C; RH: 5 ÷ 80%
Storage	T: - 40 ÷ 50 °C; RH: 5 ÷ 90%
Dimensions (W x H x D)	(80 x 160 x 40) (mm)
Weight	230 g

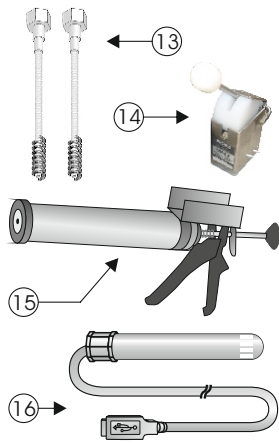
MEASUREMENT

Measurement resolution	0.1 %
Measurement range	(6 ÷ 100) (%)

3. DESCRIPTION OF MOISTURE METER AND ADDITIONAL EQUIPMENT



OPTIONAL



RVD-904 FRONT SIDE LAYOUT

1. **BNC connector** for measurement cable
2. **LCD DISPLAY** shows:
 - measured moisture content
 - parameter values
 - notes and informations during work
3. **Contacts** for connecting the device VP-02
4. **Connector** for **DSVT-03** probe
5. Button **WOOD TEMPERATURE**
6. Buttons **DOWN** and **UP**
7. Button **WOOD TYPE**
8. **ON / OFF** button
9. Button **CAL** for users calibration of the device

ADDITIONAL EQUIPMENT

10. **Action hammer** for probes insertion into wood
11. **Measurement cable** for probes connection with RVD-905
12. Wood **probes (electrodes)**

OPTIONAL EQUIPMENT (delivered on user request)

13. **Concrete probes** (set)
14. **VP-02 device** for sawdust moisture measurement
15. **VP-01 device** for sawdust moisture measurement
16. Temperature / humidity **probe DSVT-03**

The universal RVD-905 moisture meter is made primarily for measuring moisture content in wood. Device is placed in the plastic case with large display for indication of all measurement data and flat keyboard for device control.

Standard set of equipment consists of device itself and:

- set of wood probes (electrodes),
- action hammer for probes insertion into wood
- measurement cable for probes and meter inter-connection
- 9V battery
- wrench for tensioning the probes for a action hammer.

Optionally (on user request), air temperature/humidity probe DSVT-03 and/or devices for sawdust moisture measurements and/or pair of probes for moisture measurements in concrete and other construction materials will be delivered.

4. DEVICE SET-UP AND ADJUSTMENT FOR MEASUREMENT

Certain parameters which depend on measured sample and measurement conditions must be adjusted before measurement. This is crucial because measured moisture content greatly depends on parameter settings.

4.1 WOOD / CONCRETE / SAWDUST TYPE parameter setting

Information regarding **type of wood or sawdust or concrete** is defined by the value of parameter **TYPE**, which represent the group - type of measured sample.

All wood species are divided into 4 groups, represented by values $t 1$ to $t 4$, and appropriate value must be entered for the parameter **TYPE**.

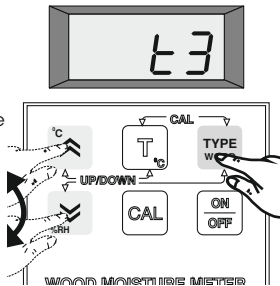
Also, different types of construction materials are divided into 6 groups: $b 1$, $b 2$, $b 3$, $b 15$, $b 25$ and $b 35$ according to their characteristics.

Information regarding wood type for most common wood species and concrete type are given in Appendix, or some other reliable sources can be used.

To measure moisture of sawdust, set the wood type parameter to $P i L$.

Parameter setting procedure: Press and hold the button **TYPE WOOD** and use

the buttons  (UP) or  (DOWN) to adjust desired value.




4.2 WOOD / SAWDUST TEMPERATURE parameter setting

Second data needed for correct wood or sawdust moisture content measurement is **wood / sawdust temperature**. The temperature of the wood / sawdust is usually equal to the ambient air temperature at which the wood / sawdust is present for a longer time, so this value can also be used as the relevant data for measurement.

Therefore, it is necessary to measure wood or sawdust temperature (or air temperature) using appropriate thermometer, and enter that value as a **TEMPERATURE** parameter setting.

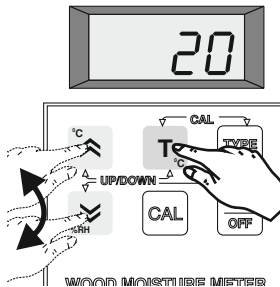
Data entry procedure is similar to one used for type parameter.

Parameter setting procedure: Press and hold the button  and use

the buttons  (UP) or  (%RH) (DOWN) to adjust desired value

of temperature in °C.

Release all buttons. After this, device will again display currently measured moisture content.



5. WOOD MOISTURE CONTENT MEASUREMENT

Basic purpose of this device is **wood moisture content (MC) measurement**. This value (MC) is represented in percent (%) of moisture. Measurement is performed in following steps:

- Set the device according to the instructions given in the previous section;
- Probes (electrodes) are hammered in the timber using provided action hammer, perpendicular to wood fibre and at the measurement depth. Note that MC is not uniformly distributed and is highest in the middle of the board and lowest on the surface. Average MC is measured at 1/3 of the timber board.
- Connect the probes (electrodes) and instrument using measurement cable: connect BNC connector on one side of cable to RVD-905, and free endings on the other side of cable with probes (electrodes) hammered in the wooden sample. Measurement circle is formed this way and system is ready for measurement;
- Turn on the portable meter;
- Avoid pressing any button after powering, wait for displayed value to stabilize and make a reading;
- Turn off the portable meter;
- If necessary, repeat procedures 4 and 5. If measured values are same, measurement is successful.

NOTE: Avoid moving around during measurement because it will influence the measurement and slow down stabilization of reading. If possible, repeat measurement in several points of wooden sample to achieve most reliable measurement data.

Measurement of low MC require longer stabilization period (several seconds in practice). During extremely low MC, it is necessary to repeat measurement procedure several times before accepting the measured value.

5.1 General notes regarding wood and sawdust MC measurement

Operation principle of universal portable moisture meter RVD-905 is based on electric resistance measurement method. **Electric resistance of the wood** depends on wood moisture content, with almost linear dependancy in range 4% to 30% MC. For obtaining most accurate data, it is best to perform measurement in several points. Also, measurement electrodes should be inserted perpendicular to wood growing direction and at measurement depth between 1/4 and 1/3 of timber thickness. When wood with high MC is measured (above 30%, raw timber) should be expected measurement accuracy drop with MC increase. Further, wood type, temperature and other parameters influence this measurement, so data obtained should be taken with some reserve.

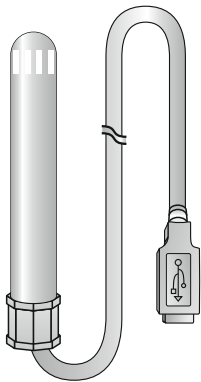
Measurement of the moisture content in sawdust, as well as in the case of massive (solid) wood, is based on measurement of electric resistance, because the resistance changes depending on moisture content of sawdust. It is not recommended to measure MC in frozen wood!

Static electricity is common phenomenon in wood working environment, especially near dried timber.

It appears in dry atmosphere environment, intensive manipulation of dried wood (especially veneer!), and is particularly increase when equipment made of artificial materials is used (e.g. plastic sawdust collection pipes). High voltage discharges may occur, which is not dangerous to humans but can cause measurement errors, and in some cases even damage the portable meter. This is why all precautions in these environments must be taken to minimize the possibility of measurement errors and damage of device.

However, even in these conditions it is possible to perform accurate measurement providing that operator is standing still and avoid any movement of measurement cable and portable meter during measurement.

6. AIR TEMPERATURE AND RELATIVE HUMIDITY MEASUREMENT (OPTIONAL)



DSVT-03 PROBE GENERAL CHARACTERISTICS

Power supply	From RVD-905
Tube dimensions (D(mm) / Ø)	140 / Ø22
Cable length / connector	2m / USB type
Operating conditions	T: $-20 \div 80$ °C; RH: $0 \div 100\%$
Storage	T: $-40 \div 50$ °C; RH: $5 \div 90\%$
Weight	85 g

MEASUREMENT

Output signal	Digital, encoded
Temperature accuracy	Class 1
Relative humidity accuracy	Class 2

On customer request, probe **DSVT-03 for air temperature and relative humidity measurement** will be delivered. Additional connector for connection of this probe (USB type, but does not support USB standard) is installed on moisture meter RVD-905. This probe can measure air temperature at which the wood timber is stored and this data then can be used as the parameter WOOD TEMPERATURE during wood moisture content measurement in case there is no better (more precise) way to determine timber temperature.

6.1 Air temperature and relative humidity measurement procedure

Air temperature and relative humidity measurement using portable moisture meter RVD-905 and probe for air temperature and relative humidity **DSVT-03** is very simple and quick. It is only required to connect the probe to universal portable moisture meter RVD-905 via special USB type connector, turn the meter on and press the button



to read current air temperature (in °C), or press the button



to read current air relative humidity (in %).

It is required to wait at least 1 minute before initial measurement in order to allow the sensor inside the probe to adapt to ambient conditions (if it was previously stored on significantly different temperature or humidity).

Also, for more accurate measurement, if whole measurement set is moved from cold into warm room, it should be left for short time (several minutes) to adapt, and then proceed with measurement.

During measurement of temperature and humidity inside the dryer, probe body should be placed inside chamber, while portable meter and part of probe's cable with connector is held outside of it. This is precaution to avoid damaging the meter if operating conditions are exceeded. Measurement should be performed after sensor is adapted to ambient conditions inside the chamber (after few minutes), then connected probe to RVD-905.

7. CONSTRUCTION MATERIALS MOISTURE CONTENT MEASUREMENT (OPTIONAL)

RVD-905 can also measure **moisture content of concrete and other construction materials** such as mortar and gypsum. Measurement principles are similar to ones used in wood moisture measurement, with a few differences. Expected values of measured moisture are lower than ones reached in wood measurement. Additional equipment and measurement procedure differs a little. There is almost no limitation regarding static electricity and similar disturbances.

RVD-905 can read moisture content in certain construction materials which are divided into 6 groups. All groups have labels which are same as symbolic values used for parameter **TYPE of concrete**. Labels and corresponding materials are given in the table.

Additional equipment is necessary for moisture measurement in these materials and is ordered separately. "NIGOS - elektronik" on customer request provide pair of especially designed probes.

Probe for concrete is shown on following picture.



LABEL	TYPE OF MATERIAL
b1	Concrete mortar
b2	Plaster
b3	Gypsum
b15	Concrete, Type 15
b25	Concrete, Type 25
b35	Concrete, Type 35

7.1 Construction materials MC measurement procedure

User must perform certain preparation before actual measurement - adjust portable meter RVD-905 (parameter **TYPE** adjustment), prepare material for measurement and connect device.

Preparation of material imply that two holes must be drilled with suitable tool with the distance of 10cm between them and vertical to material surface. Holes must have sufficient depth so that probes for concrete are placed in homogenous material along entire measurement length. Holes diameter must be appropriate to provide best possible contact of the probes and material (probes for this kind of measurement must be tightly inserted).

Holes must be thoroughly cleaned of debris before measurement.

If the material is heated during drilling, it must be given enough time to cool down (at least 10 minutes) before moisture measurement.

After preparation of material, connect the probes and instrument using measurement cable: connect BNC connector on one side of cable to RVD-905, and free endings on the other side of cable connect directly with concrete probes inserted in the concretes / constructions material sample.

Measurement circle is formed this way and system is ready for measurement.

Perform moisture measurement following same procedure as used in wood moisture content measurement:

Turn on the portable meter. Avoid pressing any button after powering, wait for displayed value to stabilize and make a reading. After reading a measurement value turn off the portable meter.

8. SAWDUST MOISTURE MEASUREMENT USING VP-02 DEVICE (OPTIONAL)

Device VP-02 is used for **sawdust moisture content measurement** (together with RVD-905).

The VP-02 housing has the shape of an open container on which top is mounted sawdust press with handle. In the lower part of the VP-02 housing, on the outside, there are prominent contacts that provide electrical connection to the measuring electrodes inside the housing.

Use following procedure to perform measurement:

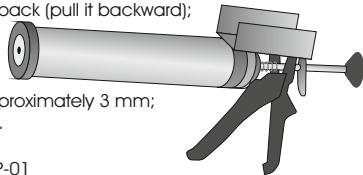
- Before the measurement, set on RVD-905 valid temperature of sawdust and wood type to P_{iL} ;
- Prepare the device VP-02 for measuring: Place the container on stable, flat and solid surface. Separate the press with handle from the container, fill the container with the sawdust (up to 2/3 volume) and return the press on the container;
- Pressing the handle on the press to the end (as much as the mechanism permits) provide the required pressure of the sawdust to the bottom of the container (important for proper measurement because MC reading depends on the compaction of the sawdust in the container).
Hold the container so that it does not get overturned and injured the operator;
- Hold the handle pressed and simultaneously lean the RVD-905 so that its side open contacts are firmly attached to the prominent contacts on the housing VP-02;
- Read the measured value of MC in sawdust on RVD-905;
- After finishing the measurement, turn off the meter RVD-905 and disconnect it from VP-02;
- Empty the container VP-02 to be ready for the next measurement.



9. SAWDUST MOISTURE MEASUREMENT USING VP-01 DEVICE (OPTIONAL)

Device VP-01 is used for **sawdust moisture content measurement** (together with RVD-905). Use following procedure to perform measurement:

- Before the measurement, set on RVD-905 valid temperature of sawdust and wood type to P_{iL} ;
- Place RVD-905 in metal holder on VP-01 and connect cable plugs into contacts on the side of RVD-905;
- Use thumb to press metal clip on VP-01, release the piston and return it back (pull it backward);
- Unscrew and remove lid on the top of cylinder on VP-01;
- Place about 10cm of sawdust in cylinder (do not fill cylinder to the top);
- Return the lid on the top of cylinder and screw it back;
- Compress the sawdust until safety screw bolt on the lid does not exit approximately 3 mm;
- Turn on meter RVD-905 and read the measured value of MC in sawdust.



NOTE: When reading of moisture content (MC) in sawdust, hold device VP-01 only for cylinder with one hand. Do not touch handle and other metal parts of the device.

NOTE: Top lid on the cylinder contains special mechanical device with double purpose. It will prevent damage of the device by preventing applying of too much pressure in cylinder. Also, it provide equal pressure in each measurement, which will produce equal measurement because MC reading depends on the compaction of the sawdust in the cylinder. When sawdust is compressed pay attention on black safety screw bolt on the lid. When this screw bolt become visible 3 mm, it is a sign that sufficient pressure exists and sawdust is properly compressed. It is a sign that MC reading can be made.

10. ADDITIONAL ADJUSTMENTS

The meter RVD-905 has **additional setting parameters** that are not seen during usual operation with the device:

dLY - time interval until turn off. The parameter value is set in the range of 10 to 300 seconds, how long it lasts from the last activity on the device to the automatic shutdown, to save battery power.

cAL - users calibration. Parameter allows correction of measurements on the measuring sample itself. The parameter can be changed, as explained in Chapter 11 of this manual.

F_{id} - firmware version. Parameter can not be changed

F_{id} - date of built-in firmware. Parameter can not be changed

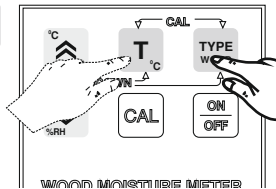
Parameters are accessed by pressing the buttons **TYPE WOOD** and **T °C** together

and the desired parameter within this list is reached by pressing the button **TYPE WOOD**

Adjustment the time until to auto turn off

To change the time until to turn off, select *dLY* parameter in the described way,

and use the buttons **°C** (UP) or **%RH** (DOWN) to adjust desired value.



WOOD MOISTURE METER

11. TESTING MEASUREMENT ACCURACY AND USERS CALIBRATION

The moisture meter RVD-905 is equipped with a function to check the correctness of its own measurement. The procedure for **testing measurement accuracy** is as follows:

- Disconnect any additional equipment and cables that may be plugged into the device;
- Turn on device and set the temperature to 20°C , and wood type to E3 , as described in chapter 4 of this manual;

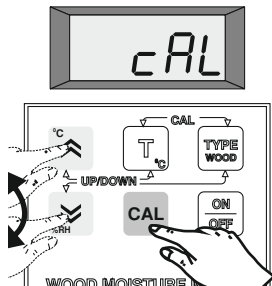
- Press and hold button **CAL**. The expected reading of the device should be in range 18.3 ± 0.5 ;

If there are minor deviations from this range, they can be corrected by **users calibration procedure** through cAL parameter in the following way:

- Access the cAL parameter as previously described.
- By pressing the key **CAL**, the current control value is displayed on device.
- Setting the control value: Press and hold the button **CAL**

and use the buttons $\text{^{\circ}C}$ **UP** or $\%RH$ **DOWN** to select value **18.3**.

This correction involves shifting the whole measuring scale in a given direction. The correction is remembered and remains valid for all next measurements. In case of large measurement deviations, returns the device to the manufacturer for calibration.



12. APPENDIX - WOOD TYPES TABLE

WOOD SPECIES	TYPE	WOOD SPECIES	TYPE	WOOD SPECIES	TYPE
Abachi	2	Banga-Wanga	2	Cherry	3
Abura	3	Basswood	2	Chestnut	3
Acacia	3	Beech, Chilean	2	Chestnut, American	3
Afara, White	3	Beech, steamed	2	Cypress	3
Afrormosia	2	Beech, White	2	Dibetou	4
Agathis	3	Bintangor	2	Durian	3
Alder / Alder, Red	3	Birch	3	Ebony	2
Ash	3	Blackwood	2	Elm, American	2
Ash, American	2	Boxwood	2	Elm, European	3
Atlas	2	Camphorwood	3	Eucalypto	3
Atlas, Nigerian	3	Camphorwood, Borneo	4	Fir, Douglas fir	3
Balau	3	Cedar / Cedar, Red	3	Geronggang	3
Balsa	3	Chengal	2	Greenheart	2

WOOD SPECIES	TYPE	WOOD SPECIES	TYPE	WOOD SPECIES	TYPE
Greenheart, African	3	Juniper	3	Magnolia	3
Guatambu	3	Kapur	4	Mahogany, African	3
Gum	3	Karri	3	Mahogany, Australian	3
Hemlock	3	Kasai	3	Mahogany, Sapelli	3
Hickory	2	Kempas	3	Mahogany, White	2
Hornbeam	3	KerANJI	3	Mahogany, Philippines	3
Ipe	2	Keruing	3	Mansonia	2
Iroko	2	Lapacho	2	Maple	3
Ironwood, Borneo	2	Larch	3	Massaranduba	2
Ivory Wood, Pink	2	Lauan	3	Meranti, Dark / Light Red	3
Jarra	3	Laurel	3	Meranti, White	3
Jelutong	3	Linden (Lime)	2	Meranti, Yellow	2
Jongkong	3	Locust	3	Merawan	3

WOOD SPECIES	TYPE	WOOD SPECIES	TYPE	WOOD SPECIES	TYPE
Merbau	3	Palisander	2	Sepetir	2
Mersawa	2	Panga Panga	2	Seraya	3
Mulberry	3	Pear	2	Sipo (Utile)	3
Niangon	2	Pine	3	Spruce	4
Nyatoh (Balam)	1	Plum	3	Teak	3
Oak, European	3	Poplar	2	Teak, Rhodesian	2
Oak, Japanese	3	Pyinkado	2	Ulin	3
Oak, American Red	2	Ramin	2	Various fruit trees	2
Oak, White	2	Redwood, Giant	3	Walnut, African	4
Okume	2	Rosewood	2	Walnut, European	3
Olive Tree	2	Rubberwood	1	Willow, White	2
Padauk, African	2	Seminai	3	Yew	3
Padauk, Burma	3	Sequoia	3	Zebrano	1

13. APPENDIX - CONSTRUCTION MATERIALS MC TABLE

LABEL	TYPE	DEVICE SHOWS (MOISTURE WEIGHT PERCENTAGE)
b1	Concrete mortar	<p>A horizontal scale from 0 to 5 [%] with major ticks every 1 unit. A diagonal line starts at 3.5% and slopes upwards to the right. The area to the left of this line is labeled 'DRY' and the area to the right is labeled 'DAMP'.</p>
b2	Plaster	<p>A horizontal scale from 0 to 5 [%] with major ticks every 1 unit. A diagonal line starts at 2.5% and slopes upwards to the right. The area to the left of this line is labeled 'DRY' and the area to the right is labeled 'DAMP'.</p>
b3	Gypsum	<p>A horizontal scale from 0 to 5 [%] with major ticks every 1 unit. A diagonal line starts at 1.5% and slopes upwards to the right. The area to the left of this line is labeled 'DRY' and the area to the right is labeled 'DAMP'.</p>
b15	Concrete, type 15	<p>A horizontal scale from 0 to 5 [%] with major ticks every 1 unit. A diagonal line starts at 2.2% and slopes upwards to the right. The area to the left of this line is labeled 'DRY' and the area to the right is labeled 'DAMP'.</p>
b25	Concrete, type 25	<p>A horizontal scale from 0 to 5 [%] with major ticks every 1 unit. A diagonal line starts at 2.5% and slopes upwards to the right. The area to the left of this line is labeled 'DRY' and the area to the right is labeled 'DAMP'.</p>
b35	Concrete, type 35	<p>A horizontal scale from 0 to 5 [%] with major ticks every 1 unit. A diagonal line starts at 2.8% and slopes upwards to the right. The area to the left of this line is labeled 'DRY' and the area to the right is labeled 'DAMP'.</p>

RVD - 905

Universal portable moisture meter

NIGOS - elektronik

Borislava Nikolića Serjože 12, 18000 Niš, Srbija

Tel/fax: +381 (0) 18 / 211-212, 217-468

Cell/Viber/Skype/Whatsapp: +381 (0) 63 / 647-073

Internet: <http://www.nigos.rs>

E-mail: office@nigos.rs

NIGOS
ELEKTRONIK - NIŠ

18000 Niš, Srbija
Borislava Nikolića - Serjože 12
Tel/Fax: +381(0)18 / 211-212, 217-468
E-mail: office@nigos.rs
Internet: www.nigos.rs