NIGOS ELEKTRONIK

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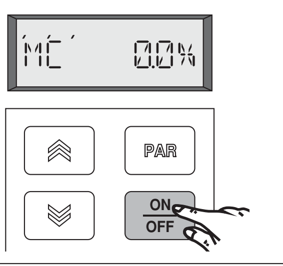
NIGOS ELEKTRONIK

Dodirni vlagomer / Nondestructive MC meter

1. KRATKI VODIČ ZA KORIŠĆENJE DODIRNOG VLAGOMERA

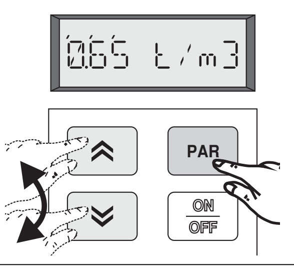
1. Turning the meter ON

- Press the button ON/OFF briefly to turn it on
- Model of the meter and battery status is shown
- After autocalibration is completed, device starts to display measured MC (in %)



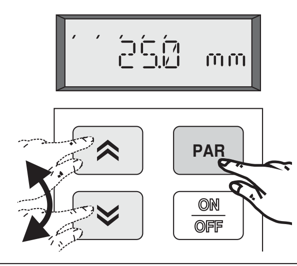
2. Wood density adjustment

- Press once the button PAR briefly (see image)
- Use buttons ▲ and ▼ to adjust wood density (given in t/m³)



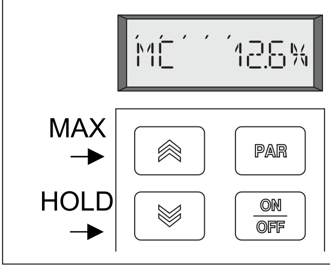
3. Wood thickness adjustment

- Press again PAR, then use ▲ and ▼ to adjust wood thickness (given in mm)
- Dots in the upper part of display also provide thickness information (1 dot per each 5mm)



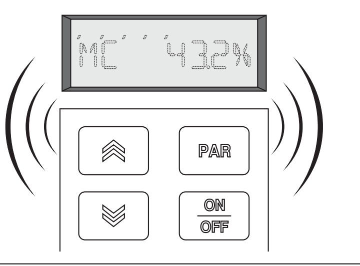
4. Measurement

- Gently press contact plate on the flat, smooth surface of the wood sample
- Read the measured value on display (in %MC)
- Repeat the measurement in several points



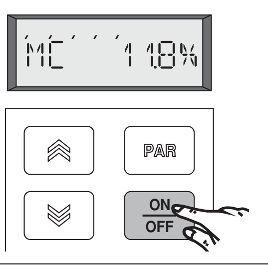
5. Measurement - ALARM function

- In case that measured MC is higher than certain setpoint, alarm will be triggered
- Device will inform the user with sound alarm and blinking display that measured MC is too high



6. Turning the meter OFF

- To turn the meter off, press the button ON/OFF
- Device will turn off automatically after selected idle time

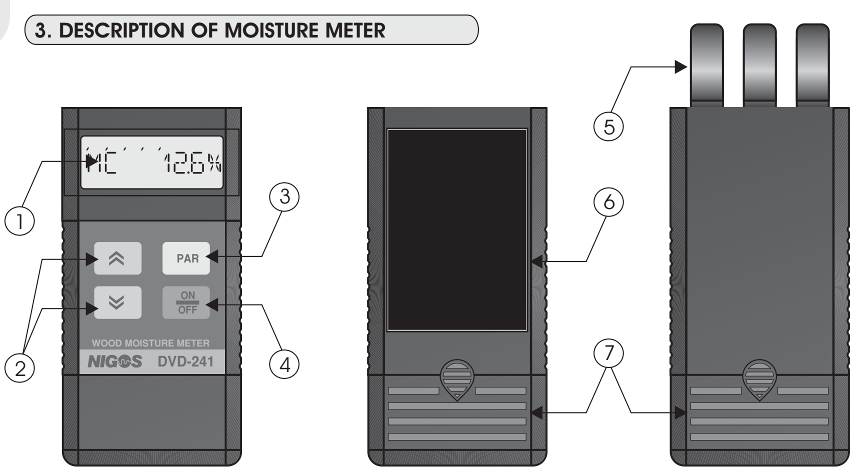


2. TECHNICAL SPECIFICATION OF MOISTURE METERS DVD-241/DVD-340/MCD-50

GENERAL CHARACTERISTICS	
Power supply	Battery 9V, alkaline or rechargeable
Consumption	3mA (DVD-241/340), 6mA (MCD-50)
Continuous operating time	up to 200h (DVD-241/340), up to 100h (MCD-50)
Display	LCD, digital
Operating conditions	T: 5 ÷ 50 °C; RH: 5 ÷ 90%
Storage	T: - 40 ÷ 85 °C; RH: 5 ÷ 90%
Device dimensions (W x H x D)	(60 x 120 x 28) (DVD-241/MCD-50); (60 x 150 x 28) (DVD-340) (mm)
Sensor dimensions (W x H)	(48 x 75) (mm) (DVD-241/MCD-50)
Weight	140 g

MEASUREMENT	
Measurement resolution	0.1% (DVD-241/340); 0.5% (MCD-50)
Wood MC measurement range	(0 ÷ 100) (%) (values above 30% should be considered informative!)
Wood thickness range	2 ÷ 30 (DVD-241/340); 10 ÷ 50 (MCD-50) (mm)
Wood density range	(0.20 ÷ 1.10) (t/m³)

3. DESCRIPTION OF MOISTURE METER



DVD-241/MCD-50/DVD-340 DVD-241/MCD-50 DVD-340

DEVICE FRONT SIDE LAYOUT

1. **LCD DISPLAY** displays:
   - Measured moisture content
   - Parameter values during set-up
   - Messages for user
2. Buttons **UP** and **DOWN** are used for increase or decrease of value of selected parameter
3. Button **PAR** is used for parameter selection
4. Power **ON** / **OFF** button

DEVICE BACK SIDE LAYOUT

5/6. **CONTACT PLATE** measures moisture content when pressed against smooth wood surface
7. Battery compartment

Contact MC meters **DVD-241**, **DVD-340** and **MCD-50** are made for quick reading of wood moisture by simple pressing on flat wooden surface (nondestructive). There is specially designed contact plate on back side of DVD-241 and MCD-50 that the meter use to read MC in the sample when it is pressed against it. DVD-340 use three contact plates at the front part for this purpose.

- DVD-241 is suitable for fast checking of MC in stack
- DVD-340 is suitable for hard to access samples and small dimension samples
- MCD-50 is suitable for on-field MC check in rough samples. It is least sensitive to surface moisture.

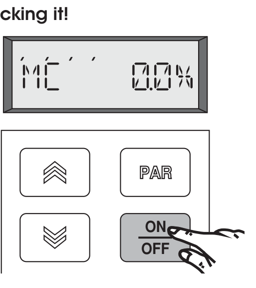
Although MC meters measure full range of moisture content (0-100%), only MC up to 30% is considered to be accurate.
MC values above 30% are approximate and only show that wood sample is wet (contains free water).

4. TURNING METER ON / OFF AND AUTOCALIBRATION

Turning the meter ON is performed with brief pressing on the button ON/OFF. Upon power-up, device will briefly display model and then battery status. During this time, device will automatically perform **AUTOCALIBRATION** procedure, i.e. series of test-measurements required for its adaptation to current operating conditions (ambient temperature, air humidity, etc).

It is essentially important to ensure that meter during autocalibration has such position that contact plate hangs free in the air, i.e. there is nothing behind contact plate blocking it!
Do not hold fingers or other objects behind contact plate during autocalibration. Existence of any object near contact plate during autocalibration procedure can corrupt this process and results in inaccurate measurement and measuring errors.

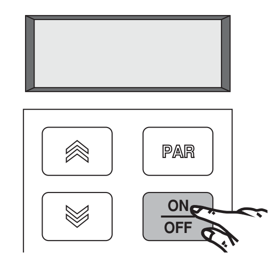
After a few seconds, when autocalibration procedure is finished, meter will display: MC 0.0%, which signals that it is ready for measurement or other adjustments.



Autocalibration procedure is performed each time the meter is powered ON, which ensures reliability of measurement in all declared conditions.

If there is any doubt in either measuring accuracy or possible error in autocalibration as a cause of false measurement, autocalibration should be repeated by simple turning off and turning on the meter again.

Turning meter OFF is performed with short pressing on the button ON/OFF.
When it is turned off, the meter does not consume energy from the battery.
Device will turn off automatically after selected idle time.

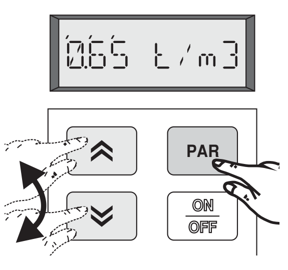


5. DEVICE SET-UP AND ADJUSTMENT FOR MEASUREMENT

5.1 WOOD DENSITY parameter setting

Information regarding type of wood for MC measurement is given via **WOOD DENSITY** for that type of wood. That is why it is required to determine wood density in **t/m³** as precisely as possible. Wood density is most commonly given as a table data for specific wood type (specie) when it is absolutely dry.
Data regarding wood density of specific wood specie can be found in appendix of this manual, but other reliable sources can also be used. Portable moisture meters **DVD-241**, **DVD-340** and **MCD-50** support selection of WOOD DENSITY in range **0.20 t/m³** to **1.10 t/m³**.

Wood density adjustment is performed in following way:
- Meter must be in basic measurement mode (MC %)
- Press the button PAR once (see image)
- Use buttons ▲ and ▼ to set wood density (in t/m³)
- Press the button PAR to advance to next parameter setting (wood thickness)

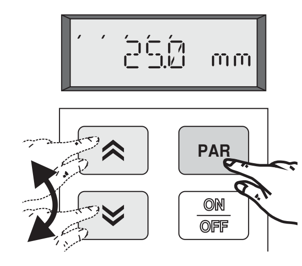


5.2 WOOD THICKNESS parameter setting

Second essential parameter for correct moisture content measurement is thickness of the wooden sample. Measured MC value greatly depends on this parameter (especially when thin samples are used - thinner than 15 mm), so it is required to determine the thickness as precise as possible. Value is entered in **mm** and in range **2** to **40 mm** for meters DVD-241 and DVD-340 while MCD-50 have range from **10** to **50 mm**.
Thickness parameter setting is performed similar to wood density parameter setting:

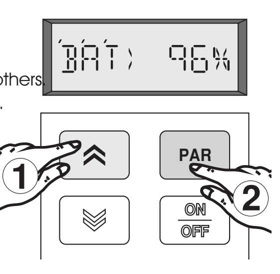
- Press the button PAR again (see image)
- Use buttons ▲ and ▼ to set wood thickness (in mm)
- Press the button PAR to return to basic measurement mode (display shows MC %)

After these procedures, all needed parameters are loaded in meter's memory. Once entered, these parameters remain stored in the memory and they are active until next adjustment. In case there is no need to change these parameters frequently, it is enough just to check these values before each measurement and proceed with measurement immediately.



5.3 Additional settings

There are several additional settings which are available at separate menu. To access this menu, device must be in basic measurement mode. Press and hold button ▲ and then briefly press button PAR (see image). Use button PAR to list the items in menu and buttons ▲ and ▼ to adjust the value of selected parameter. Battery status is shown first (BAT: 96%) followed by measured temperature (T: 25 °C). These are informational data which can not be changed.
Following parameters are changeable:
- Value of moisture content that will trigger **alarm** (AL: 30.0%). Sound signal and blinking of the display will warn the user that MC is too high. It provides easy detection the sample that has MC significantly above others. Alarm function is turned OFF when value of this parameter is set to OFF. It can be set in range from 4 to 99.9%.
- **Turn off time** (TO: 2min). It is possible to set the value of this parameter in range 1 to 60 minutes. Device will turn off automatically if it is idle for the time defined by this parameter.
- **Display contrast** (CONTRAST). In case that device is used in the field at high or low temperature, readability of the display can be low so user can adjust the value of this parameter to improve it.



6. WOOD MOISTURE CONTENT MEASUREMENT

Wood moisture content measurement is main purpose of this device. Moisture content value (MC) is given in percentage (%) and displayed on LC display.

Measurement process itself is very simple procedure and comes to (aside previously described adjustment) proper placing of the meter on the surface of wooden sample and reading of displayed value.

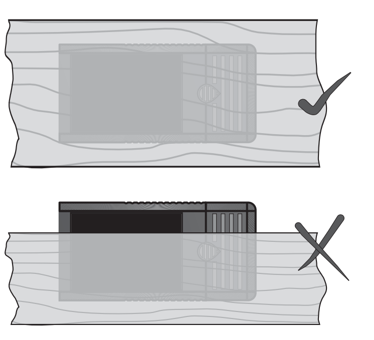
Complete procedure is as follows:

- Turn the meter on before taking the measurement. Wait until autocalibration is finished and meter is ready (see chapter 4).
- Check the value of parameters that are adjustable (**THICKNESS** and **DENSITY**) and if necessary change their values to correct ones
- Place contact plates on wood sample and ensure proper position, gently press the device against the sample and read the measured value

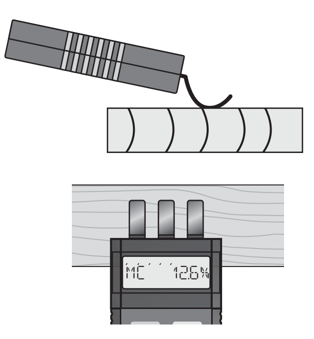
It is recommended to check moisture of the sample at several points in case that conditions allow it in order to achieve better information about moisture content and its distribution in the wooden sample.

Turn the meter off after use in order to preserve battery.

Proper placing of the meter on the surface of wooden sample means following:
- Longer side of contact plate must be parallel to wood fibers when DVD-241 and MCD-50 are used
- Wooden sample must be wider than contact plate and entire surface of contact plate must be laid on wooden sample. To check MC in narrow wooden samples, use DVD-340.
- Contact plates of DVD-340 must be perpendicular to wood fibers when DVD-340 is used



DVD-241/MCD-50

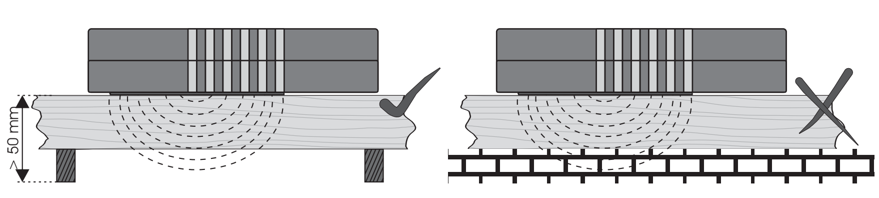


DVD-340

6.1 Timber MC measurement procedure

For accurate MC measurement in timber boards the attention must be payed to:

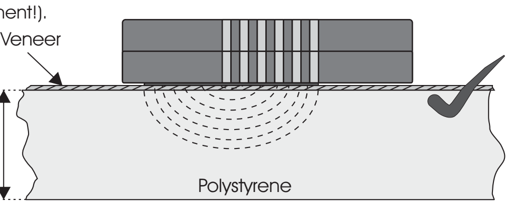
- Moisture distribution along depth of the board should be uniform (board surface must not be overdried due to exposure to direct sun light or during extensive drying. If necessary, cut the sample in half.
- Place the board (sample) on wooden bars to avoid the influence of the ground on the measurement. Thick piece of polystyrene (styropor) can be used instead of bars.



6.2 Veneer MC measurement procedure

Veneer MC measurement is very specific, so it is required to perform following preparation:

- Precisely determine sample thickness. Thickness parameter has great influence for thin samples.
- Place veneer sample on expanded polystyrene layer at least 50 mm thick (polystyrene does not influence measurement!).



NOTES:
- Use only models DVD-241 and DVD-340 to measure MC in veneer.
- Model MCD-50 is not suitable for veneer MC measurement!
- It is more accurate to measure MC of multiple veneer layers (at least 3) while setting total thickness.
- In case veneer is already stacked, set the thickness to 40 mm (best avoid this kind of measurement)

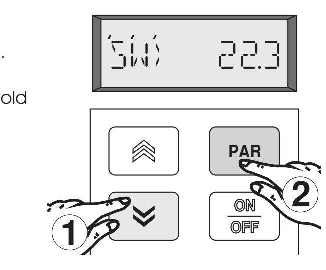
7. USER CALIBRATION OF DEVICE AND RESET TO FACTORY CALIBRATION

In case that, for any reason, there is a reason to doubt accuracy of measurement, user can perform its calibration according at its sole discretion. It is possible to reset the meter to its factory calibration at any given time.

Main goal of user calibration is that the user himself adjust device reading to match MC of the known wood sample by changing gain factor (calibration parameter GAIN - will be discussed more in chapter 7.2)

CALIBRATION MENU ENTERING:

- Device must be in basic MC measurement mode (MC 0.0%).
- Press and hold button ▼ and then simultaneously press and hold for 5 seconds button PAR i.e. until display shows software version (see image).
- Press again button PAR to see the date of software installation.

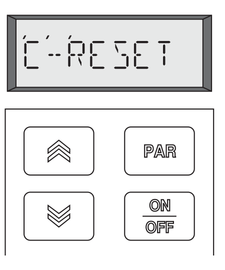


7.1 Reset to factory calibration

After entering calibration menu, subsequent pressing on button PAR will lead to next item (C-RESET), like on image bellow, which marks entering the procedure for calibration reset to factory default.

This procedure should be used in case that readings on the meter are not accurate because a user performed user calibration earlier. It can be also done in case you are not certain wether user calibration has been performed or not.

To reset the meter, use buttons ▲ and ▼ to select the value (OK) then press button PAR to confirm reset to factory default calibration.

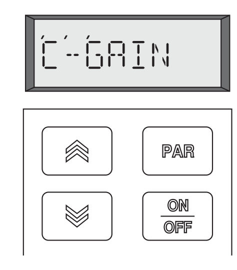


7.2 User calibration of the meter

Next item in the calibration menu is user calibration. Display will show label (C-GAIN).
After item C-GAIN is selected, meter must be placed on wood sample with known MC while taking care that all recommendation for accurate measurement are applied.

Use buttons ▲ and ▼ to change the values of calibration parameters of C-GAIN. Display will show for example: (GAIN: 170). One second after last press on any button, the meter will switch to display of measured value, for example: (CAL: 13.5%).
Calibration procedure consists of successive change of the parameter GAIN and verification of reading until wanted value is achieved.

Press the button PAR to accept the current calibration value as final.
In case we want to exit further calibration without making any change of calibration, press the button ON/OFF to exit this procedure.
We emphasize that special attention must be paid when this procedure is used and that user use it at his own risk!
In case that in any time user suspects that meter is making false measurement due to user calibration, it is required to reset the device to factory calibration defaults as described in chapter 7.1.



8. APPENDIX

8.1 Appendix 1: Additional information regarding wood density and wood moisture content

Wood density is given for wood specie (type) in absolutely dry condition and is expressed in **t/m³** or **g/cm³**. It is calculated as weight of absolutely dry wooden sample divided by its volume.
This density is often given as constant value for specific wood type from specific climate and it represents important data for wood moisture content measurement.

Wood moisture content for a given sample of wood is defined as the weight of water in wood expressed as a percentage of the weight of wood fibrous material (which is the weight of the absolutely dry sample). The moisture content is calculated by the following equation:

$$u\,(\%) = (m_u - m_o) / m_o \times 100$$

where:
u (%) - equals wood moisture content (MC)
m_u - equals weight of wet sample
m_o - equals weight of absolutely dry sample

i.e., wood moisture content (MC) in wooden sample equals weight of existent moisture content in sample divided with weight of absolutely dry (same) sample and multiplied by 100.

8.2 Appendix 2: Wood density table

WOOD SPECIE	DENSITY (t/m³)			WOOD SPECIE	DENSITY (t/m³)		
	min	**average**	max		min	**average**	max
Abachi (Samba)	0.25	**0.35**	0.52	Birch	0.46	**0.6**	0.8
Abura		**0.5**		Camphorwood	0.5	**0.55**	0.6
Acacia	0.6	**0.65**	0.75	Cedar	0.35	**0.45**	0.55
Afara, White		**0.45**		Cherry	0.52	**0.55**	0.62
Afrormosia		**0.65**		Chestnut	0.4	**0.5**	0.55
Agathis		**0.45**		Cypress		**0.4**	
Alder	0.45	**0.4**	0.6	Daru Daru		**0.90**	
Ash	0.41	**0.65**	0.82	Durian		**0.60**	
Atlas	0.6	**0.75**	0.85	Ebony	0.7	**0.85**	1.0
Balau		**0.85**		Elm	0.52	**0.6**	0.64
Balsa		**0.2**		Fir, Silver, Douglas	0.32	**0.45**	0.71
Beech	0.49	**0.65**	0.88	Hickory	0.66	**0.7**	0.8
Beech, Chilean		**0.45**		Hornbeam		**0.8**	
Bintangor		**0.60**		Iroko		**0.6**	

WOOD SPECIE	DENSITY (t/m³)			WOOD SPECIE	DENSITY (t/m³)		
	min	**average**	max		min	**average**	max
Ivory Wood, Pink		**0.8**		Mahogany, African	0.41	**0.5**	0.9
Jelutong		**0.45**		Mahogany, Sapelli		**0.65**	
Juniper	0.3	**0.4**	0.64	Mahogany, White		**0.45**	
Kapur		**0.75**		Mahogany, Philippines		**0.55**	
Kekatong		**0.82**		Mango Wood		**0.55**	
Kempass		**0.72**		Maple	0.48	**0.6**	0.75
Keranji		**0.80**		Meranti, Dark Red	0.4	**0.6**	0.63
Keruing		**0.78**		Meranti, Light Red		**0.54**	
Kranji		**0.75**		Meranti, White		**0.58**	
Kulim		**0.78**		Merawan		**0.70**	
Larch	0.4	**0.5**	0.82	Merbau		**0.85**	
Laurel, Chilean	0.45	**0.48**	0.5	Niangon		**0.6**	
Linden (Lime)	0.32	**0.45**	0.56	Nyatoh (Balam)		**0.65**	
Magnolia		**0.5**		Oak, European	0.39	**0.65**	0.93

WOOD SPECIE	DENSITY (t/m³)			WOOD SPECIE	DENSITY (t/m³)		
	min	**average**	max		min	**average**	max
Okume	0.31	**0.4**	0.57	Rosewood		**0.80**	
Olive Tree		**0.75**		Rubberwood		**0.55**	
Padauk		**0.7**		Seminai		**0.95**	
Palisander		**0.7**		Sequoia		**0.35**	
Pear	0.55	**0.65**	0.76	Seraya		**0.50**	
Perupok		**0.50**		Spruce		**0.40**	
Pine	0.38	**0.45**	0.48	Teak		**0.60**	
Pine, White, Yellow		**0.35**		Teak, Rhodesian		**0.8**	
Plum		**0.7**		Ulin		**0.95**	
Poplar	0.36	**0.4**	0.56	Walnut, African		**0.45**	
Pulai		**0.45**		Walnut, European	0.45	**0.65**	0.75
Punak		**0.72**		Willow, White		**0.4**	
Pyinkado		**0.82**		Yew	0.61	**0.65**	0.74
Ramin		**0.52**		Zebrano		**0.65**	

DVD-241 / DVD-340 / MCD-50
Nondestructive hand held MC meter

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TABLE OF CONTENTS