OPERATING MANUAL

GMK 210

Material Moisture Meter

for non-destructive measurements

Application: camper, caravan and boat

H68.0.02.6C-10

senseca

Table of contents

1 General Note

Read this document carefully and get used to the operation of the device before you use it.
Keep this document within easy reach near the device for consulting in case of doubt.

2 Safety

2.1 Intended Use

The device is designed for measurements of moisture (%u) and water content (%w) of materials with a flat surface and a thickness of at least 10mm.
In addition, it is possible to find moist spots very quickly and comfortably by means of the "detector mode", the display value here is relative [digit].

The measurement takes place at an insulated measuring spot at the rear side of the device.

The GMK 210 is particularly suited for moisture measurements in the following materials:

- wood
- GRP

The GMK 210 is especially designed to meet the needs of moisture ratings of boats, camper vans and caravans.

For use at construction sites, we recommend the GMK 100 (wood, floor screed and plaster characteristics, CM-humidity).

The device must be used only according to its intended purpose and under suitable conditions.

Personnel which starts up, operates and maintains the device has to have sufficient knowledge of the measuring procedure and the meaning of the resulting measured values, this manual delivers a valuable help for this. The instructions of the manual must be understood, regarded and followed.

To be sure that there is no risk arising due to misinterpretation of measured values, the operator must have further knowledge in case of doubt - the user is liable for any harm/damage resulting from misinterpretation due to insufficient knowledge.

The manufacturer will assume no liability or warranty in case of usage for purposes other than the intended one, ignoring this manual, operating by unqualified staff as well as unauthorized modifications to the device.

Use the device carefully and according to its technical data (do not throw it, strike it, …)
Protect the device from dirt.

2.2 Safety signs and symbols

Warnings in this document are labeled with the following signs:

Caution! This symbol warns of imminent danger, death, serious injuries and significant damage to property at non-observance.

Attention! This symbol warns of possible dangers or dangerous situations which can provoke damage to the device or environment at non-observance.

Note! This symbol points out processes which can indirectly influence operation, possibly cause incorrect measurement or provoke unforeseen reactions at non-observance.

2.3 Reasonably foreseeable misuse

To prevent malfunction of the device, personal injury and material damage, the device is designed exclusively for use as described in the chapter "Intended Use".

- This device must not be used at potentially explosive areas!
- The device must not be used at a patient for diagnosis or any other medical purpose!
- Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage.

Any failure to comply with these instructions could result in death, serious injury and material damage.

The measuring principle implies that both water and metal are influencing the display value. Eventually existing metal structures may have negative effect to the measuring, please consider the Measurement Basics (please refer to chapter 5).

2.4 Safety guidelines

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advise given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any climatic conditions other than those stated under "Specifications". If the device is transported from a cold to a warm environment condensation may cause a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.

2. 

If there is any risk involved in running it, the device has to be switched off immediately and must be marked accordingly to avoid re-starting.
Operator safety may be a risk if:
- there is visible damage to the device
- the device is not working as specified
- the device has been stored under unsuitable conditions for a longer time.

In case of doubt, please return device to manufacturer for repair or maintenance.

3 Product Description

3.1 Scope of supply

The scope of supply includes:

- GMK 210
- 9V - battery
- Operating manual
- Short manual

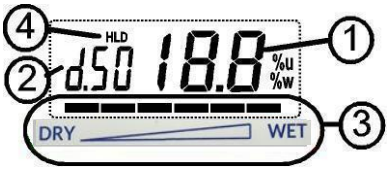
3.2 Operation and maintenance advice

Battery powered supply:
If 'bAt' is shown in the lower display the battery has been used up and needs to be replaced. However, the device will operate correctly for a certain time.

The battery must be taken out when storing the device above 50°C.
We recommend taking out the battery if the device is not used for a longer period of time.

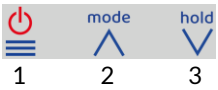
4 Handling

4.1 Display elements

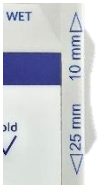


1: Main display	Display of the current moisture or water content
2: Material display	The name of the selected material characteristic curve is displayed
3: Moisture rating	Moisture rating via bar graph
4: HLD	The measuring value is “frozen” (hold-key)

4.2 Control elements



Key 1:	**on/off key** Press long: switch device off Press briefly: activation of backlight see chapter 11, “Li”
Key 2:	**mode up** Material selection: upwards, see chapter 5.5
Key 3:	**hold down** press briefly: The currently measured value is “frozen” (hold-function), “HLD” is displayed press for 2 sec.: Zeroing function (see chapter 5.6)
Keys 2 & 3 together:	**sort down** Material selection: downwards, see chapter 5.5



Depth switch: (on the right side)	**Sliding switch up: ca. 10 mm measuring depth (d 10)** **Sliding switch down: ca. 25 mm measuring depth (d 25)** After changing the measuring depth “d 10” (for 10mm) or “d 25” (for 25 mm) is briefly displayed.

4.3 Measuring spot: rear side

Rear side of the device:

The entire dark grey surface must lie on the measured material without any air gaps.

The areas marked “10 mm” (gray) and “25 mm” (white) indicate the areas under which measurements are primarily taken, depending on the position of the slide switch.

4.4 Start of operation

Switch the device on with the key.

After the segment test the device displays some information about its configuration:

5.10	If there is a slope adjustment for the 10 mm measurement (see chapter 12)
5.25	If there is a slope adjustment for the 25 mm measurement (see chapter 12)
P.oF	If the automatic-off-function is activated (see chapter 11)

The device is ready for measuring afterwards.

5 Measurement Basics

5.1 Measuring field & depth

The device measures by means of an electric field (capacitive measuring method), which propagates from the rear side downwards. The measuring depth can be changed between approx. 10 mm and 25 mm with the sliding switch.

Side view: measuring field and penetration depth for switch setting "10 mm"

Side view: measuring field and penetration depth for switch setting "25 mm"

The specifications for the penetration depth 10 mm and 25 mm are just approximate values. The actual depth will be higher the wetter the measured material is. Therefore, areas deeper than 25 mm will be measured in very wet materials and for switch setting 25 mm.

Lower values will be displayed when measuring thinner materials (e.g. plywood).

The area under which the measurement is predominantly taking place is marked on the rear side.

For precise measurements not only the marked measuring spots but the device's entire rear side must lie flat on the measured material. If there is an air gap between the device and the material the measured value will be too dry!

Some examples for measurements that are not precise (measured value too dry in all cases):

False: wrinkled surface (extreme example!)

False: unsteady surface

False: material too thin

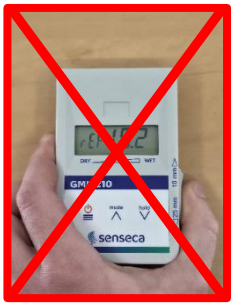
5.2 Humidity rating ('WET' - 'MEDIUM' - 'DRY')

In addition to the measuring value there is a moisture rating via a bar graph and an acoustic signal (if activated (see chapter 11): Therefore the determination 'wet or dry' is easy and comfortable for most applications and no longer has be deduced from literature and tables.

However, this rating can only be a first approximate value, because factors like the application field of the measured material must be considered for the final rating. This device cannot completely replace the knowledge of an experienced craftsman or technical expert.

5.3 Holding the device

The water content of the hand has an impact on the measuring value, if the device is held inappropriately.
The best results will be obtained if you lay the device down or hold it the way as shown in picture 3.



Picture 1: Held in a wrong way!

Picture 2: laid down – right!

Picture 3: Held in the right way!

5.4 Moisture *u* and water content *w*

Either moisture u or water content w is needed according to the application. Carpenters, joiners, etc. normally use moisture u (relating to oven-dry mass) Water content w is normally used for combustibles (i.e. wood briquette). You can choose whether the device should use moisture or water content (see chapter 11).

Moisture u (relating to oven-dry mass) - recommended setting

$$moisture\ u[\%] = ((mass_{wet} - mass_{dry}) / mass_{dry}) * 100$$

or:

$$moisture\ u[\%] = (mass_{water} / mass_{dry}) * 100$$

The unit is %u (also common: % atro, weight percent).

$mass_{wet}$: mass of the sample (= total mass = $mass_{water}$ + $mass_{dry}$)
$mass_{water}$: mass of the water contained in the sample
$mass_{dry}$: mass of the oven-dried sample after (water has been evaporated)

Example: 1kg wet wood that contains 500g water has a moisture u of 100%.

Water content w (= moisture relating to wet total mass)

$$water\ content\ [\%] = ((mass_{wet} - mass_{dry}) / mass_{wet}) * 100$$

or:

$$water\ content\ [\%] = (mass_{water} / mass_{wet}) * 100$$

The unit is %w.

Example: 1kg wet wood that contains 500g water has a water content of 50%.

5.5 Characteristics and materials

Characteristics	
rEF	Reference characteristics
d.45	Wood, density = 450 kg/m^3
d.50	Wood, density = 500 kg/m^3
d.55	Wood, density = 550 kg/m^3
d.60	Wood, density = 600 kg/m^3
d.65	Wood, density = 650 kg/m^3
d.70	Wood, density = 700 kg/m^3
d.75	Wood, density = 750 kg/m^3
d.80	Wood, density = 800 kg/m^3
d.85	Wood, density = 850 kg/m^3
d.90	Wood, density = 900 kg/m^3
d.95	Wood, density = 950 kg/m^3
d.99	Wood, density = 1000 kg/m^3
GrP	GRP (glass-fibre reinforced plastic)
ISO	Light insulation materials, e.g. Styrofoam

You can find a list of different types of wood and their corresponding characteristics d.xx in the addendum.
The materials are selected with these keys:

Material selection upwards: press mode ∧

Material selection downwards: press mode ∧ hold ∨ at the same time

The use of inappropriate characteristics can cause faulty measurements!

5.6 Zeroing function

For the best measuring results, it is recommended to run the zeroing function regularly:
Hold the device in the air as shown in the picture on the right and press the “hold” key for 2 seconds.
You can easily see whether the zero-point is ok with the “rEF” characteristic. If the device shows at air a value <0.5 or >0.5 or blinking “--” with “rEF” characteristic, you must run the zeroing function.

Please pay attention not to influence the zeroing function with your hands.
The best way to ensure this is shown on the right.

NOTE: The zeroing function adjusts the zero-point for 10 mm and 25 mm simultaneously.

6 Operating-Modes „Measuring Mode“ & „Detector Mode“

The device has two operating modes:

1. Measurement (curves: dEt oF)
2. Detector (relative measurement with adjustable alarm threshold: dEt on)

The modes can be switched via the configuration menu.

6.1 Measuring Mode

In the measuring mode (Configuration: dEt oF) material can be measured precisely. There are material curves available. The display is done in absolute unit (%u or %w). An appropriate rating is indicated as a bar graph or as an acoustic signal.

6.2 Detector Mode

In the detector mode (Configuration: dEt on, material selection is fixed: “dEt“ = rEF curve) moist spots, metal structures, beams in plasterboard, etc. can be searched for very comfortably with a high resolution and an adjustable alarm threshold („dEt SCL“). The measurement is relative (only rEF-curve! Display in „digit“ = no unit)

After the detector mode is enabled (Configuration: dEt on), a reasonable alarm threshold (=sensitivity „dEt SCL“) should be chosen, examples:

- Search for structures under drywall: 10
- Search for trouble spots on the hull: 10
- Search for wood or metal studs in plasterboard: 5

The alarm threshold determines at which display value maximum humidity is indicated (via bar display and beep).

Procedure:
Place the device on a reference point (dry) and perform a zero calibration by pressing the “hold” key until 0.0 is displayed (~ 2 seconds).
Slowly scan the area -> If increased moisture is detected, the alarm signal and the corresponding bar graph will indicate this, in addition to the changing display value.

Additional warnings in the detector mode:

Depth switch setting of 10 mm: When measuring at a depth of ~25 mm, a significantly higher moisture value is measured than is displayed.

Depth switch setting of 25 mm: When measuring at a depth of ~10 mm, a significantly higher moisture value is measured than is displayed.

7 Wood Measuring

Choose material corresponding to your type of wood according to the table in addendum A.
Example: You want to measure Scots pine -> select material d.50

Best results are obtained if you measure crossways to the wood's grain. (see right picture)

Unplaned or wrinkled surfaces result in measurements that are too low!

NOTE: Wood is a natural product. Its density fluctuates due to the tree's growth and flaws (knots, cracks, resin pockets, etc.). This may lead to measuring errors up to several %u, because the measurement depends on density.

If your kind of wood is not listed in addendum A, you must know its density (dry): for example, a wood of density 0.68 kg/dm^3 is measured with material d.70 (approximate actual density to the next material 0.52 ->d.50, 0.53 -> d.55).

8 Measurement of Other Materials

The device does not have saved characteristics for all materials. Even if there is no characteristic curve for your material you can still perform significant **relative measurements**.
We recommend the material "rEF" (dimensionless digit-value, intentional no %u or %w display) for this purpose.
For example, if you want to evaluate water damage you can measure a surely dry spot and an evidently wet one (identifiable by salt efflorescence, water spots, mould growth, etc.). Then you can compare the other measuring values with them and get the moisture distribution of your measuring area or find the reason for the moisture penetration.
You do not need absolute values (%u or %w) for this.

Please consider that the configuration of the measured wall (cavity block, cement joints, reinforcements, etc.) may also influence the measuring values.

9 Rating of Motor Homes and Caravans

Normal humidity should not cause serious problems at faultless and correctly used motor homes and caravans.
However, the following problems can occur due to increased humidity:

- Mildew together with its smell nuisance and health risks
- Damage to materials (wood rots, metals oxidize, “aluminum corrosion”, ...)

The humidity can occur from different sources:

- From the outside: rainwater or splash water gets into the structure through leaks in the vehicle’s hull
- From the inside: leaky installations and condensation water from humidity disposal of the passengers, cooking, potted plants, ...

To maintain the value of the vehicle it is important to detect and remove increased humidity as soon as possible.
The device can detect humidity in structures long before it is visible for human eyes (water patches). Although the device can even look “into” materials, it does not destroy or damage them.
Exception: Metal. In most cases, if metal structures are very close to the sensor area the device displays values that are too high. Therefore, metallic rods, reinforcement, aluminum insulation blankets, metal wires etc. can cause problems.

9.1 Materials and design

It is important to know the design of your motor vehicle/caravan for well-grounded ratings. Depending on the actual design there may be different weak points and spots, most likely for water entry from outside.
Following questions should be answered:

- Where are critical points like connections between wall and roof, windows, doors and gates, shower trays, sealings, gorges)
- Are the damages from accidents /repaired areas
- Is it a wooden framework construction? Especially common for older models.
- Is the hull a sandwich construction? Made of what materials?
- Where are metallic rods/reinforcements? Where are metal wires and pipes?

9.2 Defining measuring points for continuous inspection

We recommend to define measuring points from the outset and to check and record them regularly (at least every ½ year). This way humidity risks and impending damage can be recognized very early.

Defining the measuring points
The measuring points should be determined deliberately.
Especially weak points (edges/welds, windows, doors, etc.) should be monitored.

An overview of three possible weak points:
roof sealing, window sealing and assembly weld upper to lower trailer body
The reason here: old and porous window sealing

Consider the properties of water:

- water normally flows downwards: water accumulations at the side walls most commonly have their reason above the spot.
- water flows faster through gaps than through bulky materials, i.e. water can move along rods, cables, etc. to accumulation spots.

Absolute moisture (characteristic) and relative measurements
The device can display absolute material moisture if a suitable characteristic curve is selected and the measured component is bulky enough (at least thicker than ~8mm). In this case the moisture can be immediately rated (bar graph and buzzer).
Note: There are cases in which precise absolute moisture measurements (in [%]) and the ratings based on these measurements cannot be performed. However, a relative measurement may still be possible: for this purpose, the displayed measuring value is compared to a value measured at a definitely dry spot of the same material. A displayed value considerably higher than that reference value indicates a corresponding measuring point with most likely increased humidity.

Measuring at bulky components (parts of the wooden framework, etc.)
Select e.g. “wood characteristic”. Measuring depth 10 or 25mm, depends on thickness

Caravan floor: massive flake board, little protected

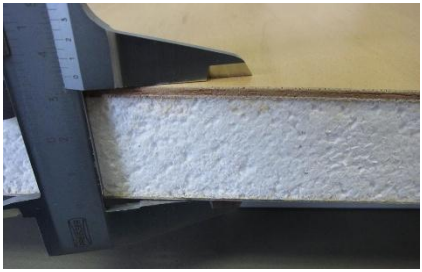
Measuring at thinner layers, rating of “sandwich”-construction
For wood veneers/parquet: “wood characteristic”. For GRP-layers (alcove, etc.) “GRP-characteristic.
Select measuring depths of 10mm to rate the material and 25mm to detect moisture behind the layer.

Measuring at insulations
Older models are often isolated with simple polystyrene -> measurable water accumulations can occur.
Attention! Here relative values are more relevant, because for insulation materials only very small display values are measured.

Suggested setting, if it is measured **directly on insulation: "ISO", 25 mm**.

Insulation and metal framing of an older caravan

Sandwich
Up-to-date sandwich constructions mainly use high-quality "closed-pore" insulation materials. This reduces moisture problems in plane areas, in open pore foams, there can be significant amounts of water.
Suggested settings for sandwich like picture:
- d.45, 25 mm for evaluation of Insulation
(- d.60, 10 mm for evaluation of plywood)
Please keep in mind: metal constructions below plywood can show extremely to high display values, wooden frames also may show to high values, but with the setting suggested above, no moisture warning will occur.



Example sandwich: aluminum - insulation - plywood

Alternatively the detector mode can be recommended instead of measuring mode:
please refer to 6 Operating-Modes „Measuring Mode" & „Detector Mode"

9.3 Measuring intervals / times

Inspections by the specialist retailer at regular intervals (annually) are common for new caravans/motor vehicles to preserve leak tightness warranty. This is reasonable but comes with costs!
Defects can lead to massive humidity damage within only little time. For example, mildew can form within few months.
Therefore, sensible measuring times are for example:
- immediately after long usage (e.g. together with final cleaning)
- at longer stationary phases, especially at non-roofed areas: every 3 months
- immediately after frost season
- during usage: regularly

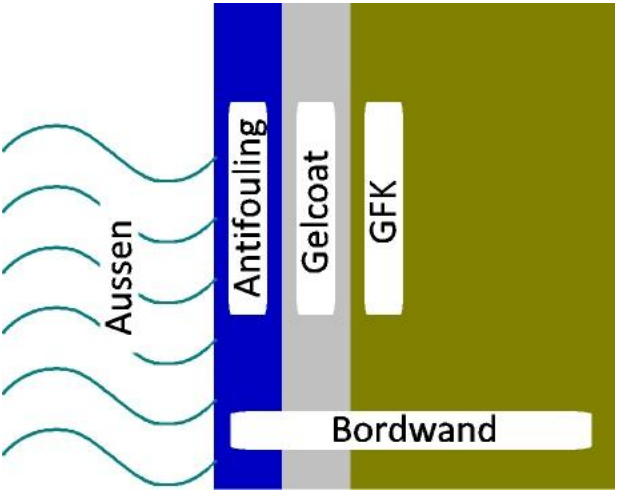
9.4 Repair

If there is a spot with critical moisture, then:

- **rectify the cause:** (replace sealing / supply sealing material …)
  This must be done professionally and with adequate materials and tools.
  The repairs should be done at a qualified garage or ask for advice from an expert.
- **dehumidify**
  e.g. with standard air dehumidifier or with alternating heating and venting
  Please consider (heating): preferably use electric heating but no simple gas heaters.
  Gas heaters produce humidity and there is a danger of suffocation!
  Close doors and windows (or only slightly opened) during heating.
  Please consider (venting): Open doors and windows as wide as possible for rapid air exchange
- **monitor**
  Check the corresponding parts/spots for a longer period (record values!) to make sure that ALL causes are rectified and the repair has been successful.

10 Rating of GRP boat hulls

10.1 Design principle of GRP hulls



The load-bearing material of GRP boats is **G**lass-fiber **R**einforced **P**lastic. This plastic is extremely robust, but water can enter the laminate structure due to osmotic and capillary effects and damage it permanently: The material gets deformed and unstable.

A **gel coat** layer protects the GRP laminate from water entering.

Antifouling: Paint coat protecting against growth of algae/bivalves etc.

If water has entered the GRP structure, it can very easily and nondestructively be measured with the GMK 210 without any further tools.

The device detects water inside the GRP structure by means of a capacitive measuring principle. Water has a relatively high permittivity. Examples of different permittivity values:

Vacuum/air	1
Polyester- and Epoxy resin	~ 3...4
Glass-fiber	~6...7
Water	~80

Structures containing carbon fibers or structures with metallic/graphitic coatings cannot be evaluated.
Metallic elements will also cause increased display values.

10.2 Procedure

Recommended settings:
- Measuring mode, characteristic “GrP”, %u, measuring depth 25mm.
- or detector mode “dEt” %u, measuring depth 25mm (refer to chapter 6.2)

Sometimes a wood characteristic (e.g. d.50) is used. Although this is not generally senseless, you must keep in mind that in this case the displayed values (in %) can only serve as comparative values but not as absolute values. The electric properties used by the device for measurement are different for wood and GRP! Remember this especially if you want to compare values of different devices!

The surface of the boat hull must be dry for measurement. Humidity on the surface will cause unrealistically high display values!

Additionally, wait at least 2 days after the boat has been lifted out of the water before starting a measurement: The antifouling can contain a large amount of water without causing any damage, but the measurement would be falsified.

It is reasonable to assume that the boat hull contains almost no water above the waterline. Thus perform a **reference measurement above the waterline.** Values below 2% should be expected.
Below the waterline the values will be higher, especially if the boat has been in the water for a long time. This must not necessarily be problematic. However, if the measuring value exceeds 3% there should be further investigations.
Areas with pimples or water accumulations not seen from the outside cause considerably higher measuring values.

It is important that the boat hull is well dried-up before a new antifouling is applied or the boat gets reconstructed.
The following procedure may be helpful to monitor the dry-up of the hull:
Search for crucial measuring spots (visible damages, keel/rudder connections, other areas with increased measuring values) and mark them with a water-proof marker.
Record the values at those measuring spots.

11 Configuration of the device

Follow these instructions to configure the functions of the device:

- Switch the device off.
- Press mode and keep it pressed, while turning the device on (briefly press ⏻). Release the mode-button not before the first parameter "P.oF" is displayed.
- Set parameter with up mode or down hold.
- Jump to the next parameter by pressing ⏻.

Parameter	Value	Information
Button ⏻	**Buttons** mode / hold	
dEt	**Detector Mode**	*factory setting: oF*
	oF	Device measures absolute humidity parameters (%) – material curves are available
	on	Device operates as a detector (relative measurement only) with adjustable sensitivity
dEt / SEn	**Detector Mode: Sensitivity**	*factory setting: 10 (only when dET on)*
	5 … 100	Sensitivity of the bar graph and acoustic signal Set value corresponds to maximum rating via bar / acoustic signal
P.oF	**Auto Power-Off** (turn-off delay)	*factory setting: 20 min*
	1 … 120	**Auto Power-Off** (turn-off delay) in minutes. If no key is pressed for the time adjusted here, the device is automatically switched off (adjustable 1 … 120 min)
	oF	Auto power-off is deactivated (continuous operation)
Uni	**Display unit**	*factory setting: %u*
	%u	Measuring value displayed in moisture %u
	%w	Measuring value displayed in water content %w
Li	**Backlight**	*factory setting: 5*
	oF	No backlight
	5 … 120	Backlight turns automatically off after 5 …120s (battery saving)
	on	Backlight always on as long as device is switched on
ton	**Acoustic signal**	*factory setting: on*
	oF	No acoustic signal
	on	Acoustic signal for moisture rating

HLD AUt	**Auto Hold**	*factory setting: oF*
	oF	Auto Hold deactivated: pressing hold-key freezes measuring and releases it again
	on	Auto Hold activated: hold-key starts new measurement, the display will be "frozen" as soon as a stable measuring value was detected.
Ini	**Restore factory settings**	
	no	Parameters are not changed to factory settings.
	Go	**ATTENTION:** All parameters are changed to factory settings.

Press again to store changed settings, the device restarts (segment test).

NOTE: If no key is pressed for more than 2 minutes, the configuration will be canceled. Any changes made up to that point will not be saved!

12 Adjustment

The accuracy can be checked with the **testing probe PW 25** (optional accessory).
Select the material "rEF" and run the zeroing function (see chapter 5.6).
Lay the device onto the testing cube. If the device displays a value different from the value printed on the cube for the device, you can use the slope correction to adjust the device:
Displayed value rEF = (measured value rEF * (1 + slope correction / 100)
Follow these instructions to adjust the device:

- Switch the device off.
- Press hold and keep it pressed, while turning the device on (briefly press).
  Release the hold-button not before the first parameter "5.10" is displayed.
- Set parameter with up mode or down hold.
- Jump to the next parameter by pressing .

Parameter	Value	Information
Button	**Buttons** mode hold	
5.10	**Slope correction for measuring depth 10 mm**	*factory setting: of= 0%*
	oF / -19 ... +19	Value of slope correction in %
5.25	**Slope correction for measuring depth 25 mm**	*factory setting: of= 0%*
	oF / -19 ... +19	Value of slope correction in %

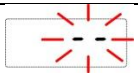
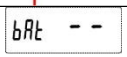
Press again to store changed settings, the device restarts (segment test).

NOTE: If no key is pressed for more than 2 minutes, the configuration will be canceled. Any changes made up to that point will not be saved!

13 Accuracy Inspection: Adjustment /Update Service

You can send the device to the manufacturer or retailer for adjustment and inspection. Moreover, the manufacturer can do the latest software update. This ensures that future improvements are provided to owners of older devices in a cost-saving way. You can display the current software version if you do not release the on/off button after you switched the device on, but hold it for more than 5 seconds. (i.e. “r. 1.0”)

14 Error and System Messages

Er. 1	Value exceeding measuring range, value too high
Er. 7	System error – the device has detected a system error (device defective or not within working temperature)
	Blinking dashes: Value below display range, (value < 19) Was an incorrect zero-point adjustment performed?
	The blinking bAt display indicates low battery voltage, device will continue to work for a short time.
	The battery is consumed and must be changed. Measurements are no longer possible.

15 Disposal

Separation by material and recycling of device components and packaging must take place at the time of disposal. The valid regional statutory regulations and directives applicable at the time must be observed.

NOTE

The device must not be disposed of with household waste. Return it to us, freight prepaid. We will then arrange for the proper and environmentally friendly disposal.

Private end users in Germany have the possibility of dropping off the device at the municipal collection center. Batteries must be removed beforehand!
Please dispose of empty batteries at the collection points intended for this purpose.

16 Specifications

Measurement	
Method	Capacitive (=dielectric) measuring methohd, non-destructive
Depth	2 selectable: approx. 10 mm and approx. 25 mm
Characteristic curves	15 characteristic curves for wood additionally reference curve (rEF) for high-resolution relative
Resolution	0.1 %; for more than 19.9 %: 1 % (for both %u and %w)
Moisture rating	Display: Rating of the moisture in 6 levels from WET to DRY Acoustic: Signal tone, depending on moisture rating
Accuracy	The achievable accuracy depends significantly on the application and the properties of the measured material!
Display	2 displays for material and measured value, backlight
Acoustic signal	Moisture rating via relating acoustic signal
Hold function	Press button to freeze current value.
Working temperature	-5 to 50 °C; 0 to 80 % RH (non-condensing)
Storage temperature	-25 to 70 °C
Power supply	9 V-battery (included)
Power consumption (measurement)	Approx. 0.12 mA (battery life: more than 2500 hours for alkaline battery)
Power consumption (backlight)	Approx. 2.5 mA (Backlight reduces battery life! Automatic turn off function is selectable)
Used battery display	“bAt” displayed if battery used, warning: “bAt” blinking
Auto off-function	Device will be automatically switched off if not operated for longer time (adjustable from 1...120min)
Housing	Impact-resistant ABS plastic housing, front side IP65
Dimension	Approx. 106 x 67 x 30 mm (H x W x D)
Weight	Approx. 145 g incl. battery
Directives and standards	The instruments confirm to following European Directives: 2014/30/EU EMC Directive 2011/65/EU RoHS Applied harmonized standards: EN 61326-1:2013 emissions level: class B emi immunity according to A.1 Additional fault: <1% EN IEC 63000:2018

Addendum A: Wood types table

english	lat.	charact.
Abachi	Triplochiton scleroxylon	d.45
Afzelia	Afzelia spp.	d.75
Ash, American-	Fraxinus americana	d.65
Ash, European-	Fraxinus excelsior	d.65
Ash, Manchurian-	Fraxinus mandshurica	d.60
Balau, Bangkirai-	Shorea laevis	d.90
Balau, Red-	Shorea guiso	d.85
Beech, European-	Fagus sylvatica	d.65
Bintangor	Calophyllum kajewskii	d.65
Birch,White-	Betula pubescens	d.60
Birch, Yellow-	Betula lutea	d.65
Bossè	Guarea cedrata	d.55
Bubinga	Guibourtia demeusii	d.85
Cedar, White	Melia azedarach	d.55
Cherry, Black-	Prunus serotina	d.60
Cherry, Wild-	Prunus avium	d.55
Cypressus	Cupressus spp.	d.45
Douglas-fir, Common-	Pseudotsuga menziesii	d.50
Douka	Thieghemella africana	d.65
Ebony	Diospyros spp.	d.99
Elm	Ulmus amer./Ulmus spp.	d.60
Fir, European Silver-	Abies alba	d.45
Fir, Grand-	Abies grandis	d.45
Fir, Pacific Silver-	Abies amabilis	d.45
Fir, Red-	Abies magnifica	d.45
Gum, Sweet	Liquidambar styraciflua	d.50
Hemlock	Tsuga heterophylla	d.45
Hickory	Carya spp.	d.75
Iroko	Chlorophora excesla	d.65
Jarrah	Eucalyptus marginata	d.75
Jelutong	Dyera costulata	d.45
Jeqituiba	Cariniana spp.	d.70
Kapur	Dryobalanops spp.	d.60
Karri	Eucalyptus diversicolor	d.85
Larch, European-	Larix decidua	d.55
Larch, Japanese-	Larix kaempferi	d.55
Larch, Western-	Larix occidentalis	d.55
Limba	Terminalia superba	d.50
Linden, American	Tilia americana	d.45
Linden, Common-	Tilia vulgaris	d.50
Locust, Black-	Robinia pseudoacacia	d.70
Magnolia, Cucumber-	Magnolia acuminata/grandiflora	d.50
Mahogany	Swietenia spp.	d.50
Mahogany, African-	Khaya spp.	d.50
Mahogany, Philippine-	Parashorea plicata / Shorea almon	d.50
Maple, New Guinea	Flindersia pimentelianan	d.55
Maple, Sugar-	Acer saccharum	d.70
Maple, Sycamore-	Acer pseudoplatanus	d.55
Mengkulang	Heritiera spp.	d.65
Meranti, Dark Red-	Shorea spp.	d.65
Meranti, White-	Shorea hypochra	d.55
Meranti, Yellow-	Shorea multiflora	d.55

english	lat.	charact.
Merawan	Hopea sulcala	d.70
Merbau	Intsia spp.	d.75
Mersawa	Anisoptera laevis	d.60
Messmate	Eucalyptus obliqua	d.80
Oak, Northern Red-	Quercus spp.	d.65
Oak, Sessile-	Quercus petraea	d.65
Oak, Sawtooth-	Quercus spp.	d.65
Oak, White-	Quercus spp.	d.65
Olive	Olea hochstetteri	d.85
Padouk, African-	Pterocarpus soyauxii	d.70
Paldao	Dracontomelum dao	d.65
Pine, Black-	Podocarpus spicatus	d.50
Pine, European Black-	Pinus nigra	d.55
Pine, Loblolly-	Pinus taeda	d.50
Pine, Lodgeole-	Pinus contorta	d.45
Pine, Longleaf-	Pinus palustris	d.60
Pine, Maritime-	Pinus pinaster	d.50
Pine, Norway-	Pinus resinosa	d.45
Pine, Parana-	Araucaria angustifolia	d.50
Pine, Ponderosa-	Pinus ponderosa	d.45
Pine, Radiata-	Pinus radiata	d.50
Pine, Scots-	Pinus sylvestris	d.50
Pine, Sugar-	Pinus lambertiana	d.45
Poplar, Black-	Populus nigra	d.45
Redcedar, Western-	Thuja plicata	d.45
Rengas	Gluta spp.	d.60
Rimu	Dacrydium cupressinum	d.50
Redwood, California-	Sequoia sempervirens	d.45
Rosewood, Brazilian	Dalbergia latifolia / -nigra	d.85
Rosewood, N. Guinea	Pterocarpus indicus	d.55
Rubber Tree	Hevea Brasiliensis	d.50
Sapele	Entandrophragma cylind.	d.65
Sipo	Entrandrophragma utile	d.60
Spruce	Picea abies	d.45
Spruce, Sitka-	Picea sitchensis	d.45
Tiama	Entandrophr. angolense	d.55
Teak	Tectona grandis	d.65
Torem	Manilkara kanosiensis	d.95
Tualang	Koompassia excelsa	d.80
Walnut, Eastern Black-	Juglans nigra	d.60
Walnut, Common-	Juglans regia	d.60
Wenge	Millettia laurentii	d.80

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