Operating Instructions

for

Manual Humidity Precision Measuring Unit

Model: HND-F205

1. Contents

Manufactured and sold by:

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2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The instruction manuals on our website www.kobold.com are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:
The standard delivery includes:

- Manual Humidity Precision Measuring Unit model: HND-F205

4. Regulation Use

Any use of the Manual Humidity Precision Measuring Unit, model: HND-F205, which exceeds the manufacturer's specification, may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

5. Operating Principle

The KOBOLD manual measuring units HND-F205 were a completely new development and offer decisive advantages in handling, user-friendliness, scope of functions, and accuracy during measuring work.

6. Electrical Connection

6.1 Mains Operation

Attention: When using a power supply unit please note that operating voltage has to be 10.5 to 12 V_{DC}. Do not apply over voltage!! Simple 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002. Prior to connecting the plug power supply with the mains supply make sure that the operating voltage stated at the power supply is identical to the mains voltage.

- Treat device and probes carefully. Use only in accordance with above specification (do not throw, hit against etc.). Protect plugs and sockets from soiling.
- To disconnect sensor plug do not pull at the cable but at the plug.
- When connecting the probe, the plug will slide in smoothly if plug is entered correctly.
- **Selection of Output-Mode**: The output can be used as serial interface or as analogue output. This choice has to be done in the configuration menu.

7. Operation / Configuration / Adjustments

7.1 In General

7.1.1 Safety Instructions

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

1. Trouble-free operation and reliability of the device can only be guaranteed if it is not subjected to any other climatic conditions than those stated under *9 Technical Information*.
2. Transporting the device from a cold to a warm environment condensation may result in 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.
3. The circuitry has to be designed most carefully if the device should be connected to other devices. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

Warning: Operating the device with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) may result in hazardous voltages at the device (e.g. at sensor socket)

4. Whenever there may be a risk whatsoever involved in running it, the device has to be switched off immediately and to 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.

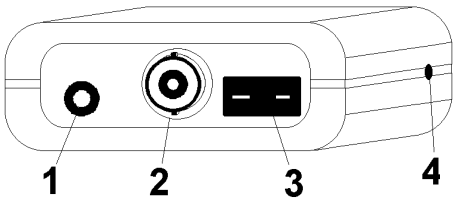
Warning: Do not use this product as safety or emergency stop device, or in any other application where failure of the product could result in personal injury or material damage. Failure to comply with these instructions could result in death or serious injury and material damage.

Risk of injury! The used measuring heads are very sharp, use thoroughly during your measuring to eliminate a possible risk of injury.

7.1.2 Disposal Notice

- Dispense exhausted batteries at destined gathering places.
- Send the device directly to us, if it should be disposed. We will dispose the device appropriate and non-polluting.

7.1.3 Connections

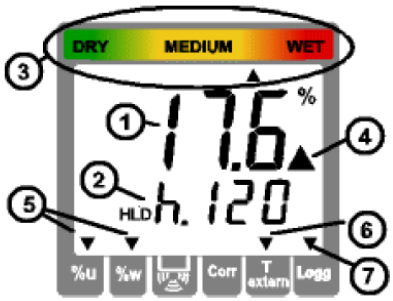


1. **Output:** Operation as interface:
   Connect to optically isolated interface adapter (accessory: HND-Z031/-Z032)
   Operation as analogue output:
   Connection via suitable cable.

Attention: The output mode has to be configured and influences battery life!

2. **Sensor-connection:** BNC
3. **Temperature-probe-connection:** Thermocouple type K (NiCr-Ni) for temperature-compensation with an external temperature-probe
4. The **mains socket** is located at the left side of the instrument.

7.1.4 Display Elements



1 = Main Display: Currently measured material moisture
[percent by weight]
HLD: Measure value is ‘frozen‘ (Button 6)

2 = Auxiliary Display: Currently selected material (or temperature when pressing Button 3)

Special display elements:

3 = Moisture estimation: Estimation of the material condition: via top arrows: DRY - MEDIUM - WET

4 = Warning triangle: Indicates low battery

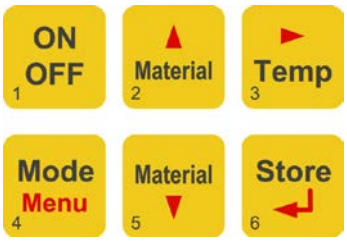
5 = “%u” or “%w” Displays unit: moisture content u or wet basis moisture content w

6 = T EXTERNAL-ARROW Appears if an external temperature-probe is connected and automatic temperature compensation is activated.

6 = LOGG-ARROW Shown if logger function is selected, flashes if cyclic logger is running

All remaining arrows have no function in this version.

7.1.5 Pushbuttons



key 1: On/Off key

key 4: Set/Menu
press (Menu) for 2 sec.: configuration will be activated

key 2, 5: **During measure: select a material**
p.r.t.*: 7.4.2 Pre selection of favourite materials ('Sort')*
List of selectable materials:
Appendix A; Appendix B

With manual temperature compensation:
When displaying temperature (call via button 3‚Temp'):
Input of temperature

up/down for configuration:
to enter values or change settings

Key 6: **Store/↵:**
Measurement:
with **Auto-Hold off: Hold current measuring value** ('HLD' in display)
with **Auto-Hold on: Start a new measure**, which is ready when 'HLD' appears in the display
refer to chapter *7.3.3 Auto-Hold Function*
or **calling of the logger functions** (refer to chapter *7.5 Operation of Logger*)
Set/Menu or temperature input:
confirming of selected input, return to measure

Key 3: **During the measure:** shortly displaying temperature or changing to temperature input.

7.2 Device Configuration

Note: Some menu items will be shown depending on the actual device configuration (e.g. there are some items disabled when the logger contains data). Please note the hints by the menu items.

For configuration of the device press "**Menu**"-key (key 4) for 2 seconds, the main menu will be shown (main display: "SEt"). Choose the desired menu branch by pressing the "**Menu**"-key (key 4). By pressing " ▸ " (key 3) the referring parameters can be chosen. The referring values are changed by pressing the keys "▴" (key 2) or "▾" (key 5) (Choice of parameter: " ▸ "). Pressing **"Menu"** (key 4) again will jump back to the main menu selection and stores the settings.
Use key " **Store/↵**" (key 6) to leave configuration.

Menu	Parameter	Values	Meaning		
key **Menu**	key ▸	key ▲ or ▼			see chapter
Set Sort	**Set Sort: limitation of the material selection**				
SEt Sort	Sort	**off:**	Unrestricted material selection via key 2 and 5	*	***7.4.2***
		1...8:	Material selection in-between 1 up to 8 selectable materials		
	Sor.1 ....Sor.8		selectable materials (not available if Sort = off) Select the desired material that should be available during the measure via key 2 and 5.	*	***7.4.2***
Set Conf	**Set Configuration: Generic Settings**				
SEt Conf	Unit %	**Arrow bottom left points to "%u"**	Moisture display = moisture content [%u]	*	
		Arrow bottom left points to "%w"	Moisture display = wet-basis moisture content [%w]		
	Unit °C °F	**°C:**	All temperature values are in degrees Celsius		
		°F:	All temperature values are in degrees Fahrenheit		
	Atc	**oFF:**	Atc off: temperature input for compensation via keys	*	***7.3.4***
		on:	Atc on: temperature compensation via internally measured temperature or external probe	*	
	Auto HLD oFF	**oFF:**	Auto HLD off: continuous measuring.	*	***7.3.3***
		on:	Auto-HLD on: when reaching a stable measuring result, this will be frozen with-HLD. When pressing the store-key a new measure will be initiated. If logger is switched on (‚Func CYCL', ‚Func Stor'): device works like setting would be "auto-HLD off"		
	P.oFF	**1...120**	Power-off delay in minutes. Device will be automatically switched off as soon as this time has elapsed if no key is pressed/no interface communication takes place		
		oFF	Power-off function inactive (continuous operation, e.g. mains operation)		
	Out	**oFF:**	Function of the output: No output function, lowest power consumption		***7.6***
		SEr:	Output is serial interface		
		dAC:	Output is analogue output 0...1 V		
	Adr.	**01,11..91**	Base Address when Output = Serial Interface : Base address of device for interface communication.		***7.6.1***
	dAC.0	**0.0...100.0 %**	Enter desired moisture value at which the analogue output potential should be 0 V		***7.6.2***
	dAC.1	**0.0...100.0 %**	Enter desired moisture value at which the analogue output potential should be 1 V		***7.6.2***
Set Logg	**Set Logger: Configuration Of Logger Function**				
SEt Logg	Func	**CYCL**	Cyclic: logger function ‚cyclic logger'	*	***7.5***
		Stor	Store: logger function ‚individual value logger'		
		oFF	no logger function		
	CYCL	**0:30... 60:00**	Cycle time of cyclic logger [minutes:seconds]	*	***7.5.2***

Menu	Parameter	Values	Meaning		
key **Menu**	key ▶	key ▲ or ▼			see chapter
Set CLOC	**Set Clock: Setting Of Real Time Clock**				
SEt CLOC	CLOC	**HH:MM**	Clock: Setting of time hours:minutes		
	YEAr	**YYYY**	Year		
	dAtE	**TT.MM**	Date day.month		

Hint: The settings will be set to the settings ex works, if keys 'Set' and 'Store' are pressed simultaneously for more than 2 seconds. (*) If the logger memory contains data already, the menus/parameters marked with (*) can not be invoked! If these should be altered, the logger memory has to be cleared before! If the manual logger contains data (Logger: 'Func Stor'), the first menu displayed will be: 'rEAd Logg' please refer to chapter 7.5.1 *„Func-Stor": Storing Single Measurements*

7.3 Some Basics of Precision Material Moisture Measuring

7.3.1 Moisture Content u and Wet-Basis Moisture Content w

Depending on the Application one of the two units is necessary.
Carpenters, joiners and the like commonly use the moisture content u (sometimes referred to as MC). When evaluating firewood, wood chips etc., wet basis moisture content w is needed.
The instrument can be configured to both of the values. Please refer to chapter "configuration".

Moisture content u or MC (relative to dry weight) = dry basis moisture content (mind the arrow at left bottom!)
The unit is %, sometimes used: % MC.
The unit expresses the moisture content like calculated below:

Moisture content u [%] = ($weight_{wet}$ - $weight_{dry}$) / $weight_{dry}$ *100
Or: Moisture content u [%] = ($weight_{water}$) / ($weight_{dry}$) *100
$weight_{wet}$: weight of the wet material
$weight_{water}$: weight of water in the wet material
$weight_{dry}$: oven-dry weight of material
Example: 1kg of wet wood, which contains 500g of water, has a moisture content u of 100%

Wet-Basis Moisture Content w (relative to total weight, mind the arrow at left bottom!)

The wet-basis moisture content expresses the ratio of the mass of water to the total mass of the substance. The ratio is represented by the following equation (the unit is % as well):

wet-basis moisture w[%] = ($weight_{wet}$ - $weight_{dry}$) / $weight_{wet}$ *100

Or: wet-basis moisture w[%] = ($weight_{water}$) / $weight_{wet}$ *100

Example: 1kg of wet wood, which contains 500g of water, has a moisture content u of 50%

7.3.2 Special Features of the Device

466 wood specimens and 28 building materials are stored directly in the memory of the device:

Thus, more exact measurements could be reached than with common devices with group selections would ever reach. Even the usage of complex conversion tables for building materials won't be necessary any more!

Example: Common wood-moisture-measuring-devices use one single group for spruce and oak, in reality the deviation of these characteristic curves is more than 3 %! (Base for this statement is complex statistical surveys, considered measuring range 7-25 %). This random error will not occur for the whole HND-F-series; with the help of individual characteristic curves highest resolution is achieved.

Extreme wide measuring range: 0-100.0 % (depending on characteristic curve) percent by weight in wood.

Moisture estimation: Additionally, to the measuring value, individual moisture estimation will be displayed simultaneously.

7.3.3 Auto-Hold Function

Particularly when measuring dry wood, electrostatic charges and other similar noise could dither the measuring value. With activated auto-hold function the device will acquire an exact measuring value automatically. During that, the device could be put down to avoid noise through discharge of the clothing etc. After having acquired the measuring value, the display will change to 'HLD': The value will be frozen as long as a new measuring is initiated by pressing button 6 (store).

Attention: If the logger is switched on ('Func CYCL' or 'Func Stor'), the auto-hold function can not be used. The device works like it is set to Auto-HLD = off.

7.3.4 Automatic Temperature-Compensation ('Atc')

Exact temperature compensation is important for a reliable wood-moisture-measuring. These devices feature a high-quality thermocouple-input for type k thermocouples. Thus, you could connect common surface-temperature-probes – The needed measuring-time ‘afield’ will be drastically lowered compared to common (non-surface-) temperature-probes
The used temperature-value therefor is:

Menu	**Used temperature-value**		**Aux. Display**
Atc on	Temperature-probe connected	Temperature-measuring through connected probe	Display-arrow ‘T extern‘
	No temperature-probe connected	Device-internal temperature-measuring	
Atc off	Independent from temperature-probe	Manual input of temperature: shortly press Temp-Button, then use ▲ (button 2) or ▼ (button 5) to input the temperature, confirm selection with ‘Store‘(button 6)	

Attention: When connecting a probe that is non-insulated you must have to observe not touching the wood or the electrodes nearby the unshielded electrode. We suggest using our insulated probe HND-FF10 (already included in standard case sets HND-FF12/-FF13.

7.3.5 Measuring in Wood: Measuring with two measuring-pikes

Normally wood is measured with measuring-pikes. Used electrodes: impact-electrode HND-FF02 or –FF03, reciprocating piston electrode HND-FF01. For measuring wood, punch in the measuring-pikes across to the wood-grain, having a good contact between the pikes and the wood (measuring along wood-grain deviates minimal)

Reciprocating piston electrode HND-FF01 with temperature-probe –FF10

Select **correct wood-sort** (refer to Appendix A).
Ensure measuring the **correct temperature**
(see chapter *7.3.4 Automatic Temperature-Compensation ('Atc')*).
Hint: The special HND-FF10 temperature-probe can be stuck into a hole punched in with the electrode before (see picture on left). Now read the measuring-value or when having activated the auto-hold-function initiate a new measuring by pressing ***Store/↵*** (button 6) .
The measured resistance will be extremely high when measuring dry wood (<15 %) thus the measuring will need more time to achieve its final value. Among other things static discharge could momentarily falsify the measuring. Therefore beware of static discharge and wait long enough until a stable measuring value is displayed (unstable: „%“ blinking) or use the auto-hold-function (see chapter *7.3.3 Auto-Hold Function*).
Most accurate measurements can be carried out within the range of **6 to 30 %**.
Beyond this range the acquirable accuracy will lessen, but the device will deliver reference values still sufficient for the practitioner.

It is measured between the measuring-pikes insulated among each other.
Requirements for an exact measurement:

- choose right correct place to measure: place should be free of irregularities like resin–clusters, knurls, rifts, etc.
- choose correct measure depth: Recommendation for trimmed timber: punch in the pikes up to 1/3 of the material thickness.
- Perform multiple measurements: the more measurements will be averaged, the more exact the result will be.
- Pay attention to temperature-compensation: the temperature-probe should be measuring the temperature of the moisture-measuring-place when measuring with external temperature-probe (Atc on).
  Without temperature-probe: let the device adapt to the temperature of the wood (Act on) or enter the exact temperature manually (Act off).

Frequent sources of errors:

- Attention with oven-dried wood: the moisture dispersion may be irregular; often in the core is more moisture than on the edge.
- Surface-moisture: The wood-edge could be more humid than the core if the wood had been stored outside and e.g. was in rain.
- Wood preservative and other treatment could falsify the measuring.
- Fouling at the connections and round the pikes could result in erroneous measurement, especially with dry wood.

7.3.6 Measuring other Materials

7.3.6.1 'Hard' Materials (concrete or similar): Measuring with brush-type probes (HND-FF06 or HND-FF05)

Measuring concrete with brush probe HND-FF06

Drill two holes with Ø6 mm (HND-FF05) or Ø 8 mm (HND-FF06) at intervals of 8 to 10 cm into the material to be measured. Do not use edgeless drills: the resulting heat will evaporate the moisture which will result in faulty measures. Wait for at least 10 min, blow out the holes to clean them from dust. Apply conductivity compound on the brush-type probes and stick them into the holes. Choose correct material (see *7.3.4 Automatic Temperature-Compensation ('Atc')*), read the measuring value. Observe that the holes dry out by-and-by, and the device will measure a value too low, if you want to use them several times.

This effect can be compensated by using conductivity compound: insert profuse conductivity compound between the holes and the brush-type probe, and let the electrode stick in the hole for about 30 min before measuring (with the device switched off). Temperature-compensation plays no role when using the building material measuring.

7.3.6.2 'Soft' Materials (polystyrene or similar): Measuring with measuring-pikes or -pins (HND-FF04)

Useable electrodes: impact electrode HND-FF02 or HND-FF03, reciprocating piston electrode HND-FF01. Procedure as described in chapter measuring in wood.

7.3.6.3 Measuring bulk cargo, bales and other special measures

Usable probes e.g. injection probe HND-FF14 or measuring pins –FF04 mounted on –FF02 or –FF03.

Measuring of splints, wood chips, insulating material and similar:

When using injection probes or measuring pins oscillating movements have to be avoided when pushing in the probes. Otherwise hollows between the probes and the material may falsify the measuring. The material should be sufficiently compressed. When in doubt, repeat the measuring a few times: the highest measuring value is the most exact one. Especially when using the injection probe, pay attention to having a foulness-free plastic insulator (situated immediately underneath the measuring-pike).

Measuring bale of straw and hay bale: Always inject the electrodes from the plain side of the bale, never from the round side, the probe can be inserted much more slightly.

7.3.7 Measuring of materials, having no characteristic curves stored

Choose the representative universal material group „h.A“, „h.b“, „h.c“ und „h.dif a conversion table exists.

Attention: The moisture evaluation wet/dry of these material groups is only valid for wood! Please keep in mind the following when using the temperature-compensation: Automatic temperature-compensation should always be activated when measuring wood (Act on), with all other materials the automatic temperature-compensation should be switched off (Act off) and a manual temperature of 20 °C should be entered.

Additionally, at HND-F205: The HND-F205 can store up to 4 additional user characteristic curves. For this, the corresponding reference point measurements for the respective material have to be carried out, from which the exact moisture content has to be dedicated with the Darr-Probe or the CM-Method. The Results can be stored in the device with the help of the GMHKonfig-Software, and can be accessed by the device directly.

7.4 Hints for special functions

7.4.1 Moisture Estimation ('WET' - 'MEDIUM' - 'DRY')

Additionally, to the measuring value, individual moisture estimation will be displayed simultaneously: The decision either wet or dry has no longer been affiliated from literature and tables for the most applications. This moisture estimation is only a guidance value; the final evaluation is depending on the application of the material e.g:

Cement floor pavement ZE, ZFE
without additives: Readiness without floor heating at 2.3 % with floor heating 1.5 %

Anhydrit floor pavement AE, AFE: Readiness without floor heating at 0.5 % with floor heating 0.3 %*

Corresponding standards and instructions must be observed!
The device can only complement the skill of a tradesman or investigator but cannot replace it!

7.4.2 Pre-selection of favourite Materials ('Sort')

A pre-selection of different materials (up to 8) can be selected from the menu for an effective working with the device. For example, you can set the Menu Sort to 4 and save the desired materials in Sor.1, Sor.2, Sor.3 and Sor.4 if you only measure 4 different materials. (Please refer to chapter *7.2* .Device Configuration.)
Only the 4 desired materials can be selected via the buttons up and down, when exiting the menu, a changing during the measurement can be done comfortably. All materials will be available when setting Sort to off. Sor.1 to Sor.4 will still be available in the 'background', when setting the menu Sort to 4 the limited selection of the 4 entered materials will be active again. If you only want to measure one material: Set the menu Sort to 1, in this case you cannot change to another material, thus a faulty operation is impossible.

7.4.3 Individually Programmable Characteristic Curves

There are 4 individually programmable characteristic curves integrated.
By using them, there can be used other material curves than the already integrated ones.
The programmable curves can be read and programmed by the software GMHKonfig.
As standard they are preset with the REF-curve. This curve is the base of the determination of user specific curves.
Each curve is defined by a table with two columns (measuring value REF [%] / display value [%]) with 20 rows.
The name of the curve, which is displayed in the lower display, can be set individually. Characters, which cannot be displayed, are displayed as a space character.
Each curve also contains limit values for wet and dry estimation.
As temperature compensation there is a choice between the standard compensation for wood or linear compensation.
If there should be used no temperature compensation: Choose linear compensation and enter 0 as compensation factor.

Linear temperature compensation:

MC compensated (T) = MC uncompensated*
(1+ compensation factor/10000 * (T-20 °C)
MC = moisture content

7.5 Operation of Logger

The device supports two different logger functions:

„Func-Stor“: Each time when „store“ (key 6) is pressed, a measurement will be recorded.

„Func-CYCL“: Measurements will automatically be recorded at each interval, which was set in the logger menu ‚CYCL‘ until the logger will be stopped or the logger memory is full. The recording is started by pressing „Store“ 2 seconds.

The logger records 1 measurement result each time. For the evaluation of the data the software HND-Z034 (V1.7 or higher) has to be used. The software also allows easy configuration and starting of the logger.
When the logger is activated (Func Stor or Func CYCL) the hold and auto hold functions are no longer available, key 6 is solely used for the operation of the logger functions.

7.5.1 „Func-Stor“: Storing Single Measurements

Each time when „store“ (key 6) is pressed a measurement and its time stamp will be recorded. The recorded data can be viewed either in the display (when calling the configuration an additional menu „REAd LoGG“ is displayed, see below) or by means of the interface and a PC.

The logger stores the current measuring, independent from the stability of the value.

The material curve can be altered like during a normal measuring.

Max. number of measurings: 99
A measuring contains:
- current measuring value at the time of recording
- temperature value at the time of recording
- material curve at the time of recording
- time and date of the recording

After each recording „St. XX“ will be displayed for a short time. XX represents the number of the recording.

When logger memory contains recordings already:
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

If the logger memory is full, the display will show: 

Viewing Recorded Measurings
Within the „LoGG Stor“ function, the measurings can be viewed directly in the display not only by means of a computer (like at „Func CYCL“): press 2 seconds „Set“ (key 4): The first menu displayed now is „rEAd LoGG“ (read logger data). After pressing ▶ (key 3) the measurement recorded last will be displayed, changing between the different data referring to the measurement also is done by pressing ▶.
Changing the measurement is done by pressing the keys ▲ or ▼.

7.5.2 „Func-CYCL“: Automatic Recording with selectable Logger-Cycle-Time

The Logger-Cycle-Time is selectable (see *Device Configuration*). For example „CYCL“ = 1:00: A measuring is recorded after each 60 seconds.

Special feature of this logger function: The device will change to a **‘sleeping state’** during the measurings (lower display shows a countdown to the next measuring). Just before a new measuring should be recorded, the devices wakes up and measures until a stable measuring value is evaluated. This value will be stored, the device enters the sleeping state again. This procedure reduces the battery consumption dramatically; with a fresh zinc carbon battery, the device is capable of recording more than a month without an additional mains adapter.

When the cyclic logger contains data (independent if running or stopped), the material cannot be changed.
The value measured during the last recording is shown in the upper display. During the pauses no measuring is done!
An adequate message is stored, if no stable value could be measured during the interval.

Max. number of measurings	10000
Cycle time:	0:01...60:00 (minutes:seconds, min 1s, max 1h), selectable in the configuration
A measuring contains:	- current measuring value at the time of recording - temperature at the time of recording
Recording time:	> 1 month (with output activated: OUT = SEr) > 3 months (with output deactivated: OUT = off) With mains adapter: limited just by memory and cycle time, up to 416 days

Starting a recording:
By pressing "Store" (key 6) for 2 seconds, the recording will be initiated. After that, the display shows ‘St.XXXX‘ for a short time whenever a measuring is recorded. XXXXX is the number of the measuring 1..9999.
If the logger memory is full, the display will show: The 

recording automatically will be stopped.

Stopping the recording manually:
By pressing "Store" (key 6) the recording can be stopped manually. Then the following choice appears:

Stop the recording

Do not stop the recording

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

Note: If you try to switch off the instrument in the cyclic recording operation, you will be asked once again if the recording should be stopped. The device can only be switched off after the recording has been stopped! The Auto-Power-Off-function is deactivated during recording!

Clear Recordings:
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

7.6 Output

The output can be used as serial interface (for HND-Z031 or –Z032 interface adapters) or as analogue output (0-1 V). If none of both is needed, we suggest switching the output off, because battery life then is extended.

7.6.1 Interface - Base Address ('Adr.')

By using an electrically isolated interface converter HND-Z031 or HND-Z032 (accessory), the device can be connected to a RS232- or USB-interface.
In order to avoid transmission errors, there are several security checks implemented (e.g. CRC).

The device has 2 Channels:

- **Channel 1: Material moisture in % and base address**
- **Channel 2: Temperature**

Note: The measuring and range values read via interface are always in the selected display unit (°C/°F)!

Supported Interface-functions:

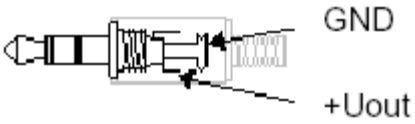
1	2	Code	Name/Function	1	2	Code	Name/Function
x	X	0	read nominal value	x	x	202	read unit of display
x	X	3	read system status	x	x	204	read decimal point of display
x		12	read ID-no.	x		205	read extended measuring type in display
x	X	176	read min measuring range	x		208	read channel count
x	X	177	read max measuring range	x	x	214	read scale correction
x	X	178	read measuring range unit	x	x	215	set scale correction
x	X	179	read measuring range decimal point	x	x	216	read zero displacement
x	X	180	read measuring type	x	x	217	set zero displacement
	X	194	set display unit	x		222	read turn-off-delay
x	X	199	read measuring type in display	x		223	Set turn-off-delay
x	X	200	read min. display range	x		240	Reset
x	X	201	read max. display range	x		254	read program identification

The following standard software packages are available for data transfer:
BUS-S20M: 20-channel software to record and display the measuring values

7.6.2 Analogue Output – Scaling with DAC.0 and DAC.1

With the DAC.0 and DAC.1 values the output can be rapidly scaled to your efforts. Keep in mind not to connect low-resistive loads to the output, otherwise the output value will be wrong and battery life is decreased. Loads above approx. 10 kOhm are uncritical.
If the display exceeds the value set by DAC.1, then the device will apply 1 V to the output.
If the display falls below the value set by DAC.0, then the device will apply 0 V to the output.
In case of an error (Err.1, Err.2, no sensor, etc.) the device will apply slightly above 1 V to the output.

Plug wiring:



Attention! The 3rd contact has to be left floating! Only stereo plugs are allowed!

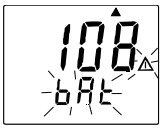
8. Maintenance

8.1 Battery Operation

The battery has been used up and needs to be replaced, if „bAt“ is shown in lower display. The device will, however, continue operating correctly for a certain time.
The battery has been completely used up, if ´bAt´ is shown in the upper display. The battery has to be removed, when storing device above 50 °C.

Hint: We recommend removing the battery if device is not used for a longer period of time! Risk of leakage!

8.2 Fault and System Messages

Display	Meaning	Remedy
	low battery voltage, device will continue to work for a short time.	replace battery
	if mains operation: wrong voltage	replace power supply, if fault continues to exist: device damaged
	low battery voltage	replace battery
	if mains operation: wrong voltage	check/replace power supply, if fault continues to exist: device damaged
No display or weird display. Device does not react on keypress.	low battery voltage	replace battery
	if mains operation: wrong voltage	check/replace power supply, if fault continues to exist: device damaged
	system error	disconnect battery or power supply, wait some time, re-connect
	device defective	return to manufacturer for repair
----	sensor error: no valid signal, charge at the probe, device will discharge (resp. at dry wood)	wait until probe has discharged
	sensor broken or device defective	return to manufacturer for repair
Err.1	value exceeding measuring range	check: Is the value exceeding the measuring range specified? ->temperature too high!
	wrong probe connected	check probe
	probe or device defective	return to manufacturer for repair
	non-floating probe near the unshielded electrode	insulate probe or measure at shielded electrode
Err.2	value below display range	check: Is the value below the measuring range specified? -> temperature too low!
	wrong probe connected	check probe
	probe, cable or device defective	return to manufacturer for repair
Err.7	system error	return to manufacturer for repair

8.3 Application in the glued timber construction acc. to DIN 1052-1 (MPA certified)

The instrument with its curve h.460 (Fir) was certified by the MPA Stuttgart (Otto Graf institute) for applications in the glued timber construction according to DIN 1052-1 with the following equipment:

- measuring cable HND-Z051
- reciprocating piston electrode HND-FF01 (recommended) or impact electrode HND-FF02

8.4 Inspection of the Accuracy / Adjustment Services

Accuracy can be inspected with the testing adapter HND-Z058 (extra equipment).
To check precision, select material characteristic curve ".rEF" and plug in testing adapter.
The device must display the printed value for the HND-F105/-F110.

If the precision is no more corresponding to the imprint of the HND-Z058, we suggest sending the device to the manufacturer for a new adjustment.

9. Technical Information

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

10. Order Codes

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

11. Dimensions

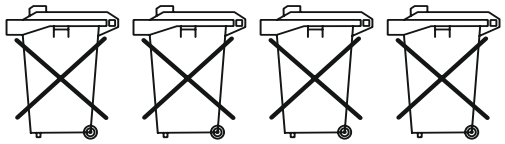
Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

12. Disposal

- **Note!**
    - Avoid environmental damage caused by media-contaminated parts
    - Dispose of the device and packaging in an environmentally friendly manner
    - Comply with applicable national and international disposal regulations and environmental regulations.
    -

- **Batteries**

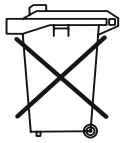
- Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:



Cd[1] Hg[2] Pb[3] Li[4]

1. „Cd" stands for cadmium
2. „Hg" stands for mercury
3. „Pb" stands for lead
4. „Li" stands for lithium

- **Electrical and electronic equipment**



13. EU Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

Manual Humidity Precision Measuring Unit Model: HND-F205

to which this declaration relates is in conformity with the standards noted below:

EN 61326-1:2013
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

EN 50581:2012
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also, the following EC guidelines are fulfilled:

2014/30/EU	Electromagnetic compatibility
2011/65/EU	**RoHS** (category 9)
2015/863/EU	Delegated Directive (RoHS III)

Hofheim, 23 Nov. 2021

H. Volz
General Manager

M. Wenzel
Proxy Holder

Appendix A: Sorts of wood

Select kind of wood you want to measure, enter number on the device, e.g. birch = h. 60

Identification	Number	Comment	Range
Group A	h. A	Wood-group A	0..82%
Group B	h. B	Wood-group B	1..95%
Group C	h. C	Wood-group C	2..107%
Group D	h. D	Wood-group D	3..121%
AS/NZS 1080.1	h. AS	Australian reference characteristic curve	4..91%
Group Spruce-Pine-Fir	h.402	Softwood-Group	6..99%
Fir, Picea abies Karst.	**h.460**	**applications in the glued timber construction, MPA certified**	**6..101%**
HND-F reference	.rEF	Internal reference for determining additional characteristic curves / calculation tables (without temperature-compensation)	

Abura	Hallea ciliata	h.2	7..50%
Afrormosia	Pericopsis elata	h.3	6..47%
Afzelia	Afzelia spp.	h.4	8..42%
Agba	Gossweilerodendron balsamiferum	h.426	6..64%
Albizia / Iatandza, New Guinea	Albizia falcatara	h.8	5..88%
Albizia / Iatandza, Solomon Island	Albizia falcatara	h.9	4..72%
Alder, Blush	Solanea australis	h.10	5..65%
Alder, Brown	Caldcluvia paniculosa	h.11	7..69%
Alder, Common	Alnus glutinosa	h.131	2..107%
Alder, Rose	Caldcluvia australiensis	h.12	6..71%
Alerce	Fitzroya cupressoides	h.13	7..61%
Amberoi	Pterocymbium beccarii	h.14	5..67%
Amoora, New Guinea	Amoora cucullata	h.15	3..94%
Andiroba	Carapa guianensis	h.16	5..59%
Antiaris, New Guinea	Antiaris toxicaria	h.7	6..83%
Apple, Black	Planachonella australis	h.17	7..62%
Ash Silvertop	Eucalyptus sieberi	h.27	2..90%
Ash, American	Fraxinus americana	h.132	5..79%
Ash, Bennet's	Flindersia bennettiana	h.18	6..76%
Ash, Crow's	Flindersia australis	h.19	7..69%
Ash, European	Fraxinus excelsior	h.133	7..56%
Ash, Hickory	Flindersia ifflaiana	h.20	6..71%
Ash, Japanese	Fraxinus mandshurica	h.134	4..79%
Ash, Red	Flindersia excelsa	h.21	5..67%
Ash, Scaly	Ganophyllum falcatum	h.22	5..90%
Ash, Silver (Northern)	Flindersia schottina	h.23	7..70%
Ash, Silver (Queensland)	Flindersia bourjotiana	h.24	6..88%
Ash, Silver (Southern)	Flindersia schottina	h.25	7..82%
Ash, Silver, New Guinea	Flindersia amboinensis	h.26	5..82%
Aspen, Hard	Acronychia laevis	h.28	5..66%
Ayan	Distemonanthus benthamianus	h.285	7..54%
Balau	Shorea laevis	h.31	4..54%
Balau, red	Shorea guiso	h.32	4..68%
Balsa	Ochroma pyramidale	h.33	4..91%
Basralocus / Angelique	Dicorynia guianensis	h.34	6..55%
Basswood	Tilia americana	h.228	4..85%
Basswood, Fijian	Endospermum macrophyllum	h.35	4..63%
Basswood, Malaysian	Endospermum malacense	h.36	5..116%
Basswood, New Guinea	Endospermum medullosum	h.37	5..76%
Basswood, Silver	Polyscias elegans	h.38	7..72%
Basswood, Solomon Island	Polyscias elegans	h.39	4..65%
Bean, Black	Castanosperum australe	h.40	6..87%
beech, damped	Fagus sylvatica	h.87	6..55%
beech, european -	Fagus sylvatica	h.86	5..85%
Beech, Myrtle	Nothofagus cunninghamii	h.41	6..76%
Beech, New Zeeland Red (hearted untreated)	Nothofagus fusca	h.42	7..87%
Beech, New Zeeland Red (sapwood boron)	Nothofagus fusca	h.43	2..97%
Beech, New Zeeland Red (sapwood untreated)	Nothofagus fusca	h.44	5..84%
Beech, Silky	Citronella moorei	h.45	8..66%
Beech, Silver	Nothofagus menziesii	h.46	8..58%
Beech, Silver (sapwood tanalith)	Nothofagus menziesii	h.47	6..76%
Beech, Silver (sapwood untreated)	Nothofagus menziesii	h.48	4..92%
Beech, Wau	Elmerrilla papuana	h.49	7..96%
Beech, White (Fiji)	Gmelina vitiensis	h.50	5..77%
Beech, White (Queensland)	Gmelina leichardtii	h.51	6..81%
Bintangor / Calophyllum, Fijian	Calophyllum leucocarpum	h.53	5..81%
Bintangor / Calophyllum, Malaysian	Calophyllum curtisii	h.54	6..76%
Bintangor / Calophyllum, New Guinea	Calophyllum papuanum	h.55	4..98%
Bintangor / Calophyllum, Phillipines	Calophyllum inophyllum	h.56	6..78%
Bintangor / Calophyllum, Solomon Islands	Calophyllum kajewskii	h.57	6..85%
Binuang	Octomeles sumatrana	h.130	5..73%
Birch, American	Betula lutea	h.59	7..72%
Birch, European	Betula pubescens	h.60	5..96%
Birch, White	Schizomeria ovata	h.58	7..75%
Bishop Wood (Fiji)	Bischofia javanica	h.61	5..73%
Blackbutt	Eucalyptus pilularis	h.62	4..92%
Blackbutt, Western Australia	Eucalyptus patens	h.63	6..88%
Blackwood	Acacia melanoxylon	h.64	6..75%
Bloodwood, Red	Corymbia gunmifera	h.66	7..78%
Bollywood	Litsea reticulata	h.67	5..78%
Bossime	Drypetes spp,	h.70	7..62%
Box Grey	Eucalyptus moluccana	h.75	8..73%
Box Grey Coast	Eucalyptus bosistoana	h.76	7..76%

Box, Black	Eucalyptus lafgiflorens	h.71	5..92%
Box, Brush (Location Unknown)	Lophostemon confertus	h.74	5..53%
Box, Brush (N.S.W.)	Lophostemon confertus	h.72	4..55%
Box, Brush (Queensland	Lophostemon confertus	h.73	7..46%
Box, Kanuka	Tristania laurina	h.77	6..78%
Boxwood, New Guinea	Xanthophyllum papuanum	h.78	5..69%
Boxwood, Yellow	Planchonella pholmaniana	h.79	7..62%
Brachychiton	Brachychiton carrthersii	h.80	5..55%
Bridelia	Bridelia minutiflora	h.81	5..103%
Brigalow	Acacia harpohylla	h.82	5..83%
Brownbarrel	Eucalyptus fastigata	h.83	5..80%
Bubinga	Guibourtia demeusii	h.84	7..70%
Buchanania	Buchanania arborescens	h.85	4..76%
Burckella, Solomon Island	Burckella obovata	h.88	4..59%
Butternut, Rose	Blepharocarya involucrigera	h.89	5..69%
Camphorwood, New Guinea	Cinnamomum spp,	h.90	6..74%
Campnosperma (Malaysia)	Campnosperma curtisii	h.91	8..95%
Campnosperma (Solomon Island)	Campnosperma kajewskii	h.92	3..78%
Cananga (Phillipines)	Canagium odoratum	h.93	7..62%
Canarium Solomon Island	Canarium salomonese	h.97	4..65%
Canarium, African	Canarium Scheinfurthii	h.94	7..80%
Canarium, Fijian	Canarium oleosum	h.95	5..77%
Canarium, New Guinea	Canarium vitiense	h.96	5..75%
Candlenut	Aleurites moluccana	h.98	0..168%
Carabeen, Yellow	Sloanea woollsii	h.99	6..67%
Cathormion, New Guinea	Cathormion umbellatum	h.100	4..56%
Cedar , Amercan	Cedrela odorata	h.102	8..67%
Cedar, incense	Calocedrus decurrens	h.65	5..96%
Cedar, White	Melia azedarach	h.101	7..86%
Cedar, Yellow	Chamaecyparsis nootkatensis	h.457	4..91%
Celtis, New Guinea	Celtis spp,	h.103	5..67%
Celtis, Solomon Island	Celtis philippinesis	h.104	4..56%
Cheesewood, White (Queensland) /Asian Alstonia	Alstonia scholaris	h.105	5..77%
Chengal (Malaysia)	Neobalanocarpus heimii	h.106	4..76%
Cherry, American	Prunus serotina	h.216	5..97%
Cherry, European	Prunus avium	h.217	7..68%
Cleistocalyx	Cleistocalyx mirtoides	h.107	5..85%
Coachwood	Ceratopetalum apetalum	h.108	4..84%
Coondoo, Blush	Planchonella laurifolia	h.109	6..60%
Cordia, New Guinea	Cordia dichotoma	h.110	5..51%
Corkwood, Grey	Erythrina vespertillio	h.111	6..57%
Courbaril	Hymenaea coubaril	h.112	7..53%
Cudgerie, Brown	Canarium australasicum	h.113	7..67%
Cupiuba	Goupia glabra	h.147	6..56%
Curupixá	Micropholis	h.114	6..52%
Cypress	Cupressus spp,	h.456	5..89%
Cypress, Northern	Callitris intratropica	h.115	6..78%
Cypress, Rottnest Island	Callitris preisii	h.116	7..80%
Cypress, White	Callitris glaucophylla	h.117	6..86%
Dakua, Salusalu (Fiji)	Decussocarpus vitiensis	h.118	6..83%
Dibetou/African walnut	Lovoa trichilioides	h.119	7..68%
Dillenia (Solomon Island)	Dillenia salomonese	h.120	4..65%
Doi (Fiji)	Alphitonia zizphoides	h.121	5..72%
Duabanga, New Guinea	Duabanga moluccana	h.124	4..72%
Ebony, african	Diospyros spp,	h.125	6..55%
Ekki	Lophira alata	h.29	4..73%
Elm, European	Ulmus spp,	h.374	7..51%
Elm, White	Ulmus americana	h.373	5..69%
Evodia, White	Melicope micrococca	h.135	5..60%
Figwood (Moreton Bay)	Ficus macrophylla	h.139	7..56%
Fir, alpine	Abies lasiocarpa	h.410	6..80%
Fir, amabilis	Abies amabilis	h.411	4..91%
Fir, Douglas	Pseudotsuga menziesii	h.122	5..91%
Fir, Douglas (New Zealand) (sapwood treated)	Pseudotsuga menziesii	h.140	6..73%
Fir, Douglas (New Zealand) (sapwood untreated)	Pseudotsuga menziesii	h.141	5..108%
Fir, Douglas (New Zealand) (truewood untreated)	Pseudotsuga menziesii	h.142	3..99%
Fir, grand	Abies grandis	h.412	4..91%
Fir, Spruce	Abies magnifica	h.413	5..97%
Fir, white / Fir, silver	Abies alba	h.414	5..93%
Fir, MPA	**Picea abies Karst.**	**h.460**	**6..101%**
Galip	Canarium indicum	h.143	5..64%
Garo-Garo	Matrixiodendron pschyclados	h.144	5..67%
Garuga	Garuga floribunda	h.145	6..53%
Goncalo Alvez	Astronium spp,	h.146	6..45%
Greenheart	Ocotea rodiaei	h.148	6..100%
Greenheart, Queensland	Endiandra compressa	h.149	7..82%
Guarea, black	Guarea cedrata	h.68	7..94%
Guarea, white	Guarea cedrata	h.69	9..67%
Guariuba	Clarisia racemosa	h.150	8..57%
Gum, Black	Nyssa sylvatica	h.162	7..76%
Gum, Blue, Sidney	Eucalyptus saligna	h.152	7..76%
Gum, Blue, Southern	Eucalyptus globulus	h.151	6..79%
Gum, Grey	Eucalyptus punctata	h.153	5..89%
Gum, Grey, Mountain	Eucalyptus cypellocarpa	h.154	6..79%
Gum, Maiden's	Eucalyptus maidenii	h.155	7..79%
Gum, Manna	Eucalyptus viminalis	h.156	4..80%
Gum, Mountain	Eucalyptus dalrympleana	h.157	3..89%
Gum, Pink	Eucalyptus fasciculosa	h.158	6..85%
Gum, Red, American	Liquidambar styraciflua	h.166	5..92%
Gum, Red, Forest	Eucalyptus tereticomis	h.159	7..82%
Gum, Red, River	Eucalyptus camaldulensis	h.160	7..94%
Gum, Rose / Gum, Saligna	Eucalyptus grandis	h.161	7..81%
Gum, Shining	Eucalyptus nitens	h.163	5..83%
Gum, Spotted (Victoria) (Lemon-Scented)	Corymbia spp,	h.164	4..72%
Gum, Sugar	Eucalyptus cladocalyx	h.165	6..79%
Gum, White Dunn's	Eucalyptus dunnii	h.167	4..72%
Gum, Yellow	Eucalyptus leucoxylon	h.168	7..73%

Handlewood, Grey	Aphanante phillipinensis	h.169	5..66%
Handlewood, White	Strebulus pendulinus	h.170	7..58%
Hardwood, Johnstone River	Bakhousia bancroftii	h.171	5..62%
Hemlock / Hemlock, Western	Tsuga heterophylla	h.172	8..54%
Hemlock, Chinesische	Tsuga chinensis	h.173	5..75%
Hevea	Hevea Brasiliensis	h.174	7..71%
Hickory	Carya spp.	h.175	6..69%
Hollywood, Yellow	Premna lignum-vitae	h.176	7..67%
Horizontal	Anodopetalum biglandulosum	h.177	7..84%
Incensewood	Pseudocarapa nitidula	h.178	8..58%
Iroko	Chlorophora excesla	h.179	7..46%
Ironbark, Grey	Eucalyptus drephanophylla	h.180	7..88%
Ironbark, Grey	Eucalyptus paniculata	h.181	5..86%
Ironbark, Red	Eucalyptus sideroxylon	h.182	8..79%
Ironbark, Red, Broad Leaved	Eucalyptus fibrosa	h.183	8..81%
Ironbark, Red, Narrow Leaved	Eucalyptus cerbra	h.184	5..86%
Jarrah	Eucalyptus marginata	h.185	5..92%
Jelutong	Dyera costulata	h.186	0..104%
Jequitibá	Cariniana spp,	h.187	5..64%
Kahikatea (New Zealand) (Boron)	Dacrycarpus docrydiodies	h.188	7..63%
Kahikatea (New Zealand) (Thanalith)	Dacrycarpus docrydiodies	h.189	6..73%
Kahikatea (New Zealand) (untreated)	Dacrycarpus docrydiodies	h.190	6..74%
Kamarere (Fiji)	Eucalyptus deglupta	h.191	5..66%
Kamarere (New Guinea)	Eucalyptus deglupta	h.192	5..83%
Kapur	Dryobalanops spp,	h.193	7..73%
Karri	Eucalyptus diversicolor	h.194	5..79%
Kauceti	Kermadecia vitiensis	h.200	4..57%
Kauri	Agathis australis, boroneensis	h.201	5..78%
Keledang	Artocarpus lanceifolius	h.202	0..132%
Kempas	Koomapassia excelsa	h.203	4..89%
Keranji (Malaysia)	Dialium platysepalum	h.204	5..51%
Keruing	Dipterocarpus spp,	h.205	6..64%
Kiso	Chisocheton schumannii	h.218	6..54%
Lacewood, Yellow	Polyalthia oblongifolia	h.219	5..68%
Laran	Anthocephalus chinensis	h.223	7..67%
Larch	Larix decidua	h.221	5..69%
Larch, American / Larch, Western	Larix occidentalis	h.220	5..98%
Larch, Japanese	Larix kaempferi	h.222	5..99%
Lauan, Red	Shorea negrosensis	h.224	5..62%
Leatherwood	Eucryphia lucida	h.225	6..79%
Lightwood	Acacia implexa	h.226	7..62%
Limba	Terminalia superba	h.227	6..56%
Lime, European	Tilia vulgaris	h.229	4..78%
Louro, Red	Ocotea rubra	h.231	5..76%
Macadamia	Floyda praealta	h.232	7..59%
Magnolia	Magnolia acuminata/grandiflora	h.233	6..88%
Mahogany, Brush	Geissos benthamii	h.242	7..57%
Mahogany, Miva	Dysoxylum muelleri	h.243	8..73%
Mahogany, New Guinea	Dysoxylum spp,	h.241	6..74%
Mahogany, Red	Eucalyptus botryoides	h.244	7..91%
Mahogany, Rose	Dysoxylum fraseranum	h.245	7..65%
Mahogany, Southern	Eucalyptus botryoides	h.246	5..82%
Mahogany, White	Eucalyptus acmenoides	h.247	6..93%
Mahogony Khaya	Khaya spp,	h.235	7..82%
Mahogony, American	Swietenia spp,	h.234	6..84%
Mahogony, Phillipines	Parashorea plicata	h.236	5..93%
Mahogony, Phillipines	Shorea almon	h.237	4..67%
Mahogony, Sapelli / Sapele	Entandrophragma cylindricum	h.238	5..99%
Mahogony, Sipo / Utile	Entradrophragma utilie	h.239	6..110%
Mahogony, Tiama / gedu nohor	Entadrophragma angolense	h.240	10..54%
Mako	Trischospermum richii	h.248	3..68%
Makoré	Thieghemmella africana	h.123	6..86%
Makorè	Thieghemella heckelii	h.249	7..80%
Malas	Homalium foetidum	h.250	5..72%
Malletwood	Rhodamnia argentea	h.251	5..68%
Malletwood, Brown	Rhodamnia rubescens	h.252	5..70%
Manggachapui	Hopea acuminata	h.253	6..87%
Mango	Mangifera minor	h.254	4..68%
Mango, Phillipines	Mangifera altissima	h.255	7..93%
Mangosteen (Fiji)	Garcinia myrtifolia	h.256	5..68%
Mangrove, Cedar	Xylocarpus australasicus	h.257	6..82%
Maniltoa (Fiji)	Maniltoa grandiflora	h.258	6..58%
Maniltoa (New Guinea)	Maniltoa pimenteliana	h.259	6..58%
Mansonia	Mansonia altissima	h.260	7..80%
Maple, New Guinea	Flindersia pimentelianan	h.261	6..87%
Maple, Queensland	Flindersia brayleyana	h.262	5..136%
Maple, Rose	Cryptocarya erythroxylon	h.263	6..64%
Maple, Scented	Flindersia laevicarpa	h.264	7..57%
Mararie	Pseudoweinwannia lanchanocarpa	h.265	8..75%
Marri	Eucalyptus calophylla	h.266	5..64%
Masiratu	Degeneria vitiensis	h.267	5..67%
Massandaruba	Manilkara kanosiensis	h.268	4..65%
Matai	Podocarpus spicatus	h.269	6..73%
Mengkulang	Heritiera spp,	h.270	5..67%
Meranti, Buik from 1999	Shorea platiclados	h.271	4..61%
Meranti, Dark Red	Shorea spp,	h.272	5..94%
Meranti, Nemesu from 1999	Shorea pauciflora	h.274	4..91%
Meranti, Seraya from 1999	Shura curtisii	h.275	5..62%
Meranti, Tembaga from 1999	Shorea leprosula	h.276	3..72%
Meranti, White	Shorea hypochra	h.277	4..94%
Meranti, Yellow	Shorea multiflora	h.273	0..111%
Merawan	Hopea sulcala	h.278	4..90%
Merbau	Intsia spp,	h.279	6..84%
Mersawa	Anisoptera laevis	h.280	4..96%
Messmate	Eucalyptus obliqua	h.281	8..75%
Moabi	Baillonella toxisperma	h.282	6..83%
Mora	Mora excelsa	h.283	5..59%
Moustiqaire	Cryptocarya spp,	h.284	4..77%
Musizi	Maesopsis eminii	h.286	7..94%
Neuburgia	Neuburgia collina	h.287	7..75%
Nutmeg (Fiji)	Myrstica spp,	h.290	5..74%

Nutmeg (New Guinea)	Myrstica buchneriana	h.291	5..78%
Nyatoh	Palaquium spp,	h.292	4..71%
Oak, European	Quercus robur L.,	h.126	4..87%
Oak, Japanese	Quercus spp,	h.127	4..91%
Oak, New Guinea	Castanopsis acuminatissima	h.293	4..90%
Oak, Red	Quercus spp,	h.128	5..91%
Oak, Silky, Fishtail	Neorites kevediana	h.294	3..59%
Oak, Silky, Northern	Cardwellia sublimia	h.295	5..83%
Oak, Silky, Red	Stenocarpus salignus	h.296	6..67%
Oak, Silky, Southern	Grevillea robusta	h.297	5..64%
Oak, Silky, White	Stenocarpus sinuatus	h.298	6..64%
Oak, Tasmanian	Eucalyptus regnans	h.299	7..87%
Oak, Tulip, Blush	Argyrodendron actinophyllum	h.300	6..60%
Oak, Tulip, Brown	Argyrodendron trifoliolatum	h.301	9..60%
Oak, Tulip, Red	Argyrodendron peralatum	h.302	9..87%
Oak, Tulip, White	Petrygota horsfieldii	h.303	5..69%
Oak, White-	Quercus spp,	h.129	5..81%
Obah	Eugenia spp,	h.304	5..66%
Obeche	Triplochiton scleroxylon	h.1	5..50%
Odoko	Scottellila coriancea	h.305	6..72%
Olive	Olea hochstetteri	h.306	7..80%
Olivillo	Atextoxicon puncttatum	h.307	5..70%
Opepe	Nauclea diderrichii	h.52	7..73%
Padauk, African	Pterocarpus soyauxii	h.308	4..79%
Palachonella, Fijian	Planchonella vitiensis	h.347	6..61%
Palachonella, New Guinea	Planchonella kaernbachiana	h.348	4..71%
Palachonella, New Guinea	Planchonella thyrsoidea	h.349	2..67%
Palachonella, Solomon Island	Planchonia papuana	h.350	4..57%
Paldao	Dracontomelum dao	h.309	4..86%
Panga Panga	Millettia stuhlmannii	h.312	6..45%
Papuacedrus	Papuacedrus papuana	h.314	6..88%
Parinari, Fijian	Oarinari insularum	h.315	4..78%
Penarahan	Myristica iners	h.316	6..94%
Peppermint, Broad-Leaved	Eucalyptus dives	h.317	6..94%
Peppermint, Narrow-Leaved	Eucalyptus australiana	h.318	8..76%
Peroba, White	Paratecoma peroba	h.319	7..60%
Persimmon	Diospyros pentamera	h.320	5..70%
Perupok (Malaysia)	Kokoona spp,	h.321	1..135%
Perupok (Malaysia)	Lophopetalum subovatum	h.322	8..98%
Pillarwood	Cassipourea malosano	h.323	4..79%
Pine / Pine, Stone	Pinus pinea	h.345	6..87%
Pine, Aleppo	Pinus halepensis	h.324	8..76%
Pine, Austrian	Pinus nigra	h.212	5..106%
Pine, Beneguet	Pinus kesya	h.325	8..104%
Pine, Black	Prumnoptys amarus	h.326	5..76%
Pine, Bunya	Pinus bidwillii	h.327	8..69%
Pine, Canary Island	Pinus canariensis	h.328	6..80%
Pine, Celery-Top	Phyllocladus aspenifolius	h.329	7..71%
Pine, Hoop	Araucaria cunninghamii	h.330	7..79%
Pine, Huon	Dacrydium franklinii	h.331	8..70%
Pine, King William	Athrotaxis selaginoides	h.332	7..67%
Pine, Klinki	Araucaria hunsteinii	h.333	4..91%
Pine, Loblolly-	Pinus taeda	h.209	5..91%
Pine, Longpole-	Pinus contorta	h.207	5..96%
Pine, Maritime	Pinus pinaster	h.334	8..74%
Pine, Parana Red	Araucaria angustifolia	h.335	6..39%
Pine, Parana White	Araucaria angustifolia	h.336	7..58%
Pine, Pitch-, american	Pinus palustris	h.211	6..65%
Pine, Pitch-, caribbean	Pinus caribaea	h.210	6..93%
Pine, Radiata	Pinus radiata	h.337	5..100%
Pine, Radiata (New Zealand) (sapwood aac)	Pinus radiata	h.338	7..78%
Pine, Radiata (New Zealand) (sapwood boliden)	Pinus radiata	h.339	6..85%
Pine, Radiata (New Zealand) (sapwood boron)	Pinus radiata	h.340	6..69%
Pine, Radiata (New Zealand) (sapwood tanalith)	Pinus radiata	h.341	5..73%
Pine, Radiata (New Zealand) (sapwoodt untreated)	Pinus radiata	h.342	5..91%
Pine, Red	Pinus resinosa	h.343	2..99%
Pine, Scotts	Pinus sylvestris L.	h.206	6..94%
Pine, Shortleaf	Pinus echinata	h.213	5..96%
Pine, Slash (Queensland)	Pinus elliottii	h.344	6..86%
Pine, Southern	Pinus echinata	h.214	5..97%
Pine, Southern, yellow / Pine, Ponderosa	Pinus ponderosa	h.208	5..96%
Pine, Sugar	Pinus lambertiana	h.215	4..97%
Pine, western white	Pinus monticola	h.406	5..98%
Pittosporum (Tasmania)	Pittosporum bicolor	h.346	4..82%
Planchonia	Pleiogynium timorense	h.351	5..73%
Pleiogynium / Podo	Podocarpus neriifolia	h.352	7..57%
Podocarp, Fijian	Decussocarpus vitiensis	h.353	6..79%
Podocarp, Red	Euroschinus falcata	h.354	6..83%
Poplar, Black	Populus nigra	h.313	4..91%
Poplar, Pink	Euroschinus falcata	h.355	6..67%
Quandong, Brown	Eurocarpus coorangooloo	h.356	5..75%
Quandong, Silver	Elaecarpus angustifolius	h.357	5..65%
Quandong, Solomon Island	Elaecarpus spaericus	h.358	3..67%
Qumu	Acacia Richii	h.359	5..67%
Raintree (Fiji)	Samanea saman	h.360	5..49%
Ramin	Gonystylus spp,	h.361	6..54%
Redwood / Sequoia	Sequoia sempervirens	h.362	5..88%
Rengas	Gluta spp,	h.363	4..85%
Resak (Malaysia)	Cotylelobium melanoxylon	h.364	3..94%
Rimu (non-truewood boron)	Dacrydium cupresinum	h.365	7..65%
Rimu (non-truewood tanalith)	Dacrydium cupresinum	h.366	7..65%
Rimu (non-truewood untreated)	Dacrydium cupresinum	h.367	8..69%
Rimu (truewood untreated)	Dacrydium cupresinum	h.368	8..44%
Robinia	Robinia pseudoacacia	h.369	2..72%
Roble Pellin	Nothofagus obliqua	h.370	6..72%

Rock maple	Acer saccharum	h.6	5..92%
Rosewood, Brasilian	Dalbergia nigra	h.311	5..58%
Rosewood, Indian	Dalbergia latifolia	h.310	4..91%
Rosewood, New Guinea	Pterocarpus indicus	h.371	5..66%
Rosewood, Phillippines	Pterocarpus indicus	h.372	10..54%
Sapupira	Hymenolobium excelsum	h.375	5..68%
Sasauria (Fiji)	Dysoxylum quercifolium	h.376	4..69%
Sassafras	Doryphora sassafras	h.377	6..70%
Sassafras, Southern	Atherospherma moschatum	h.378	7..66%
Satinash, Blush	Acmena Hemilampra	h.379	3..84%
Satinash, Grey	Syzygium gustavioides	h.380	5..82%
Satinash, New Guinea	Syzygium butterneranum	h.381	5..68%
Satinash, Rose	Syzygium francisii	h.382	5..59%
Satinay	Syncarpia hilii	h.383	4..92%
Satinbox	Phenbalium saquameum	h.384	5..92%
Satinheart, Green	Geijera salicifolia	h.385	8..51%
Satinwood, Tulip	Rhodosphaera rhodanthema	h.386	6..94%
Scentbark	Eucalyptus aromapholia	h.387	5..70%
Schizomeria, New Guinea	Schizomeria serrata	h.388	5..81%
Schizomeria, Solomon Island	Schizomeria serrata	h.389	4..60%
Sepetir	Sindora coriaceae	h.390	1..88%
Sheoak, Fijian Beach	Casuarina nodiflora	h.391	6..71%
Sheoak, River	Casuarina cunninghamiana	h.392	7..59%
Sheoak, Rose	Casuarina torulosa	h.393	8..58%
Sheoak, Western Australia	Allocasuarina fraserana	h.394	7..64%
Silkwood, Bolly	Cryptocarya ablata	h.395	8..53%
Silkwood, Silver	Flindersia acuminata	h.396	7..71%
Simpoh (Phillippines)	Dillenia philippinensis	h.397	5..86%
Sirus, White	Ailainthus peekelii	h.398	5..74%
Sirus, White	Ailainthus triphysa	h.399	7..70%
Sloanea	Sloanea spp,	h.400	5..77%
Spondias	Spondias mariana	h.401	4..72%
Spruce, European	Picea abies Karst.	h.136	6..101%
Spruce, Norway /Norway Spruce	Picea abies	h.137	6..105%
Spruce, Sitka	Picea sitchensis	h.138	5..98%
Sterculia, Brown	Sterculia spp,	h.230	4..91%
Stringybark, Brown	Eucalyptus capitellata	h.403	6..83%
Stringybark, Darwin	Eucalyptus tetrodonta	h.404	5..81%
Stringybark, Yellow	Eucalyptus muelleriana	h.405	9..77%
Suren	Toona cilata	h.407	6..103%
Sweet chestnut	Castanea sativa	h.199	2..107%
Sycamore	Acer pseudoplatanus	h.5	7..57%
Sycamore, Satin	Ceratopetalum succirubrum	h.408	7..63%
Tallowwood	Eucalyptus microcorsis	h.409	4..92%
Tatajuba	Bagassa guianesis	h.30	7..44%
Taun Maleisien	Pometia pinnata	h.195	0..105%
Taun New Guinea	Pometia pinnata	h.196	6..103%
Taun Phillipines	Pometia pinnata	h.197	7..99%
Taun Solomon Island	Pometia pinnata	h.198	4..70%
Tawa	Beilschmiedia tawa	h.415	8..51%
Tawa (sap & heart boron)	Beilschmiedia tawa	h.416	6..61%
Tawa (sap & heart untreated)	Beilschmiedia tawa	h.417	7..64%
Teak	Tectona grandis	h.418	6..80%
Terap	Artocarpus elasticus	h.419	2..169%
Terentang	Campnosperma brevipetiolata	h.420	5..77%
Terminalia Braun	Terminalia microcarpa	h.421	3..71%
Terminalia Gelb	Terminalia complanata	h.422	3..87%
Tetrameles	Tetrameles nudiflora	h.423	5..70%
Tingle, Red	Eucalyptus jacksonii	h.424	5..110%
Tingle, Yellow	Eucalyptus guilfolei	h.425	5..105%
Tornillo	Cedrelinga catenaeformis	h.427	5..71%
Totara	Podocarpus totara	h.428	7..63%
Touriga, Red	Calophyllum constatum	h.429	8..73%
Tristiropsis, New Guinea	Tristiropsis canarioides	h.430	6..70%
Tulipwood	Harpullia pendula	h.432	7..76%
Turat	Eucalyptus gomophocephala	h.431	7..71%
Turpentine	Syncarpia glomulifera	h.433	5..91%
Vaivai-Ni-Veikau	Serianthes myriadenia	h.434	5..61%
Vatica, Phillippines	Vatica, manggachopi	h.435	7..63%
Vitex, New Guinea	Vitex cofassus	h.436	5..78%
Vuga	Metrosideros collina	h.437	6..56%
Vutu	Barringtonia edulis	h.438	4..55%
Walnut, American	Juglans nigra	h.288	5..87%
Walnut, Blush	Beilschmiedia obtusifolia	h.439	8..64%
Walnut, European	Junglans regia	h.289	7..59%
Walnut, Queensland	Endiandra palmerstonii	h.440	6..101%
Walnut, Rose	Endiandra muelleri	h.441	3..78%
Walnut, White	Cryptocarya obovota	h.442	7..63%
Walnut, Yellow	Beilschmiedia bancroftii	h.443	5..66%
Wandoo	Eucalyptus wandoo	h.444	7..87%
Wattle, Hickory	Acacia penninervis	h.445	7..64%
Wattle, Silver	Acacia dealbata	h.446	7..73%
Wengé	Millettia laurentii	h.448	7..55%
Western Red Cedar	Thuja plicata	h.449	6..56%
Whitewood, American	Liriodendron tulipifera	h.447	5..99%
Woolybutt	Eucalyptus longifolia	h.450	7..80%
Yaka	Dacrydium nausoriensis/nidilum	h.451	6..69%
Yasi-Yasi I (Fiji)	Syzygium effusum	h.452	4..71%
Yasi-Yasi II (Fiji)	Syzygium spp,	h.453	5..82%
Yate	Eucalyptus cornuta	h.454	6..73%
Yertschuk	Eucalyptus considenia	h.455	7..88%

Appendix B: Additional materials

Select material you want to measure, enter number on the device, e.g. concrete b25 = b. 6

Measuring of building materials

Material	Number	Range	Moisture estimation
Concrete			
Concrete 200kg/m³ B15 (200 kg Concrete per 1m³ sand)	b. 5	0,7..3,3%	yes
Concrete 350kg/m³ B25 (350 kg Concrete per 1m³ sand)	b. 6	1,1..3,9%	yes
Concrete 500kg/m³ B35 (500 kg Concrete per 1m³ sand)	b. 7	1,4..3,7%	yes
gas-aerated concrete (Hebel)	b. 9	1,6..173,3%	yes
gas-aerated concrete (Ytong PPW4, gross density 0,55)	b. 27	1,6..53,6%	yes
Screed			
Anhydrit screed AE, AFE	b. 1	0,0..30,3%	yes
Ardurapid screed-concrete	b. 2	0,6..3,4%	no
Elastizell screed	b. 8	1,0..24,5%	yes
Screed-plaster	b. 11	0,4..9,4%	yes
Wood-concrete screed	b. 13	5,3..20,0%	yes
Screed-concrete ZE, ZFE without additives	b. 21	0,8..4,6%	yes
Screed-concrete ZE, ZFE with bitumen additives	b. 22	2,8..5,5%	yes
Screed-concrete ZE, ZFE with synthetic additives	b. 23	2,4..11,8%	yes
Miscellaneous			
Asbestos cement panels	b. 3	4,7..34,9%	no
Bricks clay bricks	b. 4	0,0..40,4%	no
Plaster	b. 10	0,3..77,7%	yes
Plaster synthetic	b. 12	18,2..60,8%	yes
On-wall plaster	b. 20	0,0..38,8%	no
Lime mortar KM 1:3	b. 14	0,4..40,4%	yes
Lime sand bricks (14 DF (200), gross density 1,9)	b. 28	0,1..12,5%	yes
Limestone	b. 15	0,4..29,5%	yes
MDF	b. 16	3,3..52,1%	yes
Cardboard	b. 17	9,8..136,7%	yes
Stone-timber	b. 18	10,5..18,3%	yes
Polystyrene	b. 25	3,9..50,3%	yes
soft-fibre-panel-wood, bitumen	b. 26	0,0..71,1%	yes
Concrete mortar ZM 1:3	b. 19	1,0..10,6%	yes
Concrete bounded fake boards	b. 24	3,3..33,2%	yes

The accuracy of measuring building materials depends on manufacturing and using. The used additives may vary from manufacturer to manufacturer, therefore deviating measure results may occur. The given measuring-range is the theoretically measurable range.

Estimation of additional materials

Following materials may be well estimated with the help of the device, but you won't reach such high accuracy than with materials listed in appendix A and B.

Material	Number	Comment
Hay, flax	h. 458	Injection probe HND-Z058
Straw, grain	h. 459	Injection probe HND-Z058
Cork	h. A	
Fibre board	h. C	
Wood fibre insulating wall panel	h. C	
Wood fibre hard disks	h. C	
Kauramin-fake boards	h. C	
Melamine-fake boards	h. A	
Paper	h. C	
Phenolic resin-fake boards	h. A	
Textiles	h. C (D)	