humimeter.com®
by Schaller Messtechnik

User manual
humimeter FLH
hops moisture meter

version 1.4

Calibration curves

Calibration curve	Explanation	Compressed density	Unit	Measuring range	Sensor
hops ~4% α[2]	hops bales / loose	100 to 130 kg/m³	% wc	6 - 40%	13158 / 13736
hops ~10% α[2]	hops bales / loose	100 to 130 kg/m³	% wc	6 - 40%	13158 / 13736
hops ~15% α[2]	hops bales / loose	100 to 130 kg/m³	% wc	4 - 40%	13158 / 13736
hops ~20% α[2]	hops bales / loose	100 to 130 kg/m³	% wc	4- 40%	13158 / 13736
hops ~4% α[2] RT[1]	hops bales	100 to 130 kg/m³	% wc	6 - 40%	13158
hops ~10% α[2] RT[1]	hops bales	100 to 130 kg/m³	% wc	6- 40%	13158
hops ~15% α[2] RT[1]	hops bales	100 to 130 kg/m³	% wc	4 - 40%	13158
hops ~20% α[2] RT[1]	hops bales	100 to 130 kg/m³	% wc	4 - 40%	13158
straw	straw bales	100 to 130 kg/m³	% wc	8 - 40%	13158
hay	hay bales	100 to 130 kg/m³	% wc	8 - 40%	13158
Digit	special products	-		0 - 100	13158 / 13736
abs humid.g/m³	kiln	-	g/m³	0 to 100 g/m³	12032 & 12004
rel. humidity %	kiln	-	% RH	0 to 100%	12032 & 12004
EMC hops	conditioning chamber	-	% EMC		12032 & 12004
IR temperature	no glossy surfaces	-	°C °F	-25 to 125°C -13 to 257°F	12513
Empty 1	special products	-			13158 / 13736
Empty 2	special products	-			13158 / 13736
Empty 3 RT	special products	-			13158 / 13736
Empty 4 RT	special products	-			13158 / 13736
Test block	**Only for device check, not for measuring!**				13158

[1] RT...room temperature

[2] α ... alpha acid content

<u>The device automatically recognises the connected sensor and provides the corresponding calibration curves.</u>

Explanation of calibration curves:

Insertion probe:

Information about insertion probe:

Caution: In case of a high frequency of measurements and high bale density, the insertion probe may heat up due to friction. If the shown temperature rises more than 3°C/°F compared to the actual sample temperature, the calibration curve „hops RT“ has to be used! (Exception: in case the material temperature is not in the range of room temperature, keep on using the curve „hops“, but let the probe cool down before every new measurement.)

Failing this, the warmed-up insertion probe may lead to wrong measuring results.

Hops ~4% α: Hops calibration curve for hops types of approx. 4% alpha acid content (Note: not suited for measuring several bales one after another!) Shows the current water content of the hops bale in %. If the shown temperature rises more than 3°C/°F compared to the actual sample temperature, let the probe cool down!

Hops ~10% α: Hops calibration curve for hops types of approx. 10% alpha acid content (Note: not suited for measuring several bales one after another!). Shows the current water content of the hops bale in %. If the shown temperature rises more than 3°C/°F compared to the actual sample temperature, let the probe cool down!

Hops ~15% α: Hops calibration curve for hops types of approx. 15% alpha acid content (Note: not suited for measuring several bales one after another!) Shows the current water content of the hops bale in %. If the shown temperature rises more than 3°C/°F compared to the actual sample temperature, let the probe cool down!

Hops ~20% α: Hops calibration curve for hops types of approx. 20% alpha acid content (Note: not suited for measuring several bales one after another!) Shows the current water content of the hops bale in %. If the shown temperature rises more than 3°C/°F compared to the actual sample temperature, let the probe cool down!

Hops ~4% α RT: Hops calibration curve for hops types of approx. 4% alpha acid content (for short measuring intervals – warmed-up insertion probe). Shows the current water content of the hops bale in %. The temperature of the **bale** has to be in the range of room temperature (±3°C). If the shown temperature differs more than ±3°C, the calibration curve „hops 4% α“ has to be used.

Hops ~10% α RT: Hops calibration curve for hops types of approx. 10% alpha acid content (for short measuring intervals – warmed-up insertion probe). Shows the current water content of the hops bale in %. The temperature of the **bale** has to be in the range of room temperature (±3°C). If the shown temperature differs more than ±3°C, the calibration curve „hops ~10% α“ has to be used.

Hops ~15% α RT: Hops calibration curve for hops types of approx. 15% alpha acid content (for short measuring intervals – warmed-up insertion probe). Shows the current water content of the hops bale in %. The temperature of the **bale** has to be in the range of room temperature (±3°C). If the shown temperature differs more than ±3°C, the calibration curve „hops ~15% α“ has to be used.

Hops ~20% α RT: Hops calibration curve for hops types of approx. 20% alpha acid content (for short measuring intervals – warmed-up insertion probe). Shows the current water content of the hops bale in %. The temperature of the **bale** has to be in the range of room temperature (±3°C). If the shown temperature differs more than ±3°C, the calibration curve „hops 20% α“ has to be used.

Straw: (for long measuring intervals and high sample temperature range) Shows the current water content of a straw bale in %. Attention: Not suited for measurements with warmed-up insertion probe! If the shown temperature rises more than 3°C/°F compared to the actual sample temperature, let the probe cool down!

Hay (for long measuring intervals and high sample temperature range): Shows the current water content of a hay bale in %. Attention: Not suited for measurements with warmed-up insertion probe! If the shown temperature rises more than 3°C/°F compared to the actual sample temperature, let the probe cool down!

Digit: The digit curve is a unitless calibration curve with a range from 0 up to 100, which corresponds to the entire measurement range of the device. With this curve special products can be measured.

The higher the value the wetter is the material. By means of a comparative measurement by a reference method, a table with comparison values can be created.

very dry: 0 very wet: 100

Free calibration curves 1-4: There are four free calibration curves which can be used for measuring special products (temperature compensated).

On request Schaller GmbH can develop customer-specific calibration curves for your product.

Test block: This calibration curve is only determined for checking the instrument with the optionally available test block article no. 12308.

Determination of the material reference moisture

The humimeter FLH determines the water content, which means that it calculates the moisture referred to the total mass:

$$\%F = \frac{Mn - Mt}{Mn} \times 100$$

Mn:	**mass of sample with average moisture content**
Mt :	**mass of the dried sample**
%F:	**calculated absolute moisture (water content)**

Air humidity sensors:

Information for conditioning of the sensor

The conditioning of the sensor (time until the device shows the actual measuring value) depends on several parameters. The parameter responsible for the highest measuring error is a temperature discrepancy between the sensors resp. the whole measuring instrument and the material to measure resp. the air. For that reason, make sure to let the sensor adjust for an adequate time period.

absolute moisture: shows the contained amount of water in gram per cubic metre of air. The absolute humidity is a direct degree for the amount of water vapour contained in a certain air volume. It shows how much moisture can maximally condense or how much water has to be evaporated to receive a certain desired air humidity.

Relative air humidity: indicates the relation between the current water vapour pressure and the maximum possible water vapour pressure (called saturation vapour pressure).

The relative humidity shows the degree the air is saturated with water vapour. For example:

50% relative humidity indicates that at the current temperature and the current pressure the air is saturated with water vapour for half of its value, 100 % relative humidity means that the air is totally saturated. When the air has more than 100 % of relative humidity, the excessive moisture would condense or form fog.

EMC hops: Shows the hops equilibrium moisture content (for hops stored under these conditions) in % water content and the temperature in the selected unit (°C or °F).

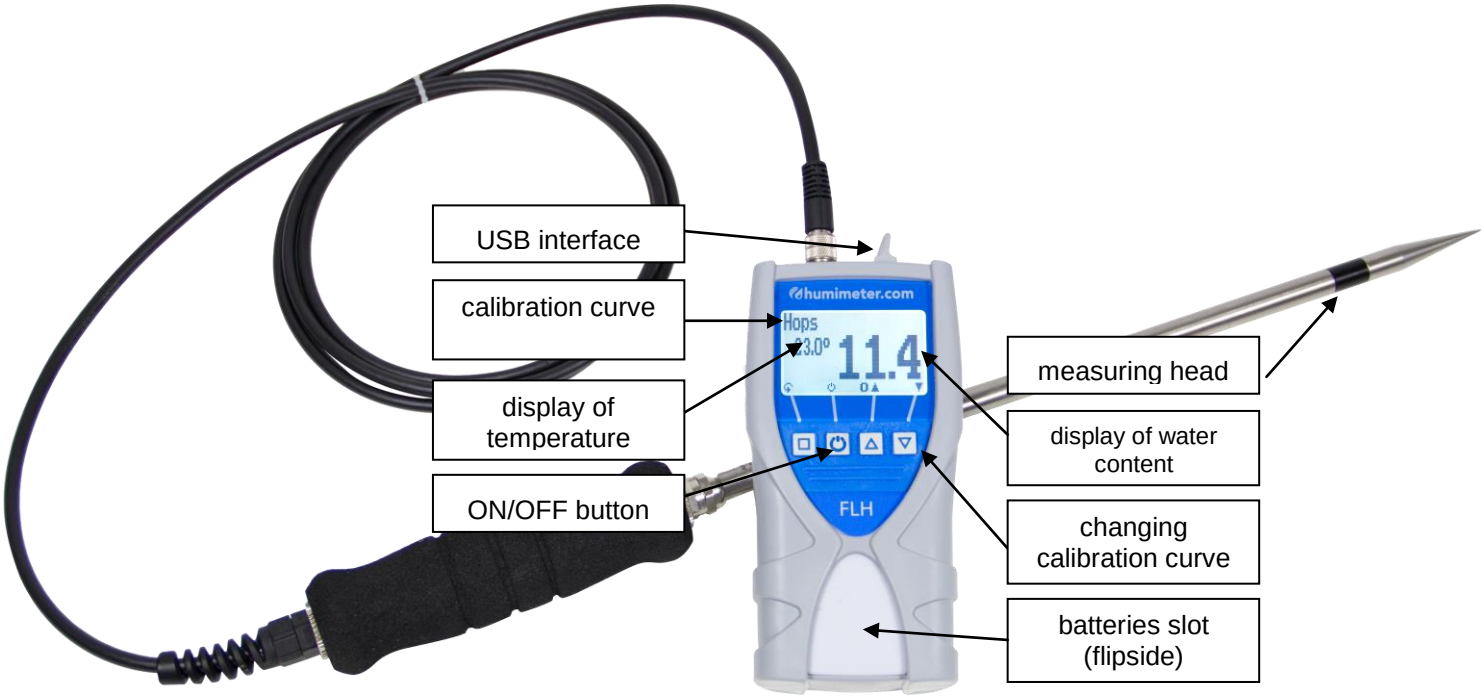
Infrared sensor:

IR temperature sensor: shows the current temperature of the object beamed by the sensor. The sensor has a 1:10 optics, which means a measuring area of 16 cm at a distance of 1 meter.

Info: The sensor is not suited for measuring brilliant or reflective materials!

humimeter FLH + IR temperature sensor article no. 12513

humimeter FLH + insertion probe article no. 13158



humimeter FLH + hop cones sensor article no. 13736

humimeter FLH + humidity & temperature sensor article no. 12032

humimeter FLH + LF_TB 120 precision moisture & temperature sensor article no. 12004

Start-up

Insert the four delivered 1.5V Alkaline AA batteries as described below:

1.) At first remove the rubber protection cover. For that, hold the rubber housing at the upper side and pull it over. In case of an optional USB interface you have to remove the protection cap before.

2.) Press with your finger onto the arrow of the battery cap und pull it back.

3.) Put four new batteries <u>1.5 Volt AA Alkaline batteries</u> in the device. Make sure that the position of the battery poles is correct.

4.) Press down the batteries and close the cap.

For switching on the instrument, press the button ⏻ for approx. 3 seconds. Now the LC display lights up. After switching on, the serial number, the software version, the battery status and the memory allocation are displayed. Then the instrument is ready for use. For switching off the instrument, press the button ⏻ again for approx. 3 seconds. If no button is pressed for 10 minutes, the instrument switches off automatically.

Changing the sensor

For changing the sensor, just screw the desired sensor on the humimeter device. The instrument automatically recognises the sensor and shows the corresponding calibration curves.

Measuring procedure

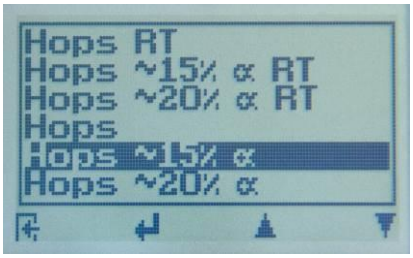
1. For a correct measurement please ensure that the device has the same temperature than the material to measure. For that reason, let your device adjust to the surrounding temperature of the material for at least half an hour before measuring (protect from direct sunlight!)

2. Switch on the device: Press the ⏻ key for 3 seconds.

3. Connect the desired sensor (if no sensor is connected, the display shows “no sensor”).

4. Now select the desired calibration curve by pressing the buttons ▲ resp. ▼. (Pressing the ▲ or ▼ key in the measuring window for at least 3 seconds, a list with all available sorts will appear. Curves displayed in grey are not available for the currently connected sensor.)

   The currently set calibration curve is indicated in the upper part of the display. For the explanation of the different curves, please see page 2 of this manual.

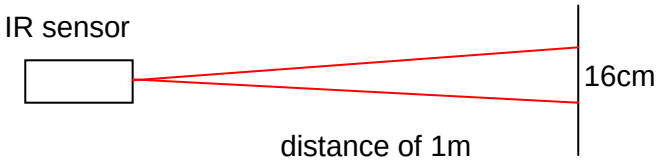


5. After selecting the calibration curve, the measurement can be started:

5.1. **Air humidity sensor**: After an adequate conditioning time, the humidity and temperature value can be read off the display.

5.2. **IR temperature sensor**: shows the current temperature of the object beamed by the sensor. The sensor has a 1:10 optics, which means a measuring area of 16 cm at a distance of 1 meter.

Info: The sensor is not suited for measuring brilliant or reflective materials!



5.3. **Insertion probe**: The probe has to be plugged into the bale as described on page 13, topic “plug-in direction”. The water content can immediately be read off the display.

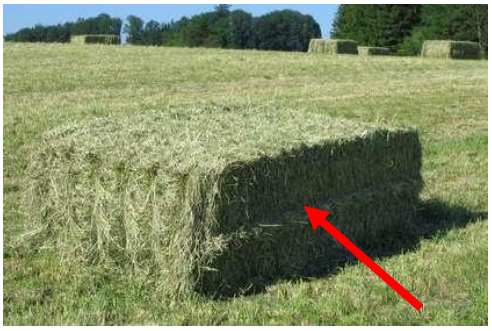
ATTENTION! Risk of injury!

5.4. **Hop cones sensor**: To ensure correct measuring results, the measuring chamber has to be full to the brim with material, but must not be precompressed (see illustration picture). Put the cap (compressing fixture) onto the measuring chamber and tighten it to the stop. As soon as the measuring chamber is completely closed, the display shows the measuring value.

Plug-in direction

Insert the sensor into the bale like shown in the pictures below. Any other direction of plugging in may lead to a significant deviation of the measuring results. Pull the unit straight out of the bale again. Any mechanical damage due to mishandling is no case of guarantee.

Round bales have to be measured on the face side. Measurements at the bearing surface lead to misreadings!

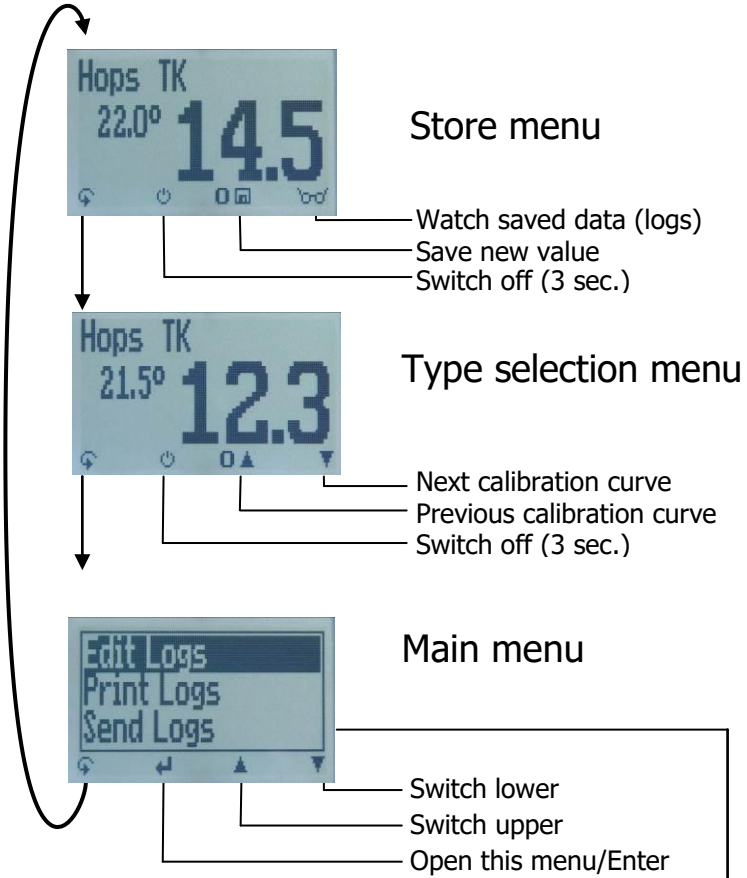


Rectangle bales have to be measured on the face side. Measurements at any other side can lead to misreadings.

Hops:

With hops bales, the plug-in direction can be chosen freely. Please only ensure that the measurement has to be effected in a compressed area (this means no measurement of loose hops, no measurement in the area of the bale closure).

Menu level overview



Overview main menu

Edit Logs Manual Logs Clear Logs *Print Logs* Last Log All Logs Clear Logs *Send Logs* Manual Logs Clear Logs *Options* *Status*	*Options* Date / Time Log Time Language Unlock °C/°F o Userlevel BL On time Auto Off time Materialcalib. Password Reset SN. Logo Admin

Keypad symbols

Measuring window:

- Rolling Menu
- Power ON / OFF
- Switch upper
- Switch lower
- Save
- Hold
- Watch the saved data
- Add suppliers data

Menu:

- Enter
- Switch upper
- Switch lower
- Exit
- 0..9 Enter numbers
- A..Z Enter letters
- Next or right
- Left
- Yes
- No
- Shift
- OK

Operating the instrument

Switching on:	Press the button ⏻ for 3 seconds.
Setting date and time:	2 times ↻ -> Options -> Date/Time
Saving measuring data:	The shown value can be saved by pressing the button 🖫. Name the saved value by pressing the ✎ button.
Hold:	Select the menu item „Datalog time“ in the menu „Options“. Activate „Hold“ there and change to the measuring window again. Pressing the button below the symbol ⏸, the measuring value will remain on the display until another button is pressed.
Display lighting:	Press the ⏻ key briefly; the display lighting switches off automatically after approx. 30 seconds. Pressing any key activates the display lighting again.
Switching off:	Press the ⏻ key for 3 seconds. The instrument switches off after releasing the key. The instrument switches off automatically after approx. 10 minutes.
Measuring range:	If the measuring value is blinking in grey, the valid measuring range is exceeded. In this case the accuracy will be decreasing.

Activation of the “super user” function

2 times ↻ - *Options* – Unlock

Enter the 4-digit password by using the ▲ button (standard is the 4-digit serial number) and confirm by pressing the ↵ button.

Changing the userlevel

Changing from advanced user to single user:

Make sure that you have activated the “super user” functions according to the instructions above. Afterwards change to the menu and choose „Options“.

In the submenu please select „o Userlevel“ (2 times - *Options* – o *Userlevel)*

Confirm by pressing the ↵ button. Now the single user is activated.

Changing from single user to advanced user:

Keep both the buttons ▲ and ▼ pressed directly after switching on the device. Your humimeter automatically starts the main menu. Activate the “super user” functions according to the instructions above.

Navigate to “*Options* – o *Userlevel”* and confirm by pressing the ↵ button.

Changing the batteries

If the battery symbol appears in the measuring w
critical charge of battery is shown in the status (
have to be changed IMMEDIATELY. If you do
humimeter device for a longer period, remove th
eventual resulting damages we cannot provide any

Exemption from liability

For misreadings and wrong measurements and of this resulting damage we refuse any liability.

This is a device for quick determination of moisture. The moisture depends on multiple conditions and multiple materials. Therefore we recommend a plausibility check of the measuring results.

Each device includes a serial number and the guarantee stamp. If those are broken, no claims for guarantee can be made. In case of a faulty device, please contact Schaller GmbH (www.humimeter.com) or your dealer.

Transfer saved data to the PC

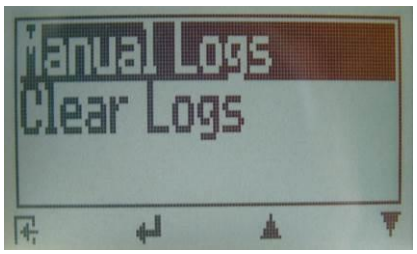
(only with optional USB data interface module)

To send your saved logs to the PC, connect the humimeter device to your PC using the USB cable that was delivered with your device. Carefully loose the protection cap on your humimeter and plug in the USB mini B connector. The bigger connector has to be connected to a USB slot on your PC.
Start the LogMemorizer software on your PC and switch on your humimeter.

The data transfer can be started on your humimeter or on the software.

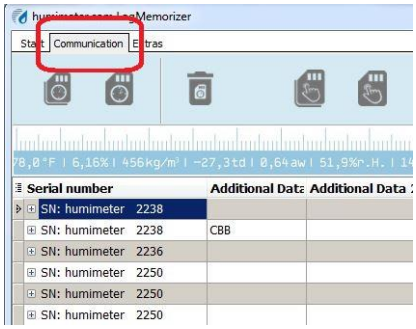
<u>Starting the data transfer on the humimeter:</u>

Press the ↻ key until you reach the menu (see image on the right). Then choose „Send Logs“ and confirm by pressing the ↵ key. Now choose „Manual Logs“ and confirm with ↵ again. All saved logs will be sent to your PC.

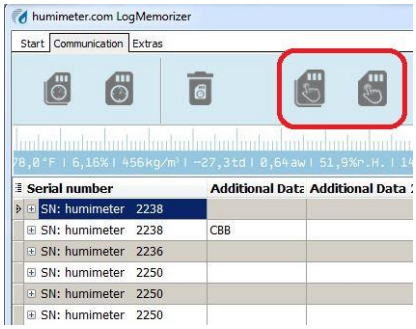


Starting the data transfer on your PC:

Press the field „communication“ in the LogMemorizer software. The menu window shown on the right opens.



For transferring the data you can select „Import last manual log“ (the last saved measuring series is transferred) or „Import all manual logs“ (all saved logs are transferred).



If you click on one of these menu items, the transfer starts immediately.

For the initial configuration of the software, please press the F1 key of your PC and read the help file.

Print saved data

(only with optional USB data interface module and Schaller thermo printer)

To print your saved data, connect the device to the printer using the printer cable that was delivered with your device. Carefully loose the protection cap on the humimeter. At first plug in the side of the connector with the close plastic casing at the humimeter.

Then switch on the device.

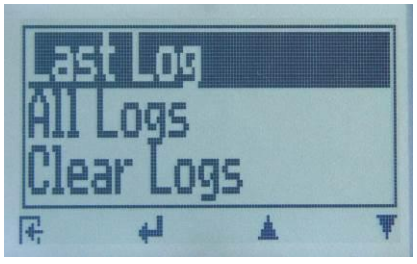
Not till then the other side of the cable has to be plugged in at the printer. Switch on the printer by pressing ⏻. Now the green LED is blinking. If it does not blink, please change the batteries and try again.

Press the ↶ button at your humimeter until you reach the menu (see image on the right). Choose „Print Logs“ and confirm by pressing ↵.

Now you can select if you want to print the last saved measuring series or all saved measuring series (logs).

Confirm by pressing ↵ again. The selected logs are printed out now.

To save paper, please think of clearing the data storage regularly.



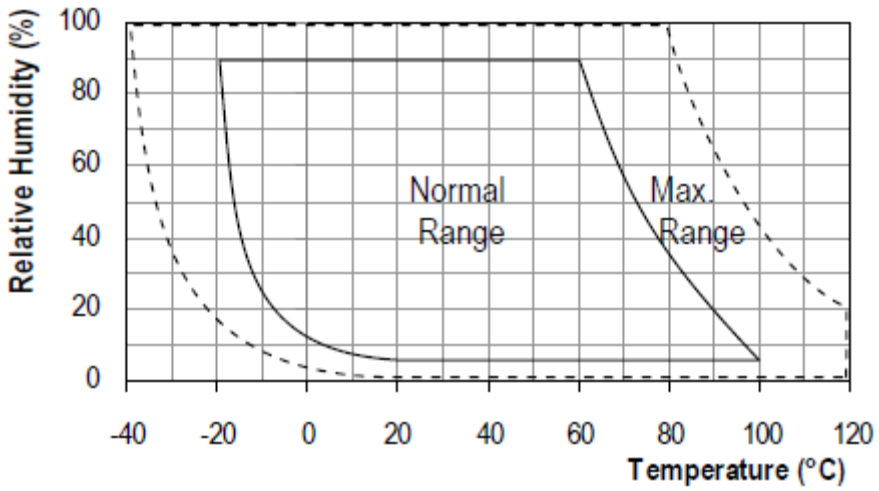
Device maintenance instructions

To provide a long life of your device please do not expose it to strong mechanical loads or heat e.g. dropping it or direct sunlight exposure. Clean your device using a dry cloth. Any kind of wet cleaning damages the device.

The instrument is not rainproof. Keep it in dry areas. When the device isn't used for a longer period (2 months) or when the batteries are empty, they should be removed to prevent a leakage of the battery acid.

Application range air humidity sensors

Within the normal application range (normal range) the accuracy of the device is as indicated. A long-term application beyond the normal application range (max. range), particularly at an air humidity of more than 80%, can lead to higher measuring errors (+3% after 60 hours). Back in the normal application range, the sensor will return to the indicated accuracy automatically.



Packaging

If the device isn´t used for a longer time period, store it in the cardboard cylinder (or optionally the wooden or plastic case) the device was delivered with. Do not discard the packaging! In case of returning the instrument for warranty or repair, use the original packaging. For eventual damages in transport due to inadequate packaging we refuse any liability.

Technical data

Resolution of display	0.5% material moisture (hay, straw) 0.1% material moisture (hops) 0.5°C temperature
Operating temperature	0°C to 40°C / 32 to 104°F
Temperature range	-15°C to 85°C / 5 to 185°F
Storage temperature	-20°C to 60°C / -4 to 140°F
Temperature compensation	automatically
Power supply	4 pcs. of 1.5Volt AA Alkaline batteries
Auto Switch Off	after approx. 10 minutes
Current consumption	55 mA (with lighting)
Display	128 x 64 matrix display, lighted
Dimensions	145 x 65 x 27 mm
Weight	approx. 250g (with batteries and rubber protection cover)
Degree of protection	IP 40
Scope of supply	humimeter FLH with rubber protection cover, 4 pcs. of 1.5Volt AA Alkaline batteries
Required accessories	external sensors

External sensors

Measurement:	**measuring range /resolution**		**/ accuracy**
Hops moisture insertion probe (13158):			
water content:	4 to 40%	/ 0.1%	
temperature °C:	-15 to +85°C	/ 0.5°C	/ ±0.5°C (at 25°C)
temperature °F:	5 to 185°F	/ 0.9°F	/ ±0.5°F (at 77°F)
Hop cones moisture sensor (13736):			
water content:	4 to 40%	/ 0.1%	
temperature °C:	-15 to +85°C	/ 0.5°C	/ ±0.5°C (at 25°C)
temperature °F:	5 to 185°F	/ 0.9°F	/ ±0.5°F (at 77°F)
Humidity and temperature sensor (12032):			
rel. air humidity:	0 to 100% rh	/ 0.1%	
Calibration	10 to 90%		/ ±2.0%RH (at 25°C)
temperature °C:	-20 to +85°C	/ 0.1°C	/ ±0.3°C (at 25°C)
temperature °F:	-4 to 185°F	/ 0.2°F	/ ±0.5°F (at 77°F)
LF-TB 120 (12004):			
rel. air humidity:	0 to 100% rh	/ 0.1%	
Calibration	10 to 90%		/ ±1.5%RH (at 25°C)
temperature °C:	-20 to +120°C	/ 0.1°C	/ ±0.3°C (at 25°C)
temperature °F:	-4 to 248°F	/ 0.2°F	/ ±0.5°F (at 77°F)
IR temperature sensor (12513):			
IR temperature °C:	-25 to 125°C	/ 0.1°C	
IR temperature °F:	-13 to 257°F	/ 0.2°F	

!IMPORTANT! Please read!

Most common reasons for misreadings

- ***Product temperature out of application range***
  Material below 0°C resp. above +40°C may cause faulty measurements. The storage of cold material in a warm storage area usually creates condensed water which may lead to major measuring errors.
- ***Too short conditioning time***
- ***Discrepancy in temperature between device and material***
  Please ensure that the device and the material under test are being stored at the same temperature before measuring. Protect your measuring device from direct sunlight for a reasonable time period before taking a measurement. A high temperature difference has a negative effect on the stability of the measurement results.
- ***Wrong calibration curve for warmed-up insertion probe***
- ***Wrong calibration curve***
  Double check the correct selection of the calibration curve before measuring.
- ***Wet or mouldy material***
- ***Frozen measuring material or material containing snow***
  This leads to a major decrease in accuracy.
- ***Plug-in direction (for straw and hay)***
  The plug-in direction has a great influence on the accuracy. Necessarily follow the instructions according to page 13 of this manual!
- ***Compressed density outside the application range***
  If the compressed density differs from that specified, there may be deviations.
- ***Moving the measuring head after plugging in leads to misreadings!***
- ***Water film at the measuring head***
  After measuring wet material a water film can arise on the sensor head. This may cause a too high result in the following measurements. After measuring wet material, clean both black plastic parts of the measuring head accurately with a dry cloth.

ATTENTION: Risk of injury by measuring head!

Keep away from children younger than 16 years!

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