Schaller
Messtechnik / humimeter.com

Moisture meter

Operating Manual

humimeter FLH

for measuring the moisture content of hops



78,0 °F | 6,16% | 456 kg/m³ | −27,3 td | 0,64 aw | 51,9 %r.H. | 14,8 %abs | 100,4 g/m² | 09 m/s | 4,90 Ugl | 1

Version 2.0

Always read this operating manual before using the humimeter FLH!

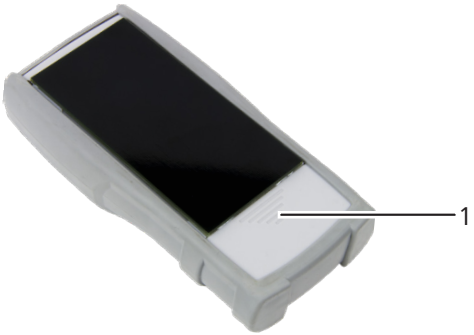
Your humimeter FLH at a glance

The main unit



No.	Name
1	Connector for external sensor
2	USB port (optional)
3	Display
4	Keypad
5	Rubber protection cover

Rear of the main unit



No.	Name
1	Battery compartment

Overview external sensors

Art.no. 13158 insertion probe



Measurement	Measuring range	Resolution	Accuracy
moisture content	4 % to 40 %	0.1 %	
temperature °C	-15 °C to +85 °C	0.5 °C	+/- 0.5 °C (at 25 °C)
temperature °F	5 °F to 185 °F	0.9 °F	+/- 0.5 °F (at 77 °F)

Art.no. 13736 umbel sensor



Measurement	Measuring range	Resolution	Accuracy
moisture content	4 % to 40 %	0.1 %	
temperature °C	-15 °C to +85 °C	0.5 °C	+/- 0.5 °C (at 25 °C)
temperature °F	5 °F to 185 °F	0.9 °F	+/- 0.5 °F (at 77 °F)

Art.no. 12004 LF_TB 120 precision humidity and temperature plug-in sensor



Measurement	Measuring range	Resolution	Accuracy
rel. air humidity	0 % to 100 % rh	0.1 %	
calibration:	10 % to 90 %		+/- 1.5 % rh (at 25 °C)
temperature °C	-20 °C to +120 °C	0.1 °C	+/- 0.3 °C (at 25 °C)
temperature °F	-4 °F to 248 °F	0.2 °F	+/- 0.5 °F (at 77 °F)

Art.no. 12032 humidity and temperature sensor



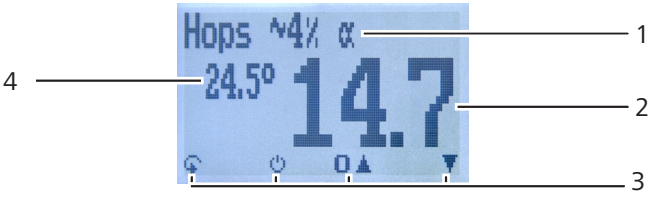
Measurement	Measuring range	Resolution	Accuracy
rel. air humidity	0 % to 100 % rh	0.1 %	
calibration:	10 % to 90 %		+/- 2.0 % rh (at 25 °C)
temperature °C	-20 °C to +85 °C	0.1 °C	+/- 0.3 °C (at 25 °C)
temperature °F	-4 °F to 185 °F	0.2 °F	+/- 0.5 °F (at 77 °F)

Art.No. 12513 IR temperature sensor



Measurement	Measuring range	Resolution
IR temperature °C	-25 °C to +125 °C	0.1 °C
IR temperature °F	-13 °F to 257 °F	0.2 °F

The display



No.	Name
1	Product type
2	Moisture content % ("6.1 How moisture is defined")
3	Display symbols
4	Temperature display

The display symbols

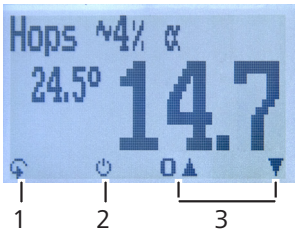
Symbol	Name
	Enter
	Up
	Down
	Back
	Enter numbers
	Enter letters
	Continue / go right
	Left
	Yes

Symbol	Name
	No
	Change input level
	OK
	Change menu
	Enter data
	View measurements
	Delete measurements
	On/off button, display light
	Save measured value

The menus

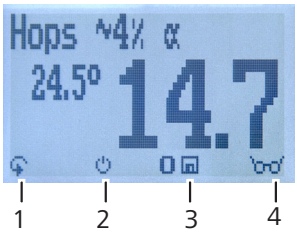
The device has three different menus: product selection, Data Log and main menu:

Product selection menu



No.	Name
1	Change menu
2	Display illumination / device on/off
3	For changing the product type

Data Log menu



No.	Name
1	Change menu
2	Display illumination / device on/off
3	Save measured value
4	Show the last recorded values

Main menu

The main menu comprises the following menu items:

- **Edit Logs:**
  Manual Logs, Clear Logs
- **Print Logs:**
  Last Log, All Logs, Clear Logs
- **Send Logs:**
  Manual Logs, Clear Logs
- **Options:**
  Bluetooth, Date/Time, Log Time, Emissions ratio, Language, Unlock, °C/°F, User-level, BL On Time, Auto Off Time, Adjust, Calibrate, Materialcalib., Online Send, Password, Reset
- **Status**

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1. Introduction

1.1 Information about this operating manual

This operating manual is designed to enable you to use the humimeter FLH safely and effectively. It is part of the device, has to be stored nearby and must be easily accessible to users at all times.

All users are required to carefully read and make sure that they have understood this operating manual before using the humimeter FLH. All of the safety and operating instructions detailed in this manual have to be observed to ensure the safety of the device.

1.2 Limitation of liability

All of the information and instructions provided in this operating manual have been compiled on the basis of the current standards and regulations, the state of the art, and the extensive expertise and experience of Schaller GmbH.

Schaller GmbH does not accept any liability for damage associated with the following, which also voids the warranty:

- Non-observance of this operating manual
- Improper use
- Inadequately qualified users
- Unauthorised modifications
- Technical changes
- Use of unapproved spare parts

This fast measuring procedure can be affected by a range of different factors. For this reason, we recommend periodically checking the device's measurements with a standardised oven-drying method.

We as the manufacturer do not accept any liability for any incorrect measurements and associated consequential damage.

1.3 Symbols used in this manual

All the safety information provided in this manual is shown with a corresponding symbol.



CAUTION

It is essential to observe this warning. Non-compliance can lead to injury.



ATTENTION

It is essential to observe this warning. Non-compliance can lead to damage to property or equipment.



Information

This symbol indicates important information that enables users to use the device more efficiently and cost-effectively.

1.4 Customer service

For technical advice, please contact our customer service department at:

Schaller GmbH
Max-Schaller-Straße 99
A - 8181 St.Ruprecht an der Raab

Telefon: +43 (0)3178 28899
Fax: +43 (0)3178 28899 - 901

E-Mail: info@humimeter.com
Internet: www.humimeter.com

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2. For your safety

The device complies with the following European directives:

- Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS)
- Electromagnetic compatibility (EMC)

The device corresponds to state-of-the-art technology. However, it is still associated with a number of residual hazards.

These hazards can be avoided through strict observance of our safety information.

2.1 Proper use

- Easy to use device for quickly measuring the moisture content of hops.
- The device must only be used for taking measurements on the products defined in the following sections of this manual (see "6. Produkte und Kennlinien").

2.2 Improper Use

- The device is not suitable for measuring rain wet or mouldy hops.
- The device is not suitable for measuring rain wet or mouldy hay/straw.
- The device is not waterproof and must be protected from water and fine dust (IP40).

2.3 User qualifications

The device must only be operated by people who can be expected to reliably take the measurements. The device must not be operated by people whose reaction times may be slowed due to, e.g. the use of drugs, alcohol or medication.

All persons using this device must have read, understood and follow the instructions provided in the operating manual.

2.4 General safety information

The following safety information has to be observed at all times to avoid damage to objects and injury to people:

- Remove the batteries if the device isn´t used for a prolonged period of time.
- Keep the measuring head away from your body throughout all activities.
- Keep the measuring head away from other people throughout all activities.
- In case of damages or loose parts on the device, remove the batteries and contact Schaller GmbH or your dealer.

All of the device's technical features have been inspected and tested before delivery. Every device has a serial number. Do not remove the tag with the serial number.

2.5 Waranty

The warranty does not apply to:

- Damage resulting from non-observance of the operating manual
- Damage resulting from third-party interventions
- Products that have been used improperly or modified without authorisation
- Products with missing or damaged warranty seals
- Damage resulting from force majeure, natural disasters, etc.
- Damage from improper cleaning
- Batteries older than six months
- Damage resulting from improper strain (pressure, bending) of the insertion probe or the measuring head
- Damage by dropping the measuring head

2.6 Packaging

- Do not discard the packaging!
- In case of returning the device for a warranty claim, the original packaging must be used.

» We refuse any liability for damages during transport using inadequate packaging.

3. On receipt of your device

3.1 Taking the device out of its packaging

- Take the device out of its packaging.
- Next, make sure that it is not damaged and that no parts are missing.

3.2 Making sure that all of the components have been included

Make sure that all of the components have been included by checking the package contents against the following list:

- humimeter FLS
- 4 pieces of AA Alkaline batteries
- Rubber protection cover
- Cardboard cylinder
- Operating manual

Required accessories:

- External sensor (see "Overview external sensors" Seite 3)

Optional accessories:

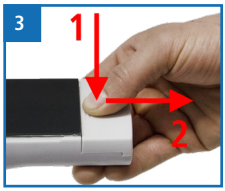
- humimeter USB data interface module - USB flash drive with software and USB cable
- Battery operated portable thermal printer (only possible together with humimeter USB data interface module) - Described in a separate operating manual
- Bluetooth module (only possible together with humimeter USB data interface module) - Described in a separate operating manual
- Test block
- Wooden case
- Plastic case

3.3 Inserting batteries





1. Remove the rubber protection cover. To do so, hold the rubber protection cover at the upper side and pull it over. If your device is provided with an optional USB port, remove the protection cap of the USB socket before (figure 1 and 2).

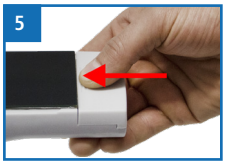


2. Take hold of the device with one hand, press your thumb onto the engraved area of the battery compartment (1) and drag downwards (2) (figure 3).



3. Insert the batteries with negative and positive terminals matching those indicated on the battery compartment. Press down the batteries so that they lay flat on the bottom of the housing (figure 4).

   » As soon as all batteries have been inserted, the device switches on automatically.

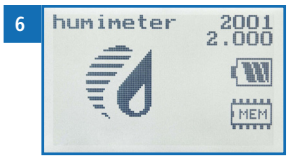


4. Push the battery cover onto the housing until it clicks into place. Then mount the rubber protection cover onto the housing, beginning at the end where the battery compartment is situated (figure 5).

4. Using the device - Basics

4.1 Switching the device on

- Press the ⏻ button for 3 seconds.



» The display will then show the status indicator (figure 6).

» After inserting the batteries, the device switches on automatically.

4.2 Selecting the product type

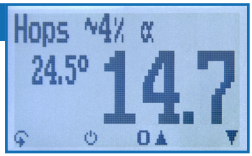
To do so: The device has to be in the product selection menu (figure 7).

For an overview of the different product types and the criteria for selecting them, please refer to "6. Product types".

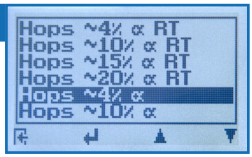
1. Press the ▽ or △ button to move from one product to the next Or
2. Press the ▽ or △ button for 3 seconds to open the product type overview (figure 8).
3. Use the arrow keys to move from one product type to the next
4. and keep any of them pressed to scroll through the types.
5. Confirm your selection by pressing ↵

» The product type you selected will now be shown at the top of the display.

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4.3 Exchanging the sensor

- If a sensor is already mounted, unscrew it counterclockwise. Plug the desired sensor into the device until both threads are in contact.

» Pay attention to the elevation in the connector and its correct positioning (figure 10).

» Do not use excessive force to plug in the sensor, which is very easy to operate.

- Now tighten the thread.

9



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4.4 Taking a measurement

- For information on how to take a measurement, see section "5. The measuring process".

4.5 Switching the device off

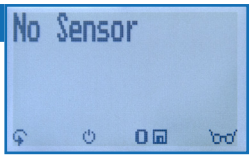
To do so: The device has to be in the product selection, the Data Log or the additional function menu. It is not possible to switch off the device when it is in the main menu.

- Press the ⏻ button for 3 seconds.

5. The measuring process

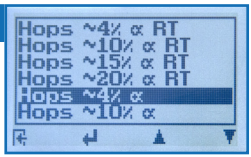
5.1 Preparing a measurement

To do so: The device has to have nearly the same temperature than the product being measured. It is recommended to let your humimeter device adjust to the surrounding temperature for at least 30 minutes before the measurement.

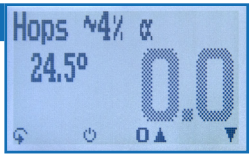


- Switch on the device (see "4.1 Switching the device on").
- Connect the desired sensor to the device (see "4.3 Exchanging the sensor").

» If no sensor is connected, the display will show **No Sensor** (figure 11).



- Select the desired product type (see "6. Product types") by pressing  or  (see "4.2 Selecting the product type") (figure 12).



5.2 Taking a measurement

5.2.1 Measurement with insertion probe:

To do so: The device has to have nearly the same temperature than the product being measured.

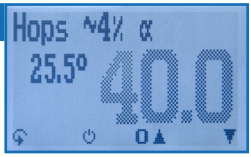


- Insert the measuring head of the device straight into the hops or hay/straw.

» Do not bend or drop the measuring head!

» For hops bales, the insertion direction is freely selectable. The measurement should only be carried out in the area of compaction.

» Bales of hay or straw, both round and rectangle bales, have to be measured on the face side of the bale!



- The device will now instantly display the moisture content on the display.

» The displayed value flashes when the moisture content exceeds the measuring range of the selected product type (figure 15). A flashing value signals lowered accuracy of the measurement. The measuring range is dependent on the product type (see "6. Product types").

» The device shows no measuring value (figure 13), if the value is below the lower limit of the measuring range of the selected product type. The measuring range is dependent on the product type (see "6. Product types").
» Once the reading has been taken, it can be saved on the device (see "5.5 Saving individual readings" or "5.6 Saving several readings (a measurement series) at the same time").

5.2.2 Measurement with umbel sensor:

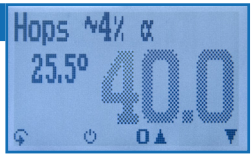
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To do so: The device has to have nearly the same temperature than the product being measured.

- Fill the measuring chamber with material full to the brim (figure 16).
» Make sure that the material is not pre-compacted.
- Place the cap on the measuring chamber and tighten it to the stop (figure 17).
- As soon as the measuring chamber is completely closed, the display shows the measuring value.

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» The displayed value flashes when the moisture content exceeds the measuring range of the selected product type (figure 18). A flashing value signals lowered accuracy of the measurement. The measuring range is dependent on the product type (see "6. Product types").

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» The device shows no measuring value (figure 13), if the value is below the lower limit of the measuring range of the selected product type. The measuring range is dependent on the product type (see "6. Product types").
» Once the reading has been taken, it can be saved on the device (see "5.5 Saving individual readings" or "5.6 Saving several readings (a measurement series) at the same time").

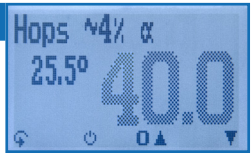
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5.2.3 Measurement with air humidity and temperature sensor:

To do so: The device has to have nearly the same temperature than the product being measured.

After an adequate conditioning time, the humidity and temperature value can be read off the display.

» The displayed value flashes when the moisture content exceeds the measuring range of the selected product type (figure 20). A flashing value signals lowered accuracy of the measurement. The

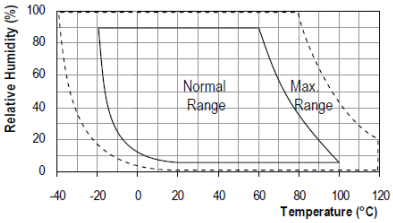
20


measuring range is dependent on the product type (see "6. Product types").

» Once the reading has been taken, it can be saved on the device (see "5.5 Saving individual readings" or "5.6 Saving several readings (a measurement series) at the same time").

Application range of 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.



5.2.4 Measurement with IR temperature sensor

To do so: The product being measured must not be glossy or reflective.

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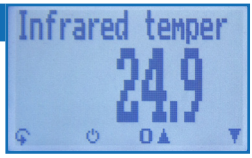


- Hold the device with the sensor facing an object.
- The device will now instantly display the current temperature of the illuminated object.

» The sensor has a 1:10 optics, which means a measuring area of 16 cm at a distance of 1 meter.

» Once the reading has been taken, it can be saved on the device (see "5.5 Saving individual readings" or "5.6 Saving several readings (a measurement series) at the same time").

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CAUTION

Risk of injury

Risk of injury due to the measuring head

- ► Keep the measuring head away from your body throughout all activities.
- ► Keep the measuring head away from other people throughout all activities.

ATTENTION - HIGH MEASURING INTERVAL

The measuring head will heat up when taking a high amount of measurements on bales with high compressed density, in a rapid succession. This will decrease the accuracy of the measurement significantly.

Information - Measuring accuracy

This rapid and non-destructive measuring procedure allows you to take moisture readings at a number of different points. When saving the individual readings, the device will automatically calculate the readings' average (see "5.6 Saving several readings (a measurement series) at the same time").

Information - Incorrect readings

Always make sure to select the correct product type for the material you are measuring. This prevents taking incorrect readings (see "11. Faults").

5.3 Simplified user

The device can be configured in such a way that the access of the user can be reduced to the product selection menu combined with the Hold function.

5.3.1 Activating/deactivating the simplified user

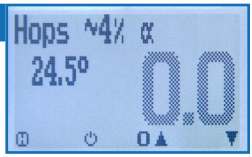
- For information on how to activate/deactivate the simplified user, see section "9.7 Changing the Userlevel".

5.3.2 Using the simplified user

The simplified user offers the following limitations:

- The only useable menu is a slightly modified product selection menu (figure 23).
- » No access to the Data Log or main menu
- Hold function replaces the function to switch between the different menus (see "5.4 Hold function - Freezing the displayed values").

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5.4 Hold function - Freezing the displayed values

The device can be configured in such a way that the information being shown on the display will freeze at the touch of a button until a new button is pressed. This function can be very useful when e.g. taking readings in spaces where it is not possible to see the display (e.g. overhead).

5.4.1 Activating the Hold function in the options menu

To do so: The device has to be switched on and be in the product selection menu.

1. Press twice or hold for 2 seconds.
2. Select **Options**. To do so, press or and confirm by pressing .
3. Select **Log Time** (figure 24). To do so, press or and confirm by pressing .
4. Select **Hold** (figure 25). To do so, press or and confirm by pressing .

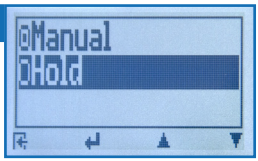
» The setting has been saved.

5. Press to leave the **Options** menu.
6. Press to leave the main menu.

24



25



5.4.2 Using the Hold function

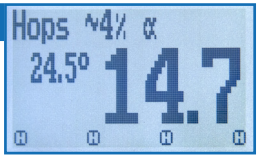
To do so: The device has to be switched on and be in the Data Log menu (see "The menus" Seite 6).

- Press .

» The current reading will be frozen. All of the four symbols will now be displayed as (figure 26).

- To reactivate the frozen display, simply press any button.

26



5.5 Saving individual readings

The device can be configured in such a way that the device will save a reading every time a button is pressed. This option (manual saving function) is the device's default setting.

5.5.1 Activating the manual saving function in the options menu

To do so: The device has to be switched on and be in the product selection menu.

1. Press twice or hold for 2 seconds.
2. Select **Options**. To do so, press or and confirm by pressing .
3. Select **Log Time** (figure 27). To do so, press or and confirm by pressing .
4. Select **Manual** (figure 28). To do so, press or and confirm by pressing .

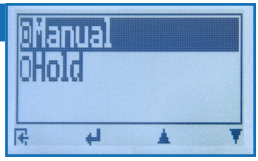
» The setting has been saved.

5. Press to leave the **Options** menu.
6. Press to leave the main menu.

27

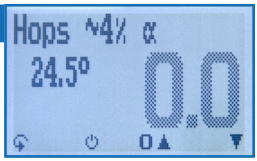


28



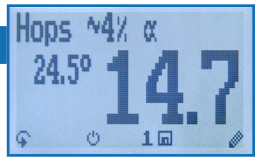
5.5.2 Using the manual saving option

To do so: The device has to be in the Data Log menu (see "Data Log menu" Seite 7). The device is set to Data Log time - Manual.



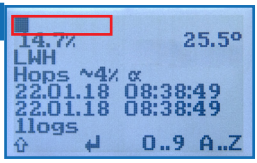
1. Press .

   » The display will now appear as shown in figure 30 and the disc symbol will be preceded by the digit one.



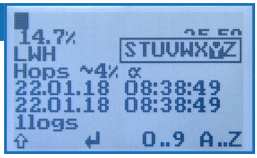
2. Press to enter a name for the saved reading and to finish the measuring process.

   » The display will now appear as shown in figure 31.



3. The data you have inputted can be overwritten at any time.

4. Inputting letters:
   Press and hold A..Z to quickly scroll to the required letter and either press it for 3 seconds or press to confirm the selected letter (figure 32).



5. Inputting numbers:
   Press and hold 0..9 to quickly scroll to the required number and either press it for 3 seconds or press to confirm the selected number.

6. Moving forward/back:
   Press to switch to another input level. Press or to move forward or back.

7. Confirm your entry by pressing .

   » The data you entered has been saved.

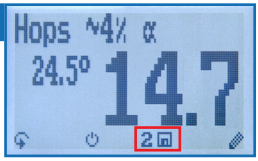
5.6 Saving several readings (a measurement series) at the same time

To do so: The device has to be in the Data Log menu.

1. Take several measurements at different points (see "5. The measuring process").
2. After each measurement, press to save the reading.

» The display will appear as shown in figure 33. The marked number shows the number of readings that have already been saved.

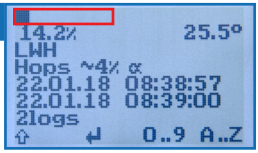
33



3. Press to enter a name for the saved measurement series and to finish the measuring process.

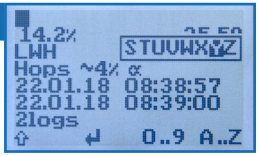
» The display will now appear as shown in figure 34.

34



4. The data you have inputted can be overwritten at any time.
5. Inputting letters:
   Press and hold A..Z to quickly scroll to the required letter and either press it for 3 seconds or press to confirm the selected letter (figure 35).

35

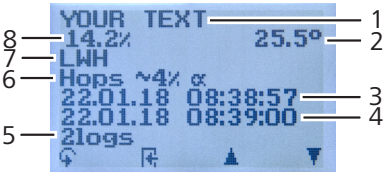


6. Inputting numbers:
   Press and hold 0..9 to quickly scroll to the required number and either press it for 3 seconds or press to confirm the selected number.
7. Moving forward/back:
   Press to switch to another input level. Press or to move forward or back.
8. Confirm your entry by pressing .

» The data you entered has been saved.

» The device automatically determines the average moisture content of the saved measuring values.

» The display will show the following information:

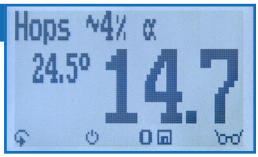


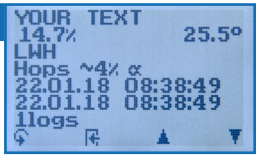
No.	Name
1	Name of the measurement series (editable)
2	Temperature (average)
3	Date & start time of the measurement series
4	Date & end time of the measurement series
5	Number of saved readings
6	Product type
7	Device name
8	Moisture content (average)

5.7 Viewing individual readings

To do so: You must have saved a reading (e.g. **1 Log**).
The display will now appear as shown in figure 36.

1. Press .
2. Select the required reading. To do so, press or .
   » The display will now appear as shown in figure 37.
   » Press to leave this screen.

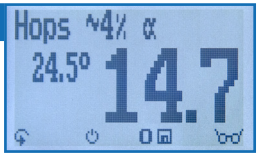
36


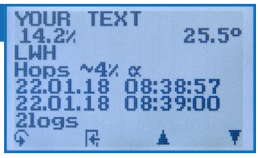
37


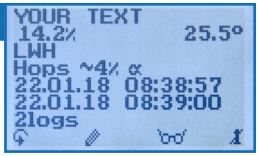
5.8 Viewing individual readings from a series of measurements

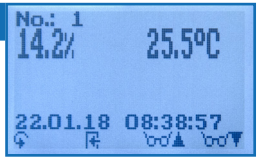
To do so: You must have saved a series of measurements (e.g. **2 logs**).
The display will now appear as shown in figure 38.

1. Press .
2. Navigate to the required measurement series. To do so, press or .
   » The display will now appear as shown in figure 39.
3. Press to switch to another input level.
   » The display will now appear as shown in figure 40.
4. Press again.
   » The display will now appear as shown in figure 41.
5. Navigate to the required reading (**No.: 1, No.: 2, No.: 3**). To do so, press or .
6. Press to leave this screen.

38


39


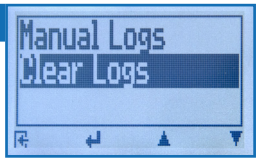
40


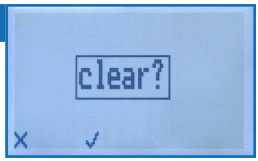
41


5.9 Deleting all measured values (data log)

To do so: You must have taken and saved one or several readings.

42

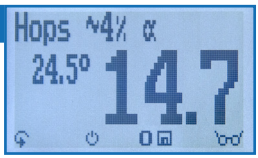

43


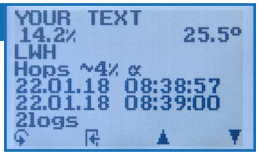
44


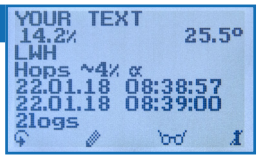
1. Press twice or hold for 2 seconds.
2. Select **Edit Logs** (figure 42). To do so, press or and confirm by pressing .
3. Navigate to **Clear logs** (figure 43). To do so, press or and confirm by pressing .
   » The display will show the message **clear?** (figure 44).
4. Confirm by pressing .
   » The data log has been deleted.
5. Press to leave the **Edit Logs** menu.
6. Press to leave the main menu.

5.10 Deleting individual measurement series

To do so: You must have saved a measured value (e.g. **1 log**) or a series of measurements (e.g. **3 logs**). The display will now appear as shown in figure 45.

45


46


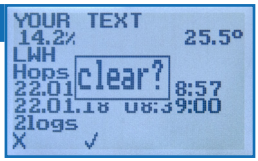
47


1. Press .
   » The display will now appear as shown in figure 46.
2. Select the required reading. To do so, press or .
3. Press to switch to another input level.
   » The display will now appear as shown in figure 47.
4. Press .

» The display will then show the message **clear?** (figure 48).

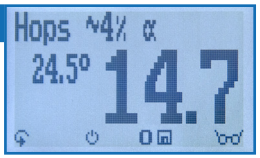
5. Confirm by pressing .

» The value has been deleted.

48


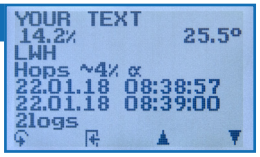
5.11 Deleting single values from a series of measurements

To do so: You must have saved a series of measurements comprising of at least 2 logs. The display will now appear as shown in figure 48.

49


1. Press .

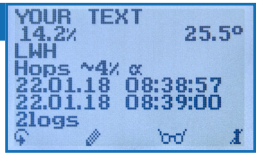
» The display will now appear as shown in figure 50.

50


2. Select the required reading. To do so, press or .

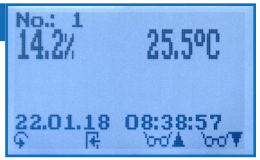
3. Press to switch to another input level.

» The display will now appear as shown in figure 51.

51


4. Press .

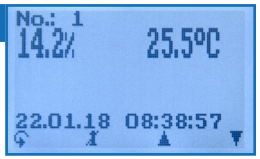
» The display will now appear as shown in figure 52.

52


5. Select the required measured value. To do so, press or .

6. Press to switch to another input level.

» The display will now appear as shown in figure 53.

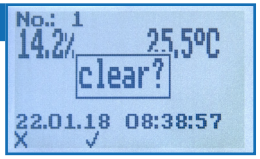
53


7. Press to delete the value shown.

» The display will then show the message **clear?** (figure 54).

8. Confirm by pressing .

» The value has been deleted.

54


6. Product types

Product name	Product type	Compressed density	Unit	Measuring range	Sensor
Hops ~4% a²	Hops bales / loose	100 - 160 kg/m³	% WC	6 % - 40 %	13158 / 13736
Hops ~10% a²	Hops bales / loose	100 - 160 kg/m³	% WC	6 % - 40 %	13158 / 13736
Hops ~15% a²	Hops bales / loose	100 - 160 kg/m³	% WC	4 % - 40 %	13158 / 13736
Hops ~20% a²	Hops bales	100 - 160 kg/m³	% WC	4 % - 40 %	13158 / 13736
Hops ~4% a² RT[1]	Hops bales	100 - 160 kg/m³	% WC	6 % - 40 %	13158
Hops ~10% a² RT[1]	Hops bales	100 - 160 kg/m³	% WC	6 % - 40 %	13158
Hops ~15% a² RT[1]	Hops bales	100 - 160 kg/m³	% WC	4 % - 40 %	13158
Hops ~20% a² RT[1]	Hops bales	100 - 160 kg/m³	% WC	4 % - 40 %	13158
Straw	Straw bales	100 - 160 kg/m³	% WC	8 % - 40 %	13158
Hay	Hay bales	100 - 160 kg/m³	% WC	8 % - 40 %	13158
Digit	Special products			0 - 100	13158 / 13736
abs. humidity g/m³	Kiln		g/m³	0 - 100 g/m³	12032 & 12004
rel. humidity %	Kiln		% rh	0 - 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	free curve for special products				13158 / 13736
Empty 2	free curve for special products				13158 / 13736
Empty 3 RT	free curve for special products				13158 / 13736
Empty 4 RT	free curve for special products				13158 / 13736
Test block	! Only for testing the moisture meter !				13158

- [1] RT ... room temperature
- [2] a ... alpha acid content

Always select the product type that most closely matches the indicated alpha acid content.

The device automatically recognises the connected sensor and provides the corresponding calibration curves.

6.1 How moisture is defined

The device measures and shows the material moisture content. The moisture content readings are calculated in relation to the material's overall mass:

$$\%WG = \frac{M_n - M_t}{M_n} \times 100$$

M_n: Mass of the sample with average moisture content

M_t: Mass of the sample with zero moisture content

%WG: Moisture content (in accordance with EN ISO 18134-2)

6.2 Selecting the product type

If you are not sure which calibration curve is the best suited for your material, it is recommended to carry out a reference measurement by kiln-drying (EN ISO 18134-2).

Schaller GmbH will be happy to advise you on the selection of the right calibration curve for your product.

6.2.1 Insertion probe

Information about the 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!

» 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.

Hops ~4% α: Hops calibration curve for hops types of approx. 4 % alpha acid content

- 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.

- Not suitable for measurements of several bales in a row!

Hops ~10% α: Hops calibration curve for hops types of approx. 10 % alpha acid content

- 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.

- Not suitable for measurements of several bales in a row!

Hops ~15% α: Hops calibration curve for hops types of approx. 15 % alpha acid content

- 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.

- Not suitable for measurements of several bales in a row!

Hops ~20% α: Hops calibration curve for hops types of approx. 20 % alpha acid content

- 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.

- Not suitable for measurements of several bales in a row!

Hops ~4% α RT: Hops calibration curve for hops types of approx. 4 % alpha acid content

- 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 temperature is not in the range of room temperature, the product type "Hops ~4% α" has to be used.

- For short measuring intervals (warmed-up insertion probe)

Hops ~10% α RT: Hops calibration curve for hops types of approx. 10 % alpha acid content

- 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 temperature is not in the range of room temperature, the product type "Hops ~10% α" has to be used.

- For short measuring intervals (warmed-up insertion probe)

Hops ~15% α RT: Hops calibration curve for hops types of approx. 15 % alpha acid content

- 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 temperature is not in the range of room temperature, the product type "Hops ~15% α" has to be used.

- For short measuring intervals (warmed-up insertion probe)

Hops ~20% α RT: Hops calibration curve for hops types of approx. 20 % alpha acid content

- Shows the current water content of the hops bale in %.
- The temperature of the bale has to be in the range of room temperature.

» If the temperature is not in the range of room temperature, the product type "Hops ~20% α" has to be used.

- For short measuring intervals (warmed-up insertion probe)

Straw:

- Shows the current water content of the straw bale in %.
- For high sample temperature range

» If the shown temperature rises more than 3 °C/°F compared to the actual sample temperature, let the probe cool down.

- Not suitable for measurements of several bales in a row!

Hay:

- Shows the current water content of the hay bale in %.

- For high sample temperature range
» If the shown temperature rises more than 3 °C/°F compared to the actual sample temperature, let the probe cool down.
- Not suitable for measurements of several bales in a row!

Digit:

- Has a unitless measuring range between 0 and 100,
» which corresponds to the entire measurement range of the device.
- The higher the indicated value, the wetter is the material:
» Very dry: 0 to very wet: 100
» By means of a comparative measurement by a reference method, a table with comparison values can be created.

Free product types 1-4:

- There are four free product curves on the device .
» They 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 curve is only destined for checking the device with the optionally available test block, article no. 12308.

6.2.2 Umbel sensor

Hops ~4% α: Hops calibration curve for hops types of approx. 4 % alpha acid content

- Shows the current water content of the hops in %.
- The device has to have nearly the same temperature than the product being measured (+/- 3 °C).
» If the temperature difference is more than +/- 3 °C, let the temperature adjust.

Hops ~10% α: Hops calibration curve for hops types of approx. 10 % alpha acid content

- Shows the current water content of the hops in %.
- The device has to have nearly the same temperature than the product being measured (+/- 3 °C).
» If the temperature difference is more than +/- 3 °C, let the temperature adjust.

Hops ~15% α: Hops calibration curve for hops types of approx. 15 % alpha acid content

- Shows the current water content of the hops in %.

- The device has to have nearly the same temperature than the product being measured (+/- 3 °C).

» If the temperature difference is more than +/- 3 °C, let the temperature adjust.

Hops ~20% α: Hops calibration curve for hops types of approx. 20 % alpha acid content

- Shows the current water content of the hops in %.
- The device has to have nearly the same temperature than the product being measured (+/- 3 °C).

» If the temperature difference is more than +/- 3 °C, let the temperature adjust.

Free product types 1-2:

- There are two free product curves on the device.

» They 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 curve is only destined for checking the device with the optionally available test block, article no 13888.

6.2.3 Air humidity sensors

Information about conditioning of the sensor

The conditioning time 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 humidity:

- Quantity of water contained in grams 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.

» 50% relative humidity: At the current temperature and the current pressure the

air is saturated with water vapour for half of its value.

» 100% relative humidity: At the current temperature and the current pressure the air is totally saturated.

» >100% 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).

6.2.4 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.

- Not suitable for measurements of glossy or reflective materials!

6.3 Notes for comparative measurement with oven-drying method

The device uses a much higher sample quantity than the drying oven (12-fold to 20-fold quantity of kiln-drying method). Furthermore, to determine a more accurate average moisture value in case of inhomogeneous material, there can be effected several measurements within a short time.

Considering a sampling error due to the considerably smaller sample quantity as well as the content of volatile matters (resin etc.) that are not water, the kiln-drying method will practically reach an accuracy of approx. +/-3 %. Therefore, if the measuring values of these two very different methods of determining the water content are compared, differences of +/- 3 % can be considered to be normal.

In the standard EN ISO 18134-2 is declared that the drying oven method provides no absolute values, but only comparable values.

7. Using the LogMemorizer program

To do so: The device is provided with USB interface, and the USB stick with LogMemorizer software and USB cable are available.

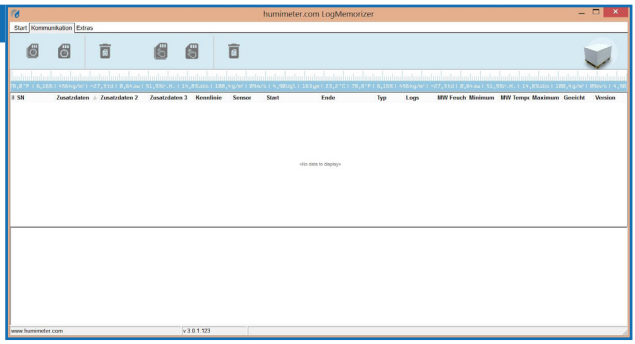
7.1 Installing/opening the program

1. Insert the USB stick with the LogMemorizer program into the USB port on your computer.
2. Open the **setup** application.
3. Follow the installation instructions.
4. Open LogMemorizer.

» The screen will now display the LogMemorizer's interface (figure 55).

» Before using LogMemorizer, please refer to the the separate LogMemorizer operating manual for the correct configuration of the USB COM Port.

55



For more information on LogMemorizer, please refer to the separate LogMemorizer operating manual supplied with the device.

7.2 Exporting measured values to a computer

To do so: The LogMemorizer program is installed. You must have taken and saved one or several moisture readings.

Options: You can export moisture readings from the humimeter FLH or initiate the export at your computer.

Exporting moisture readings from the humimeter FLH

Connect the humimeter FLH to your computer using the supplied USB cable:


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1. Insert the USB Mini B connector into the humi meter FLH (figure 56).
2. Insert the USB connector into the computer.
3. Open LogMemorizer on your computer.
4. Switch on the humimeter FLH.
5. Press twice or hold for 2 seconds.



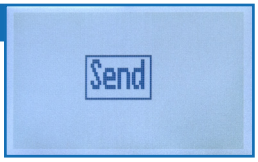
57

6. Select **Send Logs** (figure 57). To do so, press or and confirm by pressing .



58

7. Select **Manual Logs** (figure 58). To do so, press or and confirm by pressing .



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» The display will then show the message **Send** (figure 59).

» All measuring values saved on the humimeter FLH will now be sent to your computer.

Initiating the data export at your computer

Connect the humimeter FLH to your computer using the supplied USB cable:


60

1. Insert the USB Mini B connector into the humime-ter FLH (figure 60).
2. Insert the USB connector into the computer.
3. Open LogMemorizer on your computer.
4. Switch on the humimeter FLH.
5. Open the **Communication** tab in LogMemorizer (figure 61).

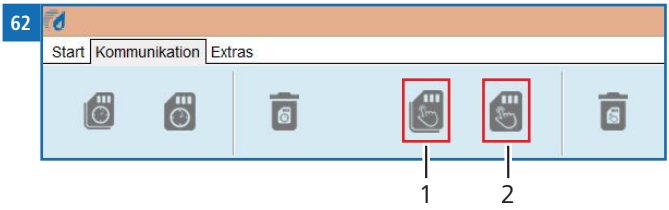


61

6. Select and click on one of the two buttons shown in figure 62.

» **Import all manual logs** (for importing all manually saved readings) or

» **Import most recent manual log** (for importing the most recent manually saved logs).

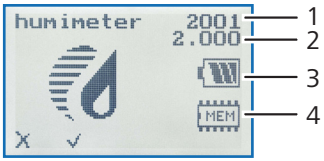


No.	Name
1	Import all manual logs
2	Import most recent manual log

» The measuring values saved on the humimeter FLH will now be sent to your computer.

8. Checking on the device's status

1. Press  twice or hold for 2 seconds.
2. Select **Status**. To do so, press  or  and confirm by pressing .
   - » The display will then show the status indicator **humimeter**.
   - » The display will show the following information:



No.	Name
1	Serial number
2	Software version
3	Battery status
4	Memory status

3. Confirm by pressing .
4. Press  to leave the main menu.

9. Configuring the device

9.1 Turning on Bluetooth

The information on Bluetooth is provided in a separate operating manual.

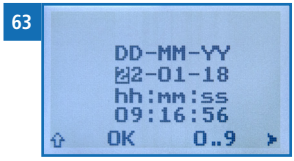
9.2 Adjusting the date/time

1. Press  twice or hold for 2 seconds.
2. Select **Options**. To do so, press  or  and confirm by pressing .
3. Select **Date/Time**. To do so, press  or  and confirm by pressing .

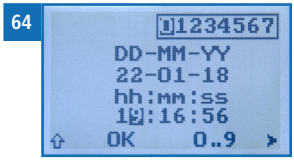
» The display will now appear as shown in figure 63.

» The format for the date is **DD-MM-YY** (Day-Month-Year).

» The format for the time is **hh:mm:ss** (Hour:Minutes:Seconds).



4. Inputting numbers:
   Press and hold  to quickly scroll to the required number and either press it for 3 seconds or press  to confirm the selected number (figure 64).



5. Moving forward:
   To move forward between **DD-MM-YY** and **hh:mm:ss**, press .
6. Moving back:
   Press  to switch to another input level. To move backward between **DD-MM-YY** and **hh:mm:ss**, press .
7. Confirm the date/time by pressing .

» The settings have been saved.

8. Press  to leave the **Options** menu.
9. Press  to leave the main menu.

9.3 Selecting a language

1. Press twice or hold for 2 seconds.
2. Select **Options**. To do so, press or and confirm by pressing .
3. Select **Language**. To do so, press or and confirm by pressing .
4. Navigate to the required language. To do so, press or and confirm by pressing .

» The settings have been saved.

5. Press to leave the **Options** menu.
6. Press to leave the main menu.

9.4 Activating options

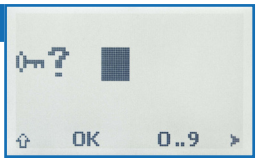
To do so: Some of the options must be deactivated.

1. Press twice or hold for 2 seconds.
2. Select **Options**. To do so, press or and confirm by pressing .
3. Select **Unlock**. To do so, press or and confirm by pressing .

» The display will now appear as shown in figure 65.

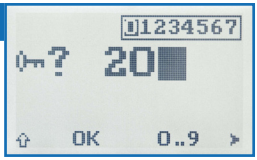
» On delivery, the four-digit password is the device's serial number.

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4. Inputting numbers:
   Press and hold 0..9 to quickly scroll to the required number and either press it for 3 seconds or press to confirm the selected number (figure 66).

66



5. Moving back:
   Press to switch to another input level.
   To move back, press .
6. Confirm the four-digit password by pressing OK.

» The settings have been saved.

» The **°C/°F, Userlevel, BL On Time**, **Auto Off Time, Adjust, Calibrate**, **Materialcalib., Online Send, Password**, **Reset** options are now activated.

7. Press  to leave the **Options** menu.
8. Press  to leave the main menu.

9.5 Deactivating options

Once the device has been restarted, the **°C/°F, Userlevel, BL On Time**, **Auto Off Time, Adjust, Calibrate**, **Materialcalib., Online Send, Password**, **Reset** options will be deactivated again.

9.6 Selecting °C/°F

To do so: All of the options must be activated (see "9.4 Activating options").

1. Press  twice or hold for 2 seconds.
2. Select **Options**. To do so, press  or  and confirm by pressing .
3. Select **°C/°F**. To do so, press  or  and confirm by pressing .
4. Navigate to the required temperature scale, i.e. Celsius (**°C**) or Fahrenheit (**°F**). To do so, press  or  and confirm by pressing .

» The settings have been saved.

5. Press  to leave the **Options** menu.
6. Press  to leave the main menu.

9.7 Changing the Userlevel

9.7.1 Changing from advanced to simplified user

To do so: All of the options must be activated (see "9.4 Activating options").

1. Press  twice or hold for 2 seconds.
2. Select **Options**. To do so, press  or  and confirm by pressing .
3. Select **Userlevel**. To do so, press  or  and confirm by pressing .

   » The simplified user is now activated.
4. Press  to leave the **Options** menu.
5. Press  to leave the main menu.

9.7.2 Changing from simplified to advanced user

To do so: The device has to be turned off.

1. Switch the device on (see "4.1 Switching the device on").
2. Press and hold  and  at the same time, directly after switching the device on.

   » The device will automatically boot into the main menu.
3. Activate all of the options (see "9.4 Activating options").
4. Select **Userlevel**. To do so, press  or  and confirm by pressing .

   » The advanced user is now activated.
5. Press  to leave the **Options** menu.
6. Press  to leave the main menu.

9.8 Reducing the device's power consumption

9.8.1 Configuring the display illumination time

To do so: All of the options must be activated (see "9.4 Activating options").

1. Press  twice or hold for 2 seconds.
2. Select **Options**. To do so, press  or  and confirm by pressing .
3. Select **BL On Time**. To do so, press  or  and confirm by pressing .
4. Select the required display illumination period (30 seconds/2 minutes/5 minutes/10 minutes). To do so, press  or  and confirm by pressing .

» The settings have been saved.

5. Press  to leave the **Options** menu.
6. Press  to leave the main menu.

9.8.2 Configuring automatic switch-off

To do so: All of the options must be activated (see "9.4 Activating options").

1. Press  twice or hold for 2 seconds.
2. Select **Options**. To do so, press  or  and confirm by pressing .
3. Select **Auto Off Time**. To do so, press  or  and confirm by pressing .
4. Select the period of time you want the device to stay switched on (3 minutes/5 minutes/10 minutes). To do so, press  or  and confirm by pressing .

» The settings have been saved.

5. Press  to leave the **Options** menu.
6. Press  to leave the main menu.

9.9 Configuring the material calibration function

The type calibration function is described in a separate operating manual.

9.10 Changing the password

To do so: All of the options must be activated (see "9.4 Activating options").

1. Press  twice or hold for 2 seconds.
2. Select **Options**. To do so, press  or  and confirm by pressing .
3. Select **Password**. To do so, press  or  and confirm by pressing .

» The display will show the current password.

Overwrite the current password. To do so, press and hold  to quickly scroll to the required number and either press it for 3 seconds or press  to confirm the selected number.

Moving back:
Press  to switch to another input level.
To move back, press .

4. Confirm the new four-digit password by pressing .

» The settings have been saved.

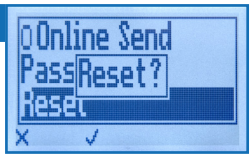
5. Press  to leave the **Options** menu.
6. Press  to leave the main menu.

9.11 Resetting the device to its factory settings

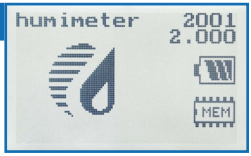
To do so: All of the options must be activated (see "9.4 Activating options").

1. Press twice or hold for 2 seconds.
2. Select **Options**. To do so, press or and confirm by pressing .
3. Select **Reset**. To do so, press or and confirm by pressing .
   - » The display will then show the message **Reset?** (figure 67).
4. Confirm by pressing .
   - » The device will now be reset to its factory settings. All of your personal settings will be lost.
   - » The display will show the status indicator **humimeter** (figure 68).
   - » Resetting the device will not affect the saved measuring values.

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10. Cleaning and maintenance

Regularly cleaning and maintaining the device will ensure that it will have a long service life and stay in good condition.

10.1 Changing batteries

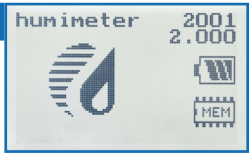
The device constantly monitors the charge level of the batteries. The current battery status is shown on the status screen.

If the battery´s charge is very low, the battery symbol will be shown with an exclamation mark. In that case, the batteries must be changed immediately (figure 70).

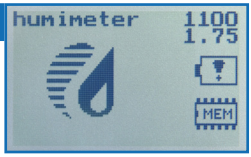
For changing the batteries, see section "3.3 Inserting batteries".

As the device's user, you are responsible by law for properly disposing of all used batteries, which must not be disposed of as domestic waste (Battery Directive).

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10.2 Checking the calibration

10.2.1 Checking the calibration of the umbel sensor

The device's calibration should be checked every four weeks.

To do so: The optionally available test block article no. 13888 is required. The device and the test block must have a temperature of between 20 °C and 26 °C.

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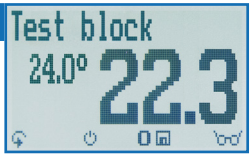
- Switch on the device and select the product type "test block" using the arrow keys (see "4.2 Selecting the product type").
- Hold the test block to the measuring chamber of the umbel sensor as shown in figure 71.

» The long end of the test block has to be positioned in the middle of the measuring chamber, the short end has to touch one of the three contacts on the edge of the umbel sensor.

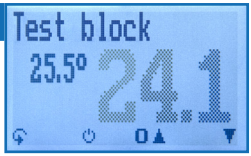
» The displayed measuring value has to be 22.0 % (+/- 0.4 %) (the moisture reading will be displayed in black) (figure 72).

» If the moisture value is outside this range, in which case it will be displayed in grey (figure 73), please contact your dealer or Schaller GmbH.

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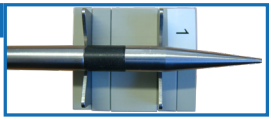
73



10.2.2 Checking the calibration of the insertion probe

To do so: The optionally available test block article no. 12308 is required. The device and the test block must have a temperature of between 20 °C and 26 °C.

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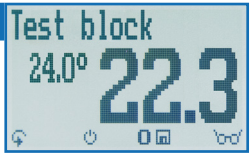


1. Switch on the device and select the product type "test block" using the arrow keys (see "4.2 Selecting the product type").
2. Hold side 1 of the test block to the measuring head of the device as shown in figure 74.

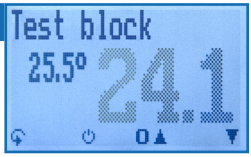
» The displayed measuring value has to be 22.0 % (+/- 0.4 %) (the moisture reading will be displayed in black) (figure 75).

» If the moisture value is outside this range, in which case it will be displayed in grey (figure 76), please contact your dealer or Schaller GmbH.

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76

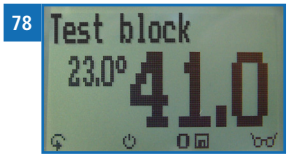


3. Hold side 2 of the test block to the measuring head of the device as shown in figure 77.



» The displayed measuring value has to be 41.0 % (+/- 1.0 %) (the moisture reading will be displayed in black) (figure 78).

» If the moisture value is outside this range, in which case it will be displayed in grey, please contact your dealer or Schaller GmbH.



10.3 Care instructions

- Do not leave the device out in the rain. The device is not waterproof.
- Do not expose the device to extreme temperatures.
- Protect the device from strong mechanical shocks and loads.

10.4 Cleaning the device

Plastic housing

- Clean the plastic housing with a dry cloth.

Measuring head

- The measuring head can be cleaned with a cloth and cleaning alcohol.

Test block

- The test block can be cleaned with a moistened lint-free cloth.

ATTENTION

Do not clean with fluids
Water or cleaning fluid getting inside the device can destroy the device.

► Only clean with dry materials.

11. Faults

If the measures listed below fail to remedy any faults or if the device has faults not listed here, please contact Schaller GmbH.

Fault	Cause	Remedy
Measuring error	The temperature of the material being measured is too low or high	The temperature of the material being measured has to be between 0 °C and +40 °C.
	Temperature discrepancy between device and material being measured	Let the temperature adjust to the material being measured (permitted difference of max. 3 °C).
	Wrong product type in case of warmed-up insertion probe	The accuracy decreases significantly.
	Wrong product type	Check whether you have selected the right product type (product) before taking a reading (see "6.2 Selecting the product type").
	Mouldy or rain wet material Accuracy decreases significantly	Only measure dry, not mouldy material.
	Frozen material or material mixed with snow Accuracy decreases significantly	The material being measured must not be frozen or mixed with snow.
	Insertion direction (for straw and hay)	The insertion direction has a great effect on the accuracy of the measurement (see "6.2 Selecting the product type").
	Wrong compressed density	The compressed density has to correspond to the selected product type (see "6. Product types").
	Movement of the measuring tip after inserting	Do not move the measuring tip after inserting.

Fault	Cause	Remedy
	Water film on the measuring head	After measuring wet material, on the measuring head may arise a water film. Clean the measuring head (see "10.4 Cleaning the device").
	Heating of the measuring head because of friction in bales with high compressed density	Let the device cool down.
Sources of error when checking the calibration	Contact pressure	Make sure the test block is in good contact with both metal contacts.
	Position	The device will display the value 0.0% if the test block isn´t positioned correctly.
	Dirt	Make sure that the test block is free from dust, dirt, oil and dampness. Clean it if necessary (see "10.4 Cleaning the device").
	Wrong calibration curve	Check whether you have selected "Test block" as product type before starting the test.
Data transfer to Log Memorizer failed	Interface has not been configurated.	The interface only has to be configurated once. To do so, press the F1 key on your computer and read the Help file of the Log Memorizer program.

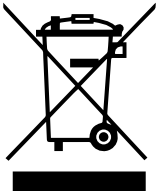
12. Storage and disposal

12.1 Storing the device

The device must be stored as follows:

- Do not store outdoors.
- Store in a dry and dust-free place.
- Protect the device from sunlight.
- Avoid mechanical shocks/loads.
- Remove the batteries if the device isn´t used for a period of 4 weeks or longer.
- Storage temperature: -20 °C to +60 °C

12.2 Disposing of the device



Devices marked with this symbol are subject to Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE).
If the device is being operated outside the European Union, the national regulations on the disposal of such devices that apply in the country of use must be observed.

Electronic devices must not be disposed of as domestic waste.

The device must be disposed of appropriately using appropriate collection systems.

13. Device information

13.1 CE declaration of conformity

CE DECLARATION OF CONFORMITY

We **Schaller GmbH**
Max-Schaller-Straße 99
A – 8181 St. Ruprecht

in accordance with the following Directives:

EMV - Richtlinie 2014/30/EU,
RoHS - Directives 2011/65/EG,

hereby declare that the following product types:

Product: **humimeter**

Types: **BL2 ; BLL ; BLH ; BLW ; FL1 ; FL2 ; FLH ; FLM ; FLS ; SLW ; WLW**

are in conformity with the applicable requirements of the following documents

- **EN 61326–1:2013** Electrical equipment for measurement, control and laboratory use – EMC requirements
- **EN 50581:2012** Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances:

I hereby declare that the equipment named above has been designed to comply with the relevant Sections of the above referenced specifications. The unit complies with all applicable Essential Requirements of the Directives.

St. Ruprecht a.d. Raab, 13.09.2018

Max Schaller

Schaller GmbH
Maximilian Schaller
General Manager

13.2 Technical data

Display resolution	0.1 % moisture content (hops), 0.5 % moisture content (hay, straw), 0.5 °C/°F temperature
Measuring range	4 % to 40 % moisture content (product type dependent)
Operating temperature	0 °C bis +40 °C
Temperature measuring range	-15 °C to +85 °C (only measuring head)
Storage temperature	-20 °C to +60 °C
Temperature compensation	Automatic
Data memory	Up to 10,000 measuring values
Power supply	4 pcs. of 1.5 Volt AA Alkaline batteries
Current consumption	60 mA (incl. display illumination)
Menu languages	English, German, French, Italian, Spanish, Portuguese, Czech, Polish, Russian, International
Display	128 x 64 illuminated matrix display
Device dimensions	145 x 65 x 27 mm
Device weight	250 g
Device IP rating	IP 40



Climate
Environment



Materials



Food



Buildings



Bioenergy



Paper / Board

Schaller Messtechnik develops, produces and sells professional moisture meters and turnkey solutions.

Schaller GmbH

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