Schaller
Messtechnik / humimeter.com

Moisture meter

Operating manual

humimeter FLSO

Online moisture transmitter for water content and temperature determination of hay

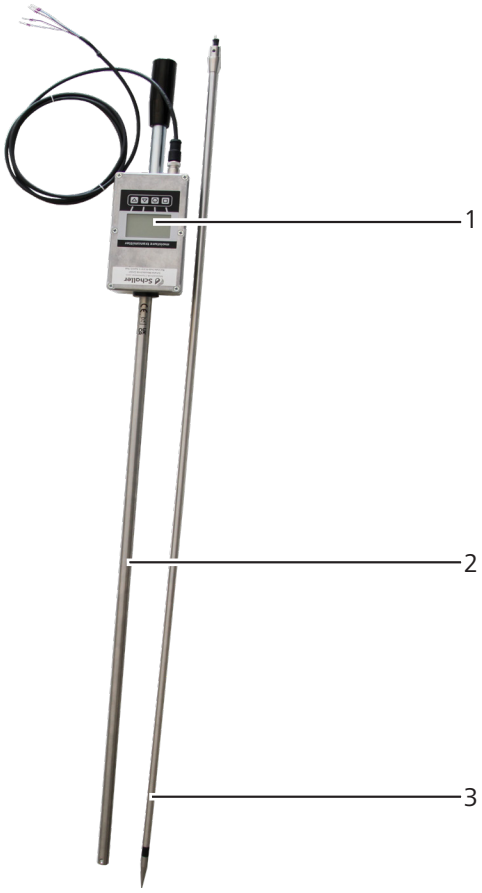
78,0 °F | 6,16% | 456 kg/m³ | −27,3 td | 0,64 aw | 51,9 %r.H. | 14,8 %abs | 100,4 g/m² | 09 m/s | 4,90 Ugl | 1

Version 1.1

Always read this operating manual before using the humimeter FLSO!

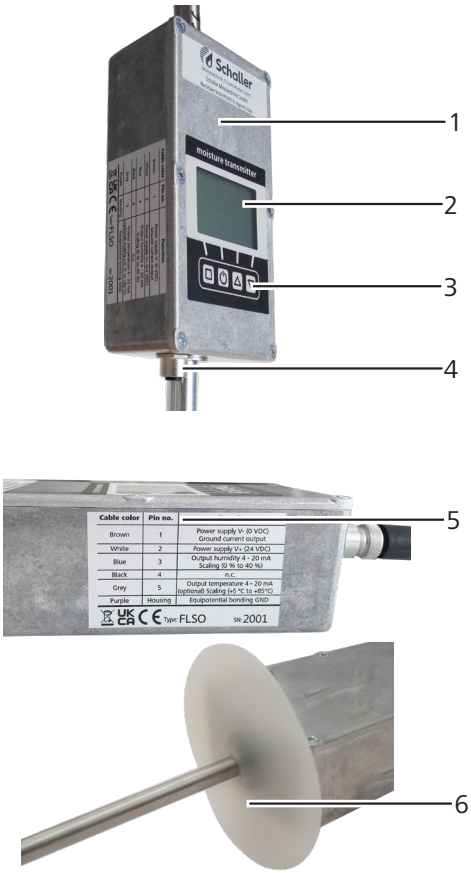
Your humimeter FLSO at a glance

The main unit



Nr	Name
1	Electronics and display in aluminum housing
2	Piercing lance
3	Measuring head

The main unit in detail



Nr	Name
1	Aluminum housing for electronics
2	Display
3	Keyboard
4	Sensor connector
5	Pin assignment
6	Protective and insulating disk

The measuring head

Nr	Bezeichnung
1	Measuring tip
3	Insulator

The display

No	Name
1	Calibration curve
2	Moisture content % ("9.1 How moisture is defined")
3	Display symbols
4	Temperature display

The display symbols

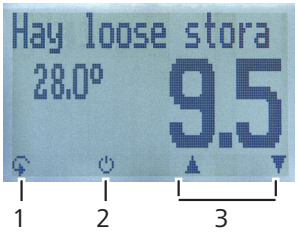
Symbol	Name
	Enter
	Up
	Down
	Back
	Enter numbers
	Enter letters
	Continue / go right

Symbol	Name
	Left
	Yes
	No
	Change input level
	OK
	Change menu
	On/off button

Übersicht Ebenen

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

Product selection menu



No	Name
1	Change menu
2	Display illumination / device on/off
3	For changing the calibration curve

Main menu

The main menu comprises the following menu items:

- **Options:**
  Language, unlock, °C/°F, averaging, luminous duration, grade calibration, password, reset
- **Status**

Inhaltsverzeichnis

1. Introduction

1.1 Information about this operating manual

This operating manual is designed to enable you to use the humimeter FLSO 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 FLSO. 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 Messtechnik GmbH.

Schaller Messtechnik 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.

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 Messtechnik 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

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 hay and straw
- The device must only be used for taking measurements on the products defined in the following sections of this manual (see "9. Calibration curves").

2.2 Improper use

- The device is not suitable for measuring mouldy or rain wet 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 Messtechnik 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 Warranty

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

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 FLSO
- Insulating disk
- 5 pole connection cable 1.9 m
- Operating manual

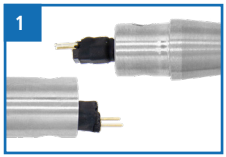
Optional accessories:

- Analog output temperature measurement (-10 °C to +70 °C)

3.3 Assembling the insertion probe

1. Put the device and the second part of the insertion probe on a flat surface (e.g. on a table).

   » The two ends with cables must be adjacent to each other (figure 1).



2. Connect the plug-in connector (figure 2).

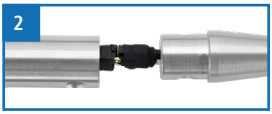
   » It is not necessary to pay attention to correct polarity.

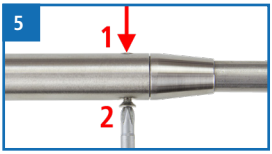
   » You may need a pair of tweezers to pull the plug out of the insertion probe mounted on the device.

3. Put the two parts of the insertion probe together (figure 3).

   » Make sure that the holes for the screws are aligned correctly (figure 4).

4. Fix the insertion probe by tightening the two delivered screws (M3x5) (figure 5).





4. Using the device - Basics

4.1 Switching on the device

» If the power supply is available, start the FLSo by pressing the power button for 3 seconds.

» Select the desired calibration curve.

» Carry out the measurement according to the specifications explained in Chapter 8. (Attention, these are symbolic images!)

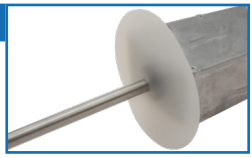
5. Installation of the FLSO

- Connect the FLSO according to the specified wiring in "5.3 Pinassignment"
- The device starts itself when the power supply is applied.
- If the FLSo is put out of operation by the switch-off button, you can put the FLSo back into operation by pressing the switch-on button for 3 seconds.

5.1 Mounting the insulating disk

- The insulating disk must be in contact with the meter (figure 6).

6

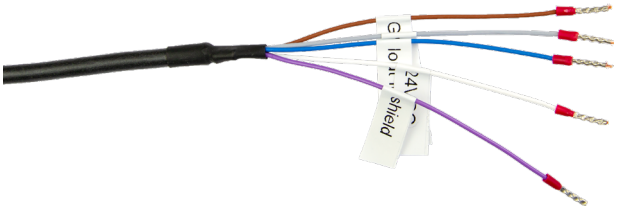


5.2 Laying of the supply or transmission line

- The cable must not be laid in the vicinity of interference fields.
- The transmitter must not be operated in the vicinity of electromagnetic interference fields.
- The cable must not be bent strongly.
- Permissible cross-sections for the installation must be observed.
- The cable length must be kept as short as possible.

» If an extension is necessary, the cross-section of the extension must not be less than 0.25 mm^2 .

5.3 Pinassignment



Cable color	Pin no.	Function
Brown	1	Power supply V- (0 VDC) Ground current output
White	2	Power supply V+ (24 VDC)
Blue	3	Analogue output humidity 4 - 20 mA
Black	4	n.c.
Grey	5	Analogue output temperature 4 - 20 mA (optional)
Purple	Housing	Equipotential bonding GND

5.3.1 Port scaling

- Analog output for water content 4 - 20 mA corresponds to 0 - 40 % water content.
- Analog output for temperature 4 - 20 mA corresponds to 5 - 85 °C.

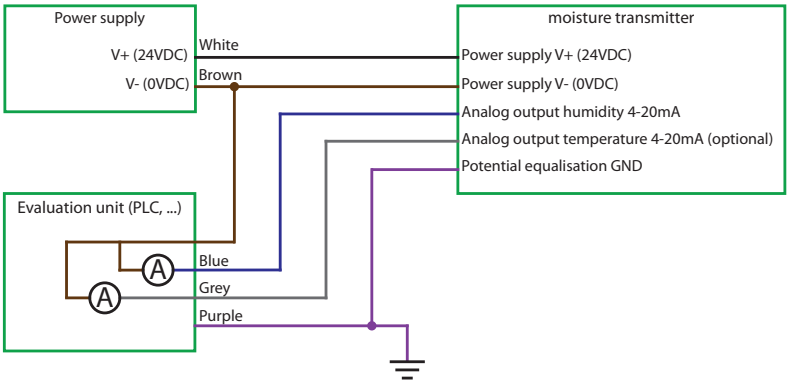
ATTENTION

Damage to the electronics due to incorrect cable connection

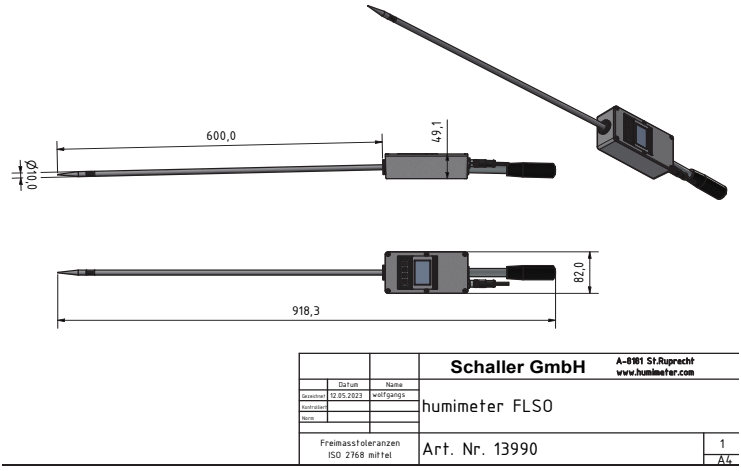
Incorrectly connected cables can lead to severe damage of the electronics.

► Connect all cables correctly..

5.4 Wiring diagram



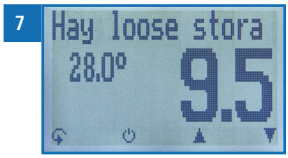
6. Technical drawing FLSO



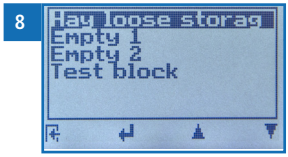
7. Selecting the calibration curve

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

For an overview of the different calibration curves and the criteria for selecting them, please refer to "9. Calibration curves".



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 calibration curve overview (figure 8).



3. Use the arrow keys to move from one calibration curve to the next
4. and keep any of them pressed to scroll through the types.
5. Confirm your selection by pressing ↵.

» The calibration curve you selected will now be shown at the top of the display.

7.1 Taking a measurement

- For information on how to take a measurement, see section "8. The measuring process".

7.2 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.

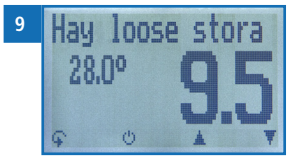
- Press the ⏻ button for 3 seconds.

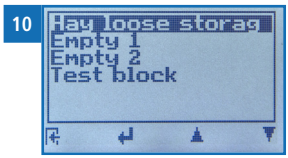
8. The measuring process

8.1 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 before the measurement.

1. Switch on the device (see "4.1 Switching on the device").
2. Make sure that the insulating disk is seated correctly (figure 6 on page 15).
3. Select the desired calibration curve (see "9. Calibration curves") by pressing the  or  (see "7. Selecting the calibration curve") (figure 10).



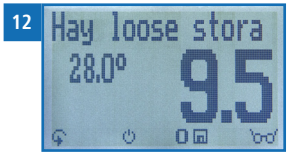


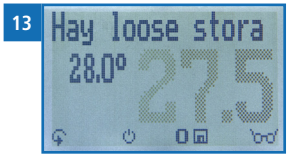
8.2 Taking a measurement

8.3 Taking a measurement

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

- Insert the measuring head of the device straight into the hay (figure 11).
- » Take care of the surroundings when inserting the probe!
- » Do not bend or drop the measuring head!
- The device will now instantly display the moisture content on the display (figure 12).
- » The displayed value flashes when the moisture content exceeds the measuring range of the selected calibration curve (figure 13). A flashing value signals lowered accuracy of the measurement. The measuring range is dependent on the calibration curve (see "9. Calibration curves").
- » Once the reading has been taken, it can be saved on the device.





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.
- ► Keep the measuring head away from current lines.
- ► Take care of the surroundings when inserting the probe to avoid damage to objects and injury to people.

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.

Information - Incorrect readings

Always make sure to select the correct calibration curve for the material you are measuring. This prevents taking incorrect readings (see "12. Faults").

9. Calibration curves

For the following products calibration curve curves are available for selection:

Calibration curve	Product type	Measuring range
Hay loose storage	loose hay	10 % - 30 %
Empty 1	free curve for special products	
Empty 2	free curve for special products	
Reference	! Only for testing the moisture meter !	

» Attention should be paid to the fact that deviations may occur due to incorrect pressing density.

9.1 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)

9.2 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.

10. Configuring the device

10.1 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.

10.2 Activating options

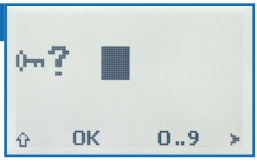
To do so: Some of the options must be deactivated.

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 14.

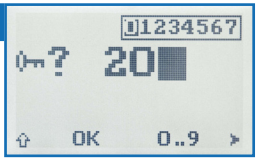
» On delivery, the four-digit password is the device's serial number.

14



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 15).

15



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

6. Confirm the four-digit password by pressing OK.
   » The setting has been saved.
   » The **°C/°F, Averaging, BL On Time, Materialcalibration, Password, Reset** options are now activated
7. Press  to leave the **Options** menu.
8. Press  to leave the main menu.

10.3 Deactivating options

Once the device has been switched restarted, the **C/°F, Averaging, BL On Time, Materialcalibration, Password, Reset** options will be deactivated again.

10.4 Selecting °C/°F

To do so: All of the options must be activated (see "10.2 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 setting has been saved.
5. Press  to leave the **Options** menu.
6. Press  to leave the main menu.

10.5 Setting the averaging time

To do so: All of the options must be activated (see "10.2 Activating options").

1. Press  twice or hold for 2 seconds.
2. Select **Options**. To do so, press  or  and confirm by pressing  .
3. Select **Averaging**. To do so, press  or  and confirm by pressing  .
4. Navigate to the required time at which the arithmetic average should be calculated (90 seconds/45 seconds/20 seconds/7 seconds/ 5 seconds). 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.

10.6 Configuring the display illumination time

To do so: All of the options must be activated (see "10.2 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. Navigate to the required setting, turned off (**0 Off**) or turned on (**1 On**). 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.

10.7 Configuring the material calibration function

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

10.8 Changing the password

To do so: All of the options must be activated (see "10.2 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.

4. 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  .

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

» The setting has been saved.

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

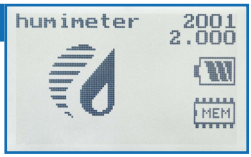
10.9 Resetting the device to its factory settings

To do so: All of the options must be activated (see "10.2 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 16).
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 17).
   » Resetting the device will not affect the saved measuring values.

16

17



11. Cleaning and maintenance

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

11.1 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.

11.2 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.

ATTENTION

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

► Only clean with dry materials.

12. Faults

If the measures listed below fail to remedy any faults or if the device has faults not listed here, please contact Schaller Messtechnik 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 calibration curve	Check whether you have selected the right calibration curve (product) before taking a reading (see "9. Calibration curves").
	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 measured material most not be frozen or mixed with snow.
	Insertion direction	The insertion direction has a great effect on the accuracy of the measurement (see "7. Selecting the calibration curve").
	Wrong compressed density	The compressed density has to correspond to the selected calibration curve(see "9. Calibration curves").
	Water film on the measuring head	After measuring wet material, on the measuring head may arise a water film. Clean the measuring head.

Fault	Cause	Remedy
	Heating of the measuring head because of friction in bales with high compressed density	Let the device cool down.

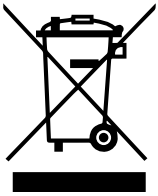
13. Storage and disposal

13.1 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.
- Store the device in its original packaging if it isn´t used for a longer period of time.
- Storage temperature: -20 °C to +60 °C

13.2 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.

14. Angaben zum Gerät

14.1 CE Konformitätserklärung

CE KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY

Name/ Adresse des Herstellers:	**Schaller Messtechnik GmbH**
Name/ address of manufacturer:	**Max-Schaller-Straße 99**
	A – 8181 St. Ruprecht
Produktbezeichnung:	**humimeter**
Product designation:	
Typenbezeichnung:	**BL2 ; BLL ; BLH ; BLW ; FL1 ; FL2 ; FLSO; FLH ; FLM ; FLS RM1 ; SLW ; WLW**
Type designation:	
Produktbeschreibung:	**Messgerät zur Bestimmung des Wassergehalts in Biomasse und diversen Schüttgütern**
Product description	***Measuring device for determining the water content in biomass and various bulk materials***

Das bezeichnete Produkt erfüllt die Bestimmungen der Richtlinien:

The designated product is in conformity with the European directives:

EMV - Richtlinie 2014/30/EC	***EMC Directive 2014/30/EU***
RoHS - Richtlinie 2011/65/EG	***RoHS-Directive 2011/65/EU***

Die Übereinstimmung des bezeichneten Produktes mit den Bestimmungen der Richtlinien wird durch die vollständige Einhaltung folgender Normen nachgewiesen:

Full compliance with the standards listed below proves the conformity of the designated product with the provisions of the above-mentioned EC Directives:

EN 61326–1:2013	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen *Electrical equipment for measurement, control, and laboratory use – EMC requirements*
EN IEC 63000:2019-05 *ersetzt / replaced* **EN 50581:2012**	Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährliche Stoffe. *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.*

Für das angeführte Produkt ist eine vollständige Dokumentation mit Betriebsanleitung in Originalfassung vorhanden.

For the mentioned product a complete documentation with manual of instruction in original version is available.

Bei Änderungen, die nicht vom Hersteller spezifiziert sind, verliert diese Konformitätserklärung die Gültigkeit.

In case of any changes not agreed upon with the manufacturer, this declaration of conformity loses its validity.

St. Ruprecht a.d. Raab, 31.07.2022

Schaller
Messtechnik / humimeter.com
Schaller Messtechnik GmbH
Max - Schaller - Straße 99
AT - 8181 St. Ruprecht a. d. Raab
www.humimeter.com | info@humimeter.com

Bernhard Maunz
Rechtsverbindliche Unterschrift des Ausstellers
Legal binding signature of the issuer

UK CA DECLARATION OF CONFORMITY

Name/ address of manufacturer:	**Schaller Messtechnik GmbH** **Max-Schaller-Straße 99** **A – 8181 St. Ruprecht**
Product designation:	**humimeter**
Type designation: **; RM1;**	**BL2 ; BLL ; BLH ; BLW ; FL1 ; FL2 ; FLSO ; FLH ; FLM ; FLS SLW ; WLW**
Product description:	**Measuring device for determining the water content in bio mass and various bulk materials**

The designated product is in conformity with the following directives:

- **Electromagnetic Compatibility Regulations 2016 Great Britain**
- **RoHS-Directive 2011/65/EU Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment**

Full compliance with the standards listed below proves the conformity of the designated product with the provisions of the above-mentioned Directives:

EN 61326–1:2013	Electrical equipment for measurement, control, and laboratory use – EMC requirements
EN IEC 63000:2019-05 replaced **EN 50581:2012**	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

For the mentioned product, a complete documentation with manual of instruction in original version is available.

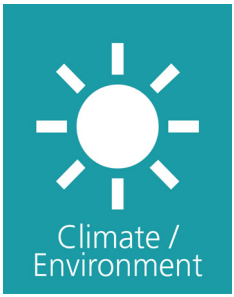
In case of any changes not agreed upon with the manufacturer, this declaration of conformity loses its validity.

St. Ruprecht a.d. Raab, 31.07.2022

Bernhard Maunz
Legal binding signature of the issuer

14.2 Technical data

Display resolution	0.1 % moisture content
Measuring range	8 % to 30 % water content
Measuring range temperature	5 °C bis 85 °C
Operating temperature	5 °C to +40 °C
Temperature measuring range	-10 °C bis +70 °C
Temperature compensation	Automatic
Temperature range water content measurement	5 °C bis 40 °C
Power supply	24VDC (15 bis 29VDC)
Power consumption	90 mA (ohne Ausgang oder Display)
Menu languages	German, English, French, Italian, Spanish, Portuguese, Czech, Polish, International, Russian
Analog outputs	4-20mA for water content
Scaling	(4-20mA) 0 % bis 40 %
Temperatur	(4-20mA) 5 °C bis 85 °C
Device dimensions	740 x 65 x 40 mm
Device weight	450 g
Device IP rating	IP 54



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

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