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GREISINGER

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Operating Manual Appendix

Moisture measuring set for agricultural applications

as of version 2.1

GMH 38-LW1 / -LW2

CE

Made in Germany

WEEE-Reg.-Nr. DE 93889386

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1 General Note

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

Mounting, start-up, operating, maintenance and removing from operation must be done by qualified, specially trained staff that have carefully read and understood this manual before starting any work.

The manufacturer will assume no liability or warranty in case of usage for other purpose than the intended one, ignoring this manual, operating by unqualified staff as well as unauthorized modifications to the device.
The manufacturer is not liable for any costs or damages incurred at the user or third parties because of the usage or application of this device, in particular in case of improper use of the device, misuse or malfunction of the connection or of the device.

The manufacturer is not liable for misprints.

2 Safety

2.1 Intended Use

The GMH 38-LW Set is a complete set for material moisture measuring including an handheld instrument (GMH 38 series) with moisture display and rating for agricultural use.

The robust measuring probe (GSF 50 TF / TFK) makes the set a first-class tool for humidity measurements of wood chips, grain and lightly pressed straw or hay (bales). With firmly pressed bales, we recommend the measuring probe GSF 40 TF (not in scope of supply).
The measuring probe is connected via BNC-plug and thermocouple connector and can be interchanged.

Depending on the application, either the moisture content u (**relative to dry weight**) or the wet-basis moisture content w (relative to total weight) can be displayed.
Please note the remark of measuring accuracy in chapter 5.

2.2 Safety signs and symbols

Warnings are labeled in this document with the followings signs:

⚠ **DANGER**

Caution! Symbol warns of impending danger, death, serious bodily injury or serious property damage if ignored.

☞

Attention! Symbol warns of potential hazards or hazardous situations that can cause damage on the equipment or the environment if ignored.

ⓘ

Note! This symbol point out processes which can indirectly influence operation or provoke unforeseen reactions at non-observance.

2.3 Safety Instructions

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

⚠ **DANGER**

Risk of injury! Only use this injection probe is extremely carefully, keep it out of reach from children.

3 Operating and Maintenance

- Treat the injection probe carefully (do not throw, hit against etc.). Protect plugs and sockets from soiling.
- When disconnecting the cable from the socket do not pull at the cable but on the plug. For locking and unlocking the movable ring has to be turned in its according direction. When having attached the plug right, it can be connected or disconnected gently without effort.
- The plastic insulator **(3)** has to be clean and dry in the range of the sensor pike, when not, faulty measurements may occur.

4 Product Description

4.1 Scope of supply

The scope of supply of the GMH 38-LW Sets includes:

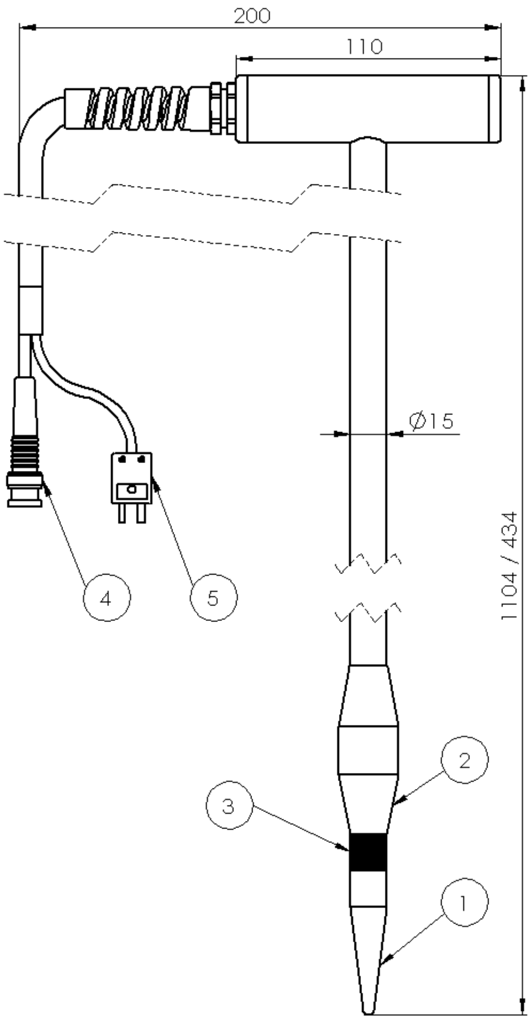
- measuring probe GSF 50 TFK or GSF 50 TF
- Display instrument of GMH 38 series
  with 9V battery and operating manual
- Operating manual appendix GMH 38-LW1/-LW2

4.2 The measuring probe GSF 50 TF(K)

The resistance of the medium between the conical metal surfaces **(1)** and **(2)** is measured. The medium being measured has to be compressed well enough.

The best is, having a constant pressure onto the medium during the measurement. Do not release handle during the measuring, otherwise the contact to the medium can be interrupted, in this case a to dry value would be measured.

Attention: Especially at bulk material stored outside or very wet material, large distribution of the actual moisture values can appear.
It is best to do several measurements and taking the average in order to get meaningful results:
The measurement of wood chips or things like that is depending on temperature. For an exact measuring result the temperature is automatically compensated when using the suitable instrument (e.g. GMH 3830). The temperature-measuring is done at the tip of the probe **(1)**, a sufficient time to adjust the sensors temperature to the material has to be waited for.
Different measuring results are depending on different types of material. Select correct material-group or material type before measuring. Refer to operation manual of the connected measuring device. When pushing in the probes, oscillating movements have to be avoided. Otherwise hollows between the probes and the material may falsify the measurement



minimum immersion 100 mm

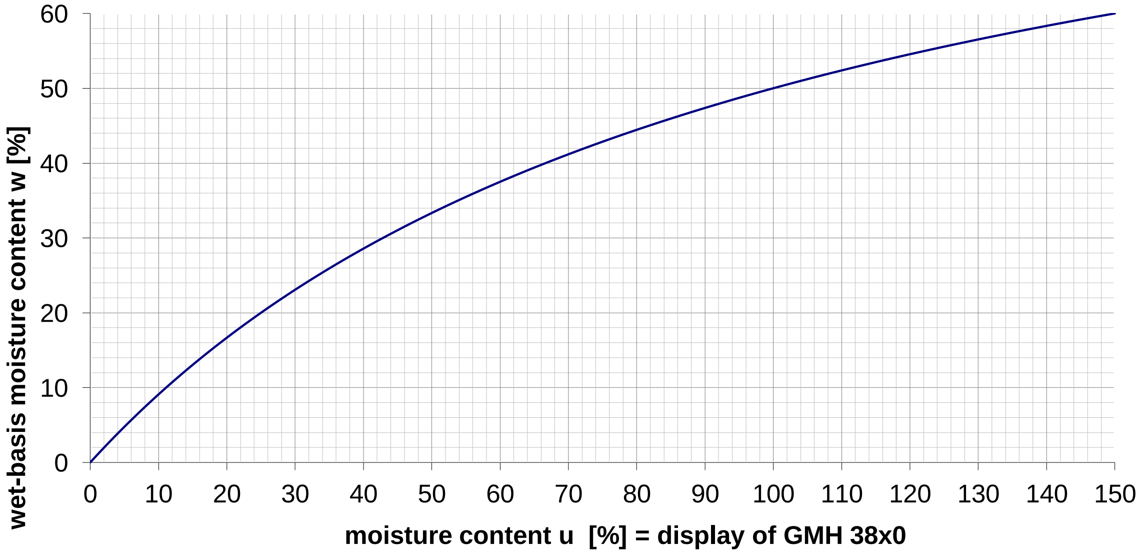
5 Unit conversion: moisture dry-and wetbasis

Older instruments (e.g. GMH 3830 before V1.4) cannot be switched from moisture content u to w, in this case the wet basis moisture content can be calculated like following:

Wet-basis moisture w [%] = 100 * Moisture content u [%] / (100 + Moisture content u [%])

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

Conversion moisture content u - wet-basis moisture content w



6 Handling

6.1 Start of operation

Switch the device on with the on/off key. After segment test the device is ready for measuring.

6.2 Selection of the characteristic curve

Selection of characteristic curve: by pressing ▲ Material / Material ▼ the characteristic curve can be selected.

☞ The use of inappropriate characteristics can cause faulty measurements!

Selectable material characteristics: (via "Sort"-function preselected, please refer to operating manual GMH 38xx)

Display	Characteristic curve
rEF	Reference characteristic
h.458	Flax
h.461	Wood chips
h.462	Wheat
h.463	Barley
h.464	Hay
h.465	Straw

☞

By means of additional equipment (not within scope of supply) wood and building materials of many kinds can be measured – therefore the user has to add the referring characteristic curves to the Sort- Preselection, or deactivate it complete.. With firmly pressed bales, we recommend the measuring probe GSF 40 TF (not included in scope of supply).

6.3 Temperature Measurement

The Temperature value will be displayed temporarily when key ► Temp is pressed.
Let the Probe adjust to the material for at least 20 seconds to achieve good measuring precision.

7 Principles of the measurements

7.1 Moisture rating (WET - MEDIUM - DRY)

In addition to the measuring value there is a moisture rating via bar graph.

☞ This rating can only be a first approximate value, because factors like the application field of the measured material have to be taken into account for the final rating.
Experience and knowledge can only be supported by this instrument, not replaced!

7.2 Temperature compensation

The temperature compensation is important for a reliable moisture-measuring.
There for the device features a temperature measuring at the Tip of the injection probe.
According to the selected material characteristic curve the device will use the associated temperature compensation.

8 Measuring bales of straw hay bales

Always inject the electrodes form the plain side of round bales never from the round side, the probe can be inserted much easier. For strongly pressed bales we suggest the probe GSF 40 or GSF 40 TF instead.
With loose medium ensure sufficient compression (e.g. like the description in chapter „Wood chips as fuel")
For the storability, their quality assessment and purpose, the 38-LW Set is an important support of decision – beside the decision of smell (fusty?) – consistence (dust…) and appearance (colour, impurities).

Less than 16 % u	Measured material is sufficiently dry and storable.
16 - 20 % u	Measured material includes increased humidity, appropriate dry before storage.
Above 20 % u	**extreme high humidity! Defer harvesting if possible or dry before storage**

9 Measuring of grain

For the storability, their quality assessment and purpose, the 38-LW Set is an important support of decision – beside the decision of smell (fusty?) – Consistence (dust…) and appearance (colour, impurities).

When measuring grain pls keep in mind to use sufficient amount of measuring good (at least 500ml), surrounding the sensor and that there is sufficient pressure between sensor and grain (in heap >30 cm and an immersion depth of >20 cm this is usually automatically the case), otherwise there may be to low display values!

With freshly harvested grain, an approximate recommendation for barley, rye und wheat can be given:

Less than 16 % u	Measured material is sufficiently dry and storable.
16 - 20 % u	Measured material includes increased humidity, appropriate dry before storage.
Above 20 % u	**extreme high humidity! Defer harvesting if possible or dry before storage**

10 Wood Chips as fuel

Instrument settings for measuring wood chips:
GMH 3830/3850/3851 Version>= 1.5: **h.461 (specialised GSF 38 / GSF 50 curve**)
others: We recommend “Wood group C” (GMH 38x0 instruments: “h. C”). This group delivers a sufficient accuracy for the fuel application up to 30% MC – above there is larger deviation.

Wood chips are classified in different quality groups.
The size and the moisture content (MC or u) or the wet-basis moisture content (w) is the measure for the usability. Usually moisture content (w) of maximum 30% is recommended.

Chip size

Class		Size
G 30	small chips	smaller than 3 cm
G 50	mid size chips	3 – 5 cm
G 100	crude chips	5 – 10 cm

Moisture content

Class		Wet basis moisture content w (can be displayed directly of GMH 3830 V>=1.5)	moisture content u
w 20	air dry	<20 % w	**<25 % u**
w 30	storable	20 – 30 % w	**25 – 43 % u**
w 35	conditionally storable	30 – 35 % w	**43 – 54 % u**
w 40	wet	35 – 40 % w	**54 – 67 % u**
w 50	fresh cut	40 – 50 % w	**67 – 100 % u**

The higher the moisture content, the lower is the heating value per weight

10.1 Field measuring

At measuring in containers, silos, chip bunkers or similar storages and a measuring depth > 0.5 m commonly the compression is high enough for direct measuring.
Although keep pressure on the handle during the measuring!
For measuring in less than 0.5 m or in loose bulk material, best is to step on the measuring spot and insert the probe below the foot.
At values above 20%u the display may have falling values: The display after 10 seconds is valid!

10.2 Bucket test

The probes from suitable places in Your material into a bucket ((>=10 litre).
Compress: Step into the bucket and compress with roughly 10 kg. Measure under Your foot:

During measuring keep pressure on the handle!
Repeat Your measuring and take average of 3 measurings!
At values above 20%u the display may have falling values: The display after 10 seconds is valid!

10.3 Additional Information about Moisture Measuring

10.3.1 Moisture gradients

Please keep in mind: Depending on Storage conditions and harvesting there can be large differences of moisture within bales or grain stocks!.

10.3.2 Measuring Precision

The 38-LW Set is perfect for approximate measuring of material moisture in Wood Chips, Hay, Straw and Grain. Depending on the sort and condition of the measured good there may appear deviations.
The main advantage of the system lies within the ability of comfortable measuring of many measuring spots (bottom, top, weather side...) within one stock in short time - without separate sampling.
This is in praxis very often much more valuable as single measurements with higher precision!

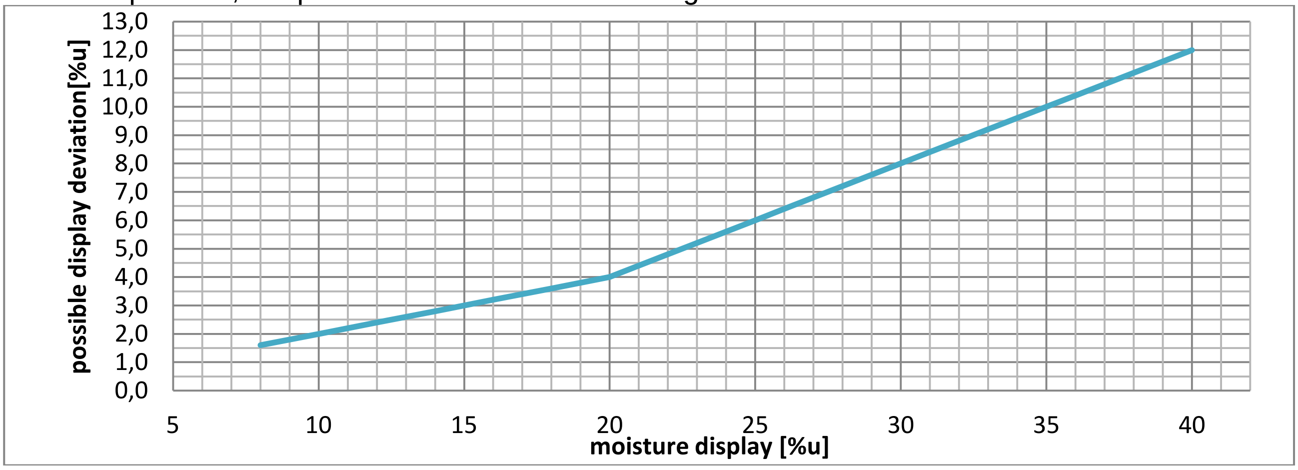
Precision of wood chip measuring

With the “bucket test” and good quality soft wood chips following precision can be achieved (curve setting h.461 GMH 3830/-3850/-3851 as of version 1.9):

- 8-20% u: better than ±20% of measured value
- 25-40% u: better than ±4%u ±40% of (measured value-20%u)

At values out of the range of 8…40% the display value is increasingly unprecise and should only be used as an indicator.
Significant here is: >25% is definitively to wet!

➔ In practice, the precision in this area is no longer decisive.



Accuracy Wood pellets

Pellet measuring is similar (also h.461), but the specified range ends already at 20 % u.

Keep probe clean!

Especially when measuring in wet hay, the probe may be soiled very strong, this may produce to low measuring displays.
In hard cases we suggest fine grinding fleece o rat least suitable household sponges for cleaning.
Do not use steel wool!

Display values at air

If the probe is not correctly in contact to material, the instrument may display any value!
This is caused by the design and measurement method.

11 Specifications

	GSF 50	GSF 50K
Measuring principle	Resistive material moisture measurement	
Connection	BNC **(4)** (cable fixed on probe)	
Profile	shaft Ø 15 mm, contact surface 2: Ø 25 mm	
Overall length	110 cm	43 cm
Measuring depth	107 cm	40 cm
Weight	650 g	420 g

12 Reshipment

☞ Use an adequate transport package for reshipment, especially for fully functional devices. Please make sure that the device is protected in the package by enough packing materials.

DANGER

All devices returned to the manufacturer have to be free of any residual of measuring media and other hazardous substances. Measuring residuals at housing or sensor may be a risk for persons or environment

13 Disposal Notes

The device must not be disposed in the unsorted municipal waste! Send the device directly to us (sufficiently stamped), if it should be disposed. We will dispose the device appropriate and environmentally sound.