

Operating Manual

Hay and straw humidity measuring device

as of version 1.0

BaleCheck 100



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 BaleCheck 100 is a material moisture measuring device with moisture display and rating.

The slim and robust measuring probe makes the set a first-class tool for humidity measurements of pressed straw or hay (bales) and grain.

The Probe included to the set is connected to the device by a BNC-plug.

Depending on the application either the material moisture u (based on dry matter) or the water content w (based on wet total mass) can be displayed.

Please consider the information “Measuring precision” in chapter 5.5

2.2 Safety signs and symbols

Warnings are labelled in this document with the followings signs:



Caution! This symbol warns of imminent danger, death, serious injuries and significant damage to property at non-observance.





Attention! This symbol warns of possible dangers or dangerous situations which can provoke damage to the device or environment at non-observance.





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

2.3 Safety guidelines

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.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".
If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
2.  If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
Operator safety may be a risk if.
 - there is visible damage to the device.
 - the device is not working as specified.
 - the device has been stored under unsuitable conditions for a longer time.
 In case of doubt, please return device to manufacturer for repair or maintenance.
3.  Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage.
Failure to comply with these instructions could result in death or serious injury and material damage.

4.  **DANGER** This device must not be used at potentially explosive areas! The usage of this device at potentially explosive areas increases danger of deflagration, explosion or fire due to sparking.
5.  **DANGER** **Avoid injuries by handling the sharp measuring probe carefully!**

3 Product Specification

3.1 Scope of supply

The scope of supply includes:

- Handheld meter BaleCheck 100
- Measuring probe GSF 40
- 9V battery
- Operating Manual
- Protection bag ST-KR

3.2 Operation and maintenance advice

a.) Battery operation:

If 'bAt' is shown in the lower display the battery has been used up and needs to be replaced. However, the device will operate correctly for a certain time.



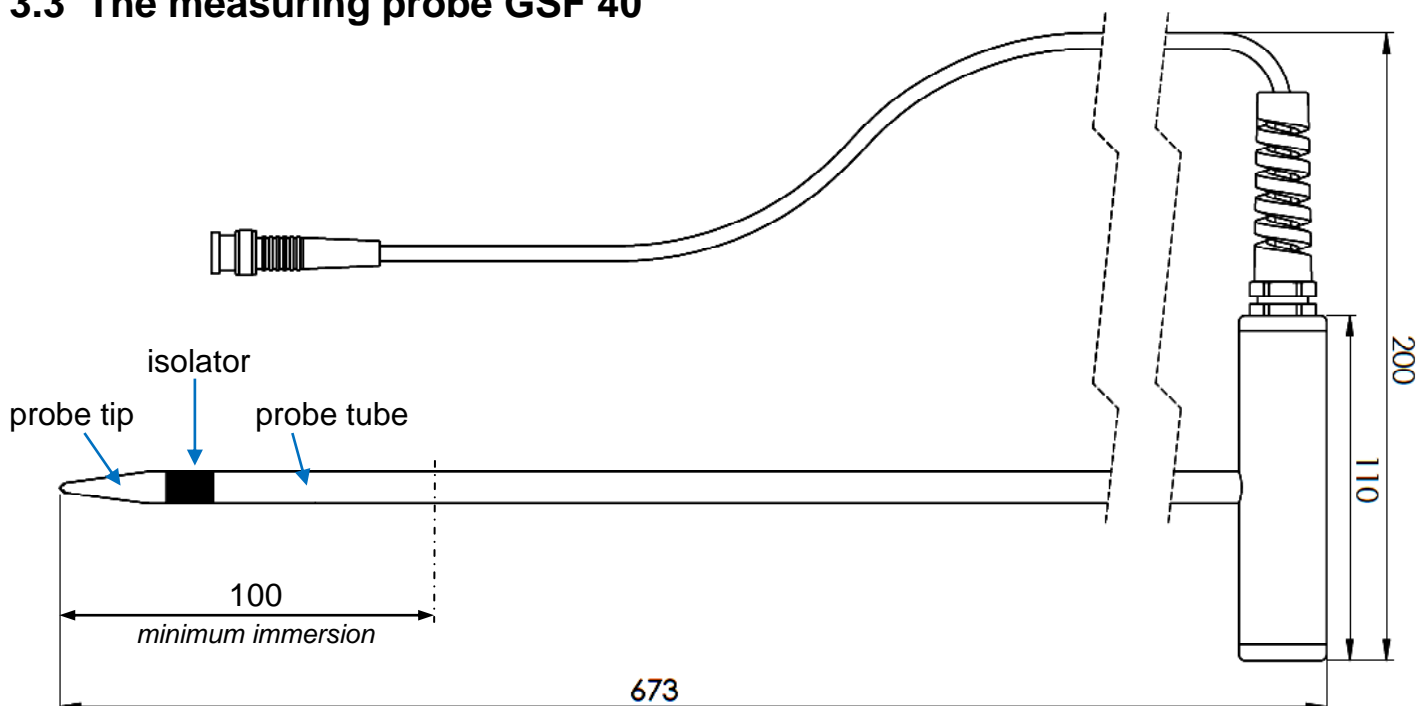
The battery has to be taken out, when storing device above 50 °C.

We recommend taking out battery if device is not used for a longer period of time.

After recommissioning the real-time clock has to be set again.

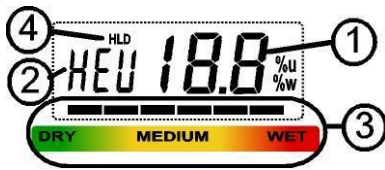
b.) Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.). Protect plug and socket from soiling.

3.3 The measuring probe GSF 40



4 Handling

4.1 Display elements




1: Main display	Display of the current moisture or water content
2: Material display	The name of the selected material characteristic curve is displayed
3: Moisture display	Moisture rating via bar graph:
4: HLD	The measuring value is 'frozen' (hold-key)

4.2 Control elements



Key 1:	Ein on/off key, Press long: switch device off Press shortly: changeover between measuring display and temperature adjustment
Key 2:	sort Selection of characteristic curve: <i>p.r.t. chapter 4.4</i>
Key 3:	hold: press shortly: The measuring current value is 'frozen' ('HLD' is displayed)

4.3 Start of operation

Switch the device on with the key .

After segment test  the device displays some information to its configuration:

P.oF if the automatic-off-function is activated (*p.r.t. chapter 0*)

The device is ready for measuring afterwards.

4.4 Selection of the characteristic curve

Selection of characteristic curve: by pressing  the next characteristic curve will be selected.



The use of inappropriate characteristics can cause faulty measurements!

Selectable material characteristics:

Display	Characteristic curve
<i>rEF</i>	Reference characteristic
<i>HEU</i>	Hay
<i>Str</i>	Straw
<i>GEt</i>	Grain (wheat, barley, rye)

5 Principles of the measurements

5.1 Moisture rating (WET - MEDIUM - DRY)

In addition to the measuring value there is a moisture rating via bar graph: Therefore the determination 'wet' or 'dry' is easy and comfortable for most applications and has no longer be deduced from literature and tables.



However, 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!

5.2 Moisture u and water content w

Either moisture u or water content w is needed according to the application. The BaleCheck 100 is supposed to be used the unit moisture u (relating to oven-dry mass). In some cases, like rating of combustibles, the water content w may be more suitable.

The instrument can be configured to both of the values, please refer to chapter 6.

Moisture u (relating to oven-dry mass) – recommended setting

$$\text{moisture } u[\%] = (\text{mass}_{\text{wet}} - \text{mass}_{\text{dry}}) / \text{mass}_{\text{dry}} * 100$$

or:

$$\text{moisture } u[\%] = (\text{mass}_{\text{water}} / \text{mass}_{\text{dry}}) * 100$$

The unit is %u (also common: % atro, weight percent)

mass_{wet}: mass of the sample (= total mass = mass_{water} + mass_{dry})

mass_{water}: mass of the water contained in the sample

mass_{dry}: mass of the oven-dried sample after (water has been evaporated)

Example: 1 kg wet hay that contains 500 g water has a moisture u of 100%

Water content w (= moisture relating to wet total mass)

$$\text{water content } [\%] = ((\text{mass}_{\text{wet}} - \text{mass}_{\text{dry}}) / \text{mass}_{\text{wet}}) * 100$$

or:

$$\text{water content } [\%] = (\text{mass}_{\text{water}} / \text{mass}_{\text{wet}}) * 100$$

The unit is % w.

Example: 1 kg wet hay that contains 500 g water has a water content of 50%





5.3 Temperature compensation

The temperature compensation is important for a reliable moisture-measuring.

There for the device features a manual temperature compensation input.

According to the selected material characteristic curve the device will use the associated temperature compensation.

Temperature selection:

- press shortly : in the left display will appear: **t.°C** or **t.°F**
- set the temperature by pressing  or .
- press  again to switch back to the measuring display.

5.4 Auto-Hold function

Particularly when measuring dry materials, electrostatic charges and other similar noise could dither the measuring value. With activated auto-hold function the device will acquire an exact measuring value automatically. During that, the device could be put down to avoid noise through discharge of the clothing etc.

After having acquired the measuring value, the display will change to 'HLD': The value will be frozen as long as a new measuring is initiated by pressing key 3 (hold).

5.5 Measuring Practice

The measuring values

For storability and evaluation of quality and purpose the BaleCheck measuring is a valuable decision support – Beside other criteria like smell (mouldy?)– consistency (dust...) and look (color, dirt...).

For freshly harvested material like straw, hay and grain the following can be recommended:

below 16 % u	Material is sufficiently dry and storable
16 - 20 % u	Material contains significant moisture, eventually dry it before storage
above 20 % u	Material contains excess moisture, stop harvesting if possible!

Irregular moisture distributions

Please consider: depending on storage and harvesting procedure, there can be irregular distributions of moisture within the bales or grain heaps/stores.

Measuring precision

The Instrument is no high-precision instrument and is designed for approximate determination of material moisture. Depending on state and sort of material there may be deviations. The strength of the measuring system lies within the ability, due to the construction and usability, to gather fast and comfortably many measurements spread over the bale/store (deep inside, at the floor, at critical weathered places..) – in practical use this often is much more valuable than single precision measurements and also is a valuable supplement to single precision measurements!

Minimum immersion / minimum amount of material

For best measuring results, the black isolator at the probe tip has to be completely immersed into the material plus at least 5 cm of the stainless steel shaft has to be in good contact to the material. When measuring grain, try to use at least ~ 500ml of grain, covering the probe tip and ensure to have enough contact/compressed grain around the probe – In heaps/stores higher than 30 cm and minimum immersions of 20 cm no additional measures have to be taken; otherwise the measurement values may be too low.

Keep probe clean!

Especially when measuring in wet hay, the probe may be soiled very strong, this may produce to low measuring displays.



Soiled probe -> wrong measuring!

In hard cases we suggest fine grinding fleece or at 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.




At values above 25% u the measurement precision decreases!

But decision making in this range is: Wet is wet, no matter how wet!

6 Configuration of the device

Follow these instructions to configure the functions of the device:



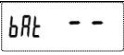
- Switch the device off.
- Press  and keep it pressed, while turning the device on (press  shortly).
Release the sort-button not before the first parameter "P.oF" is displayed.
- Set parameter with up  or down .
- Jump to the next parameter by pressing .

Parameter	Value	Information
button 	buttons  	
P.oF	Auto Power-Off (turn-off delay) <i>factory setting: 20 min.</i>	
	1...120	Auto Power-Off (turn-off delay) in minutes. If no key is pressed for the time adjusted here, the device is automatically switched off (adjustable 1 .. 120 min.).
	oF	Auto power-off is deactivated (continuous operation)
Un₁	Display unit of moisture <i>factory setting: %u</i>	
	%u	Measuring value displayed in moisture %u
	%w	Measuring value displayed in water content %w
Un₁	Display unit of temperature input <i>factory setting: °C</i>	
	°C	Temperature input in °C
	°F	Temperature input in °F
Aut ^{HLD}	Auto Hold <i>factory setting: oF</i>	
	oF	AutoHold deactivated: pressing hold-key freezes measuring and releases it again.
	on	AutoHold activated: hold-key starts new measuring, the display will be 'frozen' as soon as a stable measuring value was detected.

Press  again to store the changed settings, the device restarts (segment test).

NOTE: If there is no key pressed within the menu mode within 2 minutes, the configuration will be cancelled, the entered settings are lost!

7 Error and System Messages

E. 1	Value exceeding measuring range, value too high
E. 7	System error - the device has detected a system error (device defective or not within operating temperature)
	Value below display range
	The blinking bAt display indicates low battery voltage, device will continue to work for a short time.
	The battery is consumed and has to be changed. Measurements are no longer possible.

8 Reshipment and Disposal

8.1 Reshipment



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



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.

8.2 Disposal



Batteries must not be disposed in the regular domestic waste but at the designated collecting points.

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.

9 Specification

Measurement

Method	resistive material-moisture-measuring via external meas. probe
Characteristic curves	3 material characteristic curves for hay, straw and grain additional reference curve for high-resolution relative measurement
Measuring ranges	0,0 ... 50 %w (water content) 0,0 ... 100 %u (material moisture)
Resolution	0,1 %, over 19.9 %: 1 % (for %u and %w)
Moisture rating	6-stage bar graph display from WET to DRY
Accuracy	the achievable accuracy depends significantly on the application and the properties of the measured material!
Display	2 displays for material and measured value
Pushbuttons	3 membrane keys for on/off switch, menu operation, characteristic curve selection, hold-function etc.
Hold function	press button to freeze current value
Operating conditions	-25 to 50 °C; 0 to 80 %RH (non condensing)
Storage temperature	-25 to 70 °C
Power supply	9 V block battery, type IEC 6F22 (included)
Current consumption	approx. 1.8 mA
Used battery display	bAt" displayed if battery used, warning: "bAt" blinking
Auto-Off-Function	device will be automatically switched off if not operated for longer time (adjustable from 1..120min)
Housing	impact-resistant ABS plastic housing, front side IP65
Dimension	~ 106 x 67 x 30 mm (H x W x D)
Weight	~ 170 g (incl. battery and protection bag)
Probe	stainless steel
Dimension	probe length: approx. 600 mm, Ø 10 mm
Weight	approx. 270 g
Cable	length approx. 1 m, fixed to probe, BNC-plug
EMC	The device corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (2004/108/EG), additional error: < 1% FS

