

Operators Manual

Advanced Hay Tester

Moisture and temperature tester for baled
hay, haylage, straw, and silage

Farmscan Part No. 2189



Thank you for choosing our new Advanced Hay Tester. It ensures quick and easy measurement of moisture and temperature of baled hay, haylage, straw and silage. Patent pending automatic bale density compensation allows it to determine how dense the bale is and to adjust moisture results accordingly for improved accuracy. Other user friendly features include offset calibration, temperature compensation, automatic moisture result update each time the probe is pushed forward (patent pending), memory holding up to 1000 readings for transfer to a PC via USB, and a backlit display. High quality materials and robust stainless steel probe ensure durability.

Read this manual carefully to learn how to operate this device correctly.

1 Package Contents

- Advanced Hay Tester
- Operator's manual
- USB cable






2 Part Locator



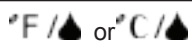




1 Battery plug
2 Handle
3 USB port
4 Keypad
5 Display
6 Probe shaft
7 Probe tip

3 Keypad and Display Symbols




Key functions change with the situation:

	Power ON Power OFF (long keypress) Go to main menu or go back in a menu
	Select Alternate between temperature and moisture measurement
 	Navigate down or up in a menu Select a different bale
	Start a measurement Force a moisture measurement


Symbols at the bottom of the display indicate functions of the adjacent keys:

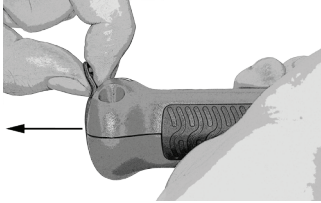
	Switch between temperature or moisture measurement mode
	Enter the menu
	Select
	Store to memory
	Go back / up / down

Other display symbols:

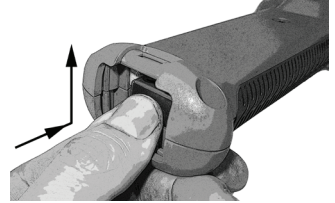
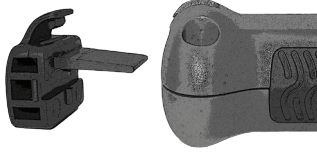
	Battery should be replaced
	Malfunction. Remove the battery, wait a short while and replace the battery. Power on. If fault repeats, take a note of the error code number displayed next to this symbol and contact the manufacturer, Agratronix
 MEM	Measurement memory is almost full. See chapters 7 and 8 for instructions on memory clearing

4 Before use

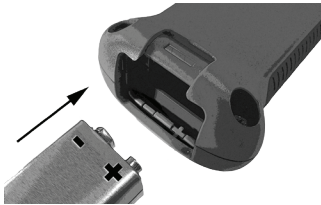
1. Check that the probe is dry and clean and that the device appears undamaged.
2. Install or change the battery as illustrated.
3. Power on by pressing the  key.
4. Configure device settings to suit your preferences, see chapter 5.
5. Run the quick calibration procedure (see chapter 9.2).



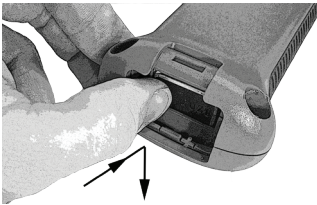
Pull battery plug out.



Release battery by pressing in and tilting up.



Insert a fresh battery (observe polarity)









Lock battery in its place by pressing in and down



Replace the battery plug

5 Settings

1. Power on by pressing the  key.
2. There is a menu symbol  at the bottom left corner of the display. Enter the main menu by pressing the  key located below it.
3. Use the arrow keys  or , until "+SETTINGS" text is chosen (light text on background) and press the  key.

The setting menu contains the following settings:


- Display language selection
- Temperature unit selection (degrees of Fahrenheit or Celsius)

- Automatic power-off delay adjustment
- Averaging length for moisture measurement (= the number of most recent moisture results to be calculated in the displayed average and high moisture estimate)
- Display backlight brightness (NOTE: affects battery life)
- Display contrast (adjust this if it is difficult to read the display)
- Remaining battery capacity display
- Calibration. Quick calibration of moisture measurement (may improve measurement accuracy). See chapter 9.2.
- Device information (this could be important upon communication with customer service)

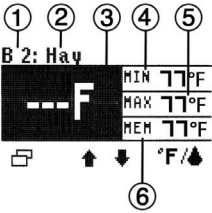
6 Usage

A large number of measurement results may be stored in the internal memory of the device. You may store results for 64 different bales. Results are saved for the calculation of average moisture and high moisture estimate and for saving on a personal computer using the USB port. The type of each bale (e.g.hay or straw¹) is selected before measurement can start. You may choose not to store results in the memory, but it is important to select the correct bale type to ensure proper operation and accuracy.

Accurate measurement of moisture requires bale temperature to be known. However, temperature measurement is much slower than moisture measurement, as hay is a thermal insulator that very slowly warms up or cools down a strong metal probe. Pushing into dense bales also warms up the probe due to friction. Therefore, temperature should be measured separately, before moisture measurement.

Power on by pressing the  key. The tester will start with either moisture or temperature measurement mode depending on which state it was previously. The display will show the following information:

Temperature measurement display:

	<ol style="list-style-type: none"> 1. Bale number (= memory slot number) 2. Bale type 3. Result of the latest temperature measurement ("---F" or "---C", if there is no result yet). 4. MIN: Lowest temperature stored in memory 5. MAX: Highest temperature stored in memory 6. MEM: Latest temperature stored in memory (NOTE: when starting moisture measurement, this value may be chosen to be used as bale temperature for temperature compensation of moisture.
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¹The selection of bale types may change with geographical location and the selection may grow with updates.

Moisture measurement display:

	<ol style="list-style-type: none"> 1. Bale number (= memory slot number) 2. Bale type 3. Result of latest moisture measurement ("---%", if there is no result yet, or e.g. <8% if bale was too dry to be measured or e.g. >80% if bale was too wet to be measured). 5. HI: Estimate of the highest moisture inside the bale, based on the stored values within the chosen averaging length. 6. n: Number of measurements used for calculation of average and high moisture estimate. 7. Moisture offset correction you have chosen for this bale type as applied to the displayed result (this area is empty if no offset correction has been set). See chapter 7. 8. Bale temperature as used for temperature compensation of the DISPLAYED moisture result. NOTE: This is NOT the current probe temperature.
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Switch between temperature or moisture measurement modes by pressing the under the (or) symbol on display.

If you wish to change the bale to be measured, press one of the arrow keys or to browse the bale list and the key to select a bale. Whenever you start to measure a new bale, select a memory slot (bale) whose type has not yet been chosen, i.e. whose type is listed as "----". Alternatively, you may choose to clear the bale memory in the main menu (see chapter 7).

Press the yellow measurement key to start the measurement.

6.1 Temperature Measurement

	<p>If you selected temperature measurement, current probe temperature will now be continuously updated on the display. You may store a temperature result to memory by pressing the key located under the displayed symbol. The stored result will then appear on display next to the word "MEM" and the minimum (MIN) and maximum (MAX) stored temperature readings will update accordingly and the symbol will disappear from the screen.</p> <p>To end temperature measurement, press the key located under the displayed symbol.</p>
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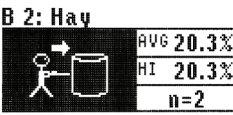


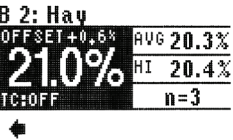






Note: Temperature measurement settling time varies greatly with bale type. Wet and dense gives faster settling than dry and light. Time after which 90% of temperature change has been achieved ranges typically from 8 minutes with 60% haylage, to 30 minutes with 16% straw.

6.2 Moisture Measurement


Unless you have recently measured moisture of this bale, the meter will ask for bale temperature before moisture measurement can start. There are up to 4 ways to give the temperature, chosen by pressing the key drawn next to each option:

<p>TEMPERATURE</p> <hr/> <p>← MEASURE NOW ↑ USE MEMORY ↓ SET ▸ USE PREVIOUS</p>	⊙↔	Measure bale temperature now. Remember that it will take a long time for the probe temperature to reach bale temperature.
	⊙↑	Use the latest temperature value stored in memory for this bale (only shown if available).
	⊙↓	Set temperature manually. The core temperature of a large bale follows the average ambient temperature with a delay of several days to a couple of weeks unless a decomposition process is heating up the bale.
	⊙▶	Use temperature value previously used for temperature compensation for this bale (only shown if available).






Once bale type and bale temperature have been set, moisture measurement may start:



 <p>B 2: Hay AVG 20.3% HI 20.3% n=2 PUSH</p>	<p>The tester asks you to push the probe into the bale. Hold the tester by the handle only.</p> <p>The tester estimates bale density during the push by measuring push force and probe motion. It uses the density estimate to improve accuracy of the moisture measurement.</p> <p>Push at least 6 inches deep into the bale. Make sure that there is at least 6 inches or hay around and in front of the probe tip.</p>
 <p>B 2: Hay AVG 20.3% HI 20.4% n=4 MEASURING</p>	<p>After the push has stopped, moisture measurement will start automatically.</p> <p>NOTE: If the required push force is very low, the push may not be detected. In this case, you may force measurement to start by pressing the  key. Density compensation will then assume that the bale is very light.</p>
 <p>B 2: Hay OFFSET +0.6% 21.0% TC:OFF AVG 20.3% HI 20.4% n=3 </p>	<p>Result will be shown on display after measurement. You may choose to store the result by pressing the  key located under the displayed  symbol. Average (AVG) and high moisture estimate (HI) values will then update on display and the  symbol will disappear from the screen.</p> <p>If you now push the probe deeper into the bale, moisture will be measured again. You may also pull the probe out of the bale and push it to another location.</p> <p>When done probing the bale, exit moisture measurement by pressing the  key located under the displayed  symbol.</p>

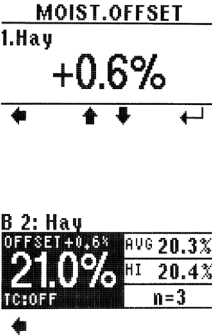

6.3 Power Off

The tester is powered off by a long press of the red  key. Automatic shutdown feature will power off after a pre-set delay starting from the latest keypress. The power-off delay may be adjusted in the settings menu.

7 Functions of the Main Menu

Enter the main menu by pressing the  key located under the displayed menu symbol . Browse the menu using the arrow keys  or  and select a function by pressing the  key.

Some functions allow removal of large amounts of data from the memory. The tester will ask to confirm these operations. In this case, press the  key to continue or the  key to cancel.

CLEAR AVG/HI	Clears average and high moisture estimate for the currently selected bale. All measurement results remain in memory. Therefore, if you later increase averaging length in the settings menu (see chapter 5), previous results will be included in calculation again. If infinite (∞) averaging length has been selected, this function will not have an effect.
CLEAR BALE	Clears the bale type of the currently selected bale and erases all measurement results stored for this bale.
CLEAR ALL	Clears the entire measurement memory. All moisture and temperature results and bale type selections will be erased.
<p>MOIST.OFFSET</p> 	<p>The moisture display may be adjusted to match an oven test or another reference method using the moisture offset setting.</p> <p>Once set, the offset correction will be applied to all moisture measurements of the same type (e.g. all hay bales). The adjustment will not affect results previously stored to memory.</p> <p>Use the arrow keys \uparrow or \downarrow to adjust the offset. You may clear the offset by pressing the arrow keys \uparrow and \downarrow simultaneously. Confirm your adjustment by pressing the \odot key under the displayed  symbol.</p> <p>As a reminder, the offset will be displayed above the moisture result on the moisture measurement screen in small letters (e.g. OFFSET +0.6%). The offset will also be shown upon bale selection.</p> <p>NOTE: Offset correction will only work well fairly close to the moisture where it was originally set. Therefore, if you apply offset correction for wet haylage, please clear the offset before measuring dry hay.</p>
T-COMP.	Set bale temperature for use in temperature compensation of moisture measurement. See chapter 6.2.
+SETTINGS	Enter the settings menu. See chapter 5

8 USB Data Transfer

Measurement results stored in memory may be transferred to a personal computer using the USB port. Pull out the USB plug and use the supplied cable. Software required for data transfer will be available on our web page at <http://agratronix.com>.

9 Cleaning and Maintenance

Store the tester in a dry place, protected from direct sunlight. Remove the battery before long term storage. There are no user serviceable parts inside the device.

Do not remove the screws and open the unit.

9.1 Cleaning

The device may be cleaned by wiping with a damp cloth. Do not use strong detergents or running water.


The tip of the probe must be kept clean and dry to retain measurement accuracy. The tip should be wiped dry and clean immediately after use, before it becomes difficult to clean. Stubborn stains may be removed by gently wiping with a damp soft scouring pad.

9.2 Quick Calibration

Moisture measurement accuracy may be improved by periodically performing the quick calibration procedure. We recommend it to be done at least always after storage. It is more important for measurement of dry bales than wet.

If you often measure bales whose core temperature is very high or very low, it may be beneficial to calibrate near the bale temperature. To do this, leave the probe inside such bale for e.g. 15 minutes, and calibrate immediately after pulling it out.

Quick calibration is performed as follows:

1. Verify that the probe is clean and dry.
2. Power on and select "CALIBRATION" in the settings menu.
3. Hold the tester so that the entire probe is surrounded only by clean, dry air with no objects closer than 30 cm to the probe in any direction. Do not touch the probe.
4. Start calibration by pressing the  key.

Result of the quick calibration will be stored to memory. It will be effective until the next quick calibration, or factory calibration during service or until you reset factory defaults (see chapter 9.5).

NOTE: Incorrectly performed calibration may weaken measurement accuracy significantly!






9.3 Factory Calibration

The Advanced Hay Tester can perform full factory calibration, where the device is checked and calibrated at its entire moisture range. Push force measurement and temperature measurement will be checked and firmware may be updated.

9.4 Updates

We may publish firmware updates that improve measurement accuracy or usability. Updates are installed via the USB port using a personal computer. Updates and update instructions will become available on our web page at <http://agratronix.com>.

9.5 Factory Reset

If the tester does not function as expected - for example, if you have chosen a language that you do not understand - factory default settings may be restored as follows: Power off with the  key. Press the  key and keep it pressed. Press the  key once, to power on tester. Lift the  key when confirmation screen appears. Accept factory reset by pressing the  key.

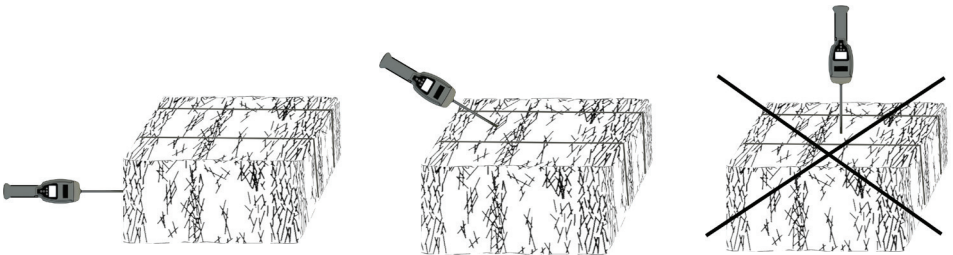
Factory reset sets all settings to their factory default values, selects the default language (usually English), clears offset correction of all bale types, erases the entire measurement memory and clears the quick calibration. Factory calibration remains untouched.

10 Instructions for Best Accuracy

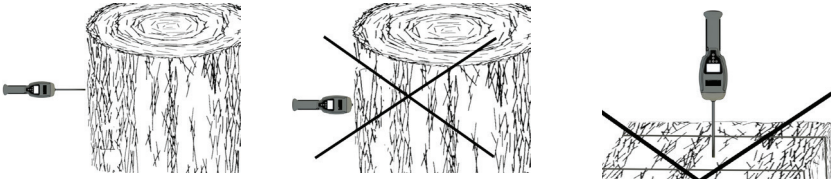
Always average several results, as bales tend to have significant local variation in moisture, quality and density. The higher the bale moisture, the more measurements should be averaged and the more important it is to use temperature compensation correctly.

There must be a sufficiently thick layer of hay in front of the probe tip and around it, at least 6 inches to all directions. Do not push to a hole from a previous measurement or closer than 4 inches to a previous measurement.

When measuring small square bales, push from a direction where the probe is surrounded by as much hay as possible. Avoid loose areas between sections of square bales.



Do not push the probe all the way to the soft core of a round bale. Do not push to the flat end of a round bale.



Push the probe using the handle and the end of the handle. Do not touch the probe during a push or measurement. Otherwise push force measurement or the electrical moisture measurement may not function as intended.

Take care not to bend the probe, especially when pulling it out of a bale. The probe is made of strong steel, but it is quite thin to keep required push force reasonable. It is easiest to pull the probe out of a bale by grabbing the top of the tester as illustrated below.



When measuring a bale with thick wrapping, puncture the wrapping with the probe tip before measurement to make sure the force required for making a hole in the wrapping will not affect density measurement.

Accuracy of the moisture measurement may be affected if a strong heating reaction (“sweating”) is in progress, or if the bale has spoiled, or if the effect of preservatives has not yet fully stabilized.

Keep the probe clean and dry. Any other electronic devices possibly connected to the bale must be powered off during measurement.

11 Technical Data

Battery	9 V alkaline battery, IEC type 6LR61 tai 6LF22	
Dimensions	32" x 4.25" x 2", probe length: 20", weight (with battery): 2 lbs.	
Moisture measurement range	Hay and haylage: 8% ... 80%, Straw: 8% ... 25%, Hay Silage: 30% ... 84%, Corn Silage: 40% ... 76%, Alfalfa: 8% ...75% (percentage of water in weight at 59°F (15°C) temperature)	
Moisture measurement accuracy ²	10% to 20%: 1.4% 20% to 30%: 2%	30% to 50%: 4% 50% to 70%: 6%
Reference method for moisture determination	Oven dry method according to ISO 6496:1999, EY N:o 152/2009, with samples acquired using a core sampler drill from the depth of moisture measurement	
Moisture measurement	Electronic impedance measurement	
Density compensation	Automatic, based on push force and motion measurement	
Temperature compensation	Semi-automatic, optional	
Operating temperature range	Handle/display: 14°F ... 122°F (-10°C ... +50°C), Probe: 14°F ... 176°F (-10°C ... +80°C)	
Temperature measurement range	14°F ... 176°F (-10°C ... +80°C)	
Measurement memory	64 bales, with total of 1000 moisture or temperature results	

² Instructions in chapter 10 must be followed to achieve full accuracy. Typical accuracy specified for baled timothy/fescue mix without preservatives. Accuracy with other products may vary. As substantial variation in measurement accuracy is possible, the manufacturer will not accept any claims for direct or consequential damage due to incorrect display.

12 Warranty

This product has a warranty valid for one (1) year from the date of purchase. The warranty covers the materials and workmanship. To claim the warranty, the customer should return the defected product to the Manufacturer at the customer's own expense.

The warranty claim must be accompanied with the description of the fault, copy of the sales receipt and customer's contact information.

The manufacturer, Agratronix will repair or replace the defected product and return it as soon as possible.

The warranty does not cover any damages that are caused by incorrect or careless use of the product, installation that does not correspond to the provided instructions and other damages which may arise due to causes beyond the control of the manufacturer.

The liability of Agratronix is limited to the price of the product at a maximum. Agratronix does not accept any responsibility for any direct, indirect or consequential damages that are caused by the use of the product or the fact that the product could not be used.

Manufacturer's Contact Information

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