

BIOFUEL MOISTURE METER BIO-1

USERS MANUAL



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1. Application

Biofuel Moisture Meter BIO-1 is a state-of-the-art electronic device for measuring of moisture contents in:

- sawdust, scobs*, wood shavings,
- hay and straw,
- dried fruit waste,
- fragmented waste paper,
- sunflower hull,
- buckwheat hull, bran, chaff,
- sunflower and corn stem,
- ground grain,
- rape and soy oilseed cake.

The Moisture Meter is primarily designed for evaluation of moisture contents of materials used for production of briquettes and pellets. It can also be used for approximate measurement of readymade pellets (crumbled).

2. Operation

The Moisture Meter measures the resistance of a compressed sample of biofuel. The measurement is done in two stages:

- first – the sample is compressed always to the same pressure of approx. 0.2 MPa,
- second – the resistance of the sample is measured and converted into moisture contents.

3. Technical data

Measuring range	[%] moisture contents (*)
sawdust, scobs*, wood shavings	8 - 30
hay and straw	8 - 25
dried fruit waste	8 - 25
fragmented waste paper	6 - 20
sunflower hull	8 - 25
buckwheat hull, bran, chaff	8 - 25
sunflower and corn stem	8 - 25
ground grain	9 - 25
rape and soy oilseed cake	8 - 25

* maximum size of scobs: approx. 20 x 15 x 15 mm

Temperature range	0 - 50°C
Resolution	0,1%
Display	LCD, 3 digits
Power	12V, battery 23A
Sample volume	120 cm ³
Measuring pressure	approx. 0.2 MPa
Power consumption	approx. 3 mA
Size	300 x 220 x 65mm
Weight	1,0 kG

(*) The moisture contents M_c is defined as follows:

$$M_c = \frac{w_w - w_d}{w_w} * 100 \quad [\%]$$

where:

w_w – weight of a sample before drying

w_d – weight of a completely dry sample

4. Measurements

The producer recommends the following sequence of actions:

- Unscrew the head of the measuring chamber (fig. 1).



Fig. 1

Guarantee

This Users Manual is a guarantee certificate of a Biofuel Moisture Meter BIO-1 with a serial number:

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production date:



Repair or replacement without charge is our company's only obligation under this warranty. Our company will not be responsible for any special, consequential or incidental damages resulting from the purchase, use, or improper functioning of this equipment regardless of the cause. Such damages for which our company's will not be responsible include, but are not limited to, loss of revenue or profit, downtime costs, loss of use of the equipment, cost of any substitute equipment, facilities of services, or claims of your customers for such damages.

The producer recommends calibration tests in due time (approx. every 12 months). Such test should be conducted according to appropriate standards or directly by the Producer.

12. Producer



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- Pull back (retract) the crush all the way, so that the measuring chamber has the maximal volume (see fig. 6).
- Fill the measuring chamber with sawdust or other biofuel (fig. 2).



Fig. 2

The exact amount of sawdust or other biofuel (within a reasonable range) does not have an influence on the result. If the material is highly compressible pack and press it with your fingers. It's very important that the measured compressed sample be at least 2 cm thick (see fig. 7).

- Screw the head of the measuring chamber on (see fig. 1). The head does not have to be screwed all the way on. Sometimes extra sawdust prevent the head from being screwed all the way on. This does not influence the result.
- Compress the sample to the pressure of approx. 0.2 MPa. Press and release the handle of the crush (fig. 3).



Fig. 3

After several repetitions a two coloured pressure indicator will start appearing from the head.

The compression is sufficient when the red part of the pressure indicator is visible - the red ring should extend only 0.5 – 1.0 mm (fig. 4). Stop the compression.



Fig. 4

WARNING:

Using excess force to compress the sample may cause bending or breaking of the crush mechanism.



Fig. 8

10. Guarantee and service

Tanel Electronics & IT warrants the BIO-1 to be free from malfunction and defects in both materials and workmanship for one year (12 months) from the date of purchase.

If the BIO-1 does not function properly during the warranty period due to defects in either materials or workmanship, our company will, at its option, either repair or replace the instrument without charge, subject to the conditions and limitations stated herein. Such repair service will include any necessary adjustments and replacement part.

The producer conducts:

- guarantee repairs – within 7 days after receiving the device,
- other repairs – within 10 days after receiving the device.

The Moisture Meter is shockproof and can be sent by post.

11. Limitations

This warranty does not cover damages caused by using excess force during sample compression.

This warranty becomes null and void if you fail to pack your BIO-1 in a manner consistent with the original product packaging and damage occurs during product shipment.

This warranty does not cover: circumstance beyond our company's control; service required as the result of unauthorized modifications or service; misuse, abuse; failure to follow our company operating or maintenance instructions.

7. Practical remarks

- To prevent faulty results in measurements we recommend that in due time you check your meter readings with a dry oven test.
- Samples should be representative for the whole prism (pile, truckload). Therefore they should be taken from the middle of the whole volume (not from the surface).
- The accuracy of measurements can be increased by conducting several (e.g. 3) measurements of the material and calculating an average result.

8. Maintenance and battery test

The producer recommends periodical maintenance of the measuring head. Place the measuring head on e.g. cramp (so that the pressure indicator can extend freely) and press the head hard with your thumbs several times. If the pressure indicator won't extend, the head is filled with dust or other pieces of samples. Pour a little amount of alcohol or water into the head and loosen the pressure indicator. The dirt should flow out of the holes in the front side of the head. Before next measurements dry the head. A minor dampness of the head has no significant influence on the results.

The device is equipped with active power level control circuit. If the power level drops below acceptable level a sign "BAT" is displayed on the LCD. This indicates that the battery is expired and should be replaced.

9. Storage and battery replacement

Store the device in a well ventilated, dry place in a chemically neutral atmosphere.

Replace the battery when needed but no less than every 6 months. To replace the battery unscrew the cork signed BATTERY and using a small screwdriver carefully remove the battery compartment. Replace the battery in the compartment. Please mind the correct polarization. Insert the compartment into the moisture meter. It should insert without problems as long as it is positioned exactly as shown on fig. 8.

- Press and hold ON/OFF button to turn the device on (fig. 5).
- Press MATERIAL button to set the number corresponding to the type of biofuel being measured (e.g. in case of ground grain – 8) (fig. 5).
- Press TEMPERATURE button to set the measured or estimated temperature of the material.
Each press of the button increases the temperature by 2°C. Holding the button "fast forwards" the temperature. Temperature estimation error of up to ± 4°C does not have any significant influence on the result.
- Wait until the result stabilises. With very dry samples the result may take up to 10 seconds to set. With moist samples the results should be almost instantaneous (1-2 seconds). Hold the device steady during that time.
- Read the result.



Fig. 5

- Decompress the measuring chamber by unblocking and slightly retracting the crush (fig. 6).

WARNING:

Do not press the handle while retracting the crush.



Fig. 6

- Unscrew the head of the measuring chamber.
- Push the sample and empty the measuring chamber (fig. 7). Press and release the handle of the crush.



Fig. 7

WARNING:

In due time (approx. once a week) push the crush all the way forward, outside the measuring chamber in order to remove any dust or other sample pieces that might have gotten into the space below the crush.

- Retract the crush approx. 3 - 4 cm back (fig. 6) so that you can screw the head back on.
- Screw the head back on.

5. Results

If the sample is very dry – moisture contents is below the measuring range, a sign “LO” will appear on the LCD. If the sample is very moist - moisture contents is above the measuring range, a sign “HI” will be displayed on the LCD. Regardful measurements should provide the results with the accuracy of $\pm 10\%$ of the measured value (e.g. for the moisture contents of 15% the accuracy is $\pm 1.5\%$).

6. Moisture contents of readymade pellets

Freshly made pellets are very dry (below 8%). During storage they gradually gain moisture contents. The highest moisture contents is in the external layers of a pellet. If the air humidity is between approx. 60% - 70% RH you can assume that the moisture contents of pellets stored in such atmosphere will increase to approx. 10% - 20% depending on type of material.

In order to conduct measurements of pellets with Moisture Meter BIO-1 take a handful of pellets from the middle of the prism (or container) and crush them with a hammer. Input the crumbled material into the measuring chamber and follow the procedure described in chapter 4. Set the material type to the correct type of material of pellets. For example when measuring moisture contents of pellets made from straw set the material to 2 (HAY, STRAW).

Consider the measurements of pellets moisture contents as approximate only.