



GrainMaster i2

Protimeter Grain Moisture Meter

Instruction Manual



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Introduction

The Protimeter GrainMaster i2 is a versatile moisture meter for measuring moisture and temperature levels in crops. It is used with a grinder-compressor unit to measure small samples of grains during harvesting and drying. It can also be used with optional probes for monitoring the temperature and moisture levels of stored grain and the moisture levels of baled hay and straw.

1. Product Features


The GrainMaster is a hand held instrument powered by one 9V battery located in a compartment on its underside. It incorporates a grain cell with retaining lugs for the grinder-compressor unit, graphical LCD, and 4-button interface for selecting the operational modes and taking measurements. There are two sockets on the left hand side of the instrument. One of these sockets can be used to attach the optional probes, and the other socket is a USB device port through which the internal program can be updated with the provided software tool.


The instrument is supplied with the following auxiliary items:



- Grinder-Compressor Unit
- Grain Cup
- Sample Spoon (10ml)
- Cleaning Brush
- Quick Check
- Pouch
- Instructions



1.1 Display and Buttons

The power button  is pressed to switch the instrument ON and to take the measurements. Only when the button is pressed will the measurement will be updated on the screen.

The instrument has two primary modes of operation, selected by , which are called internal and external modes.

In internal mode, the instrument is used in combination with the grinder-compressor unit to measure a small sample of grain in the grain cell.  and  buttons are then used to select the required crop calibration and to switch from moisture to temperature displays. The instrument is used in external measurement mode when using optional moisture/temperature probes.

1.2 Crop Calibrations and Functions


Sixteen calibrations (see Table 1) are pre-programmed into the GrainMaster i2.

Table 1: Pre-Programmed Calibrations of Grains

Wheat	Canola	Coffee	Rice
Oats	Linseed	Soya (Soybean)	Sorghum
OSR (Oilseed Rape)	Sunflower	Beans	Paddy
Barley	Corn (Maize)	Peas	0-100 Relative

Note: Not all calibrations are for ground samples. Also, some of the pre-programmed calibrations are not available with the optional external moisture and temperature probe.

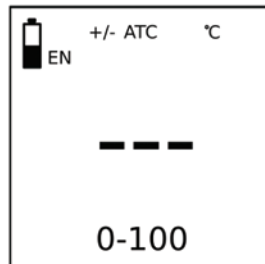
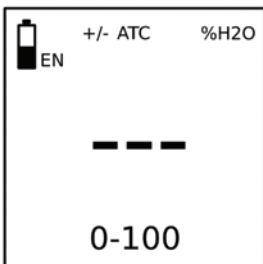
Before measuring moisture and temperature of ground and compressed samples, do the following:

1. Enter the setup mode from the switch off state. To enter in to setup, press and hold ►, and then turn on the unit by pressing .
2. Switch temperature display from °C to °F, since the default is °C.
3. Switch automatic temperature correction (ATC) ON or OFF. Please note: Protimeter recommends that ATC is always activated when measuring moisture levels in crops. When ATC is off, the displayed text “ATC” flashes on the display as a warning.

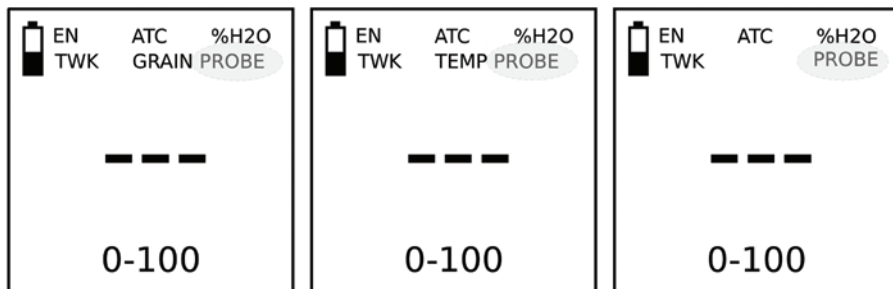
2. Measuring Moisture and Temperature of Ground and Compressed Samples

To take moisture and temperature measurements of 10ml crop samples, complete the following steps:

1. Ensure that no external probe is connected to the unit. Switch ON in internal measurement mode by pressing and releasing ►. If it is in the correct mode, the display will appear as below:






If the display appears as below, it means the instrument is in external measurement mode. To revert back to the internal measurement mode, switch the unit off, and then remove the attached external probe.



2. Scroll to the required crop calibration or 0-100 relative scale by pressing ▲ or ▼.
3. Ensure that the grain cell of the instrument is clean. If it is dirty, clean it with the brush.
4. Place the grain cup (the matte aluminium ring) over the grain cell.
5. Ensure that the grinder-compressor unit is clean and operating smoothly. If not, disassemble and clean as detailed in Section 5.1.
6. Prior to placing the grinder-compressor unit on the instrument, ensure that the plunger is fully retracted within its housing. The plunger is retracted fully by sliding the switch on the underside of the rotating handle forward into the compress position (pictured) and rotating the handle anti-clockwise until the clutch clicks a few times. The sliding switch can only be pushed or pulled into position when the black pips on the top of the rotating handle are aligned with the yellow X.
7. Pull the switch on the underside of the rotating handle to the grind position, and place the grinder-compressor unit over the grain cup. Lock the unit in place by twisting it clockwise against the three lugs.
8. Always use the correct sample size of 10ml. Using the 10ml spoon provided, pour a sample into the hopper on the side of the grinder-compressor unit.








9. Hold the GrainMaster i2 against a flat and horizontal surface, and rotate the handle clockwise to grind the sample and push it through into the grain cup. If necessary, check to see the entire sample has passed through the grinder blade by turning the handle anti-clockwise a quarter turn and looking into the hopper.
10. Align the pips and the yellow X of the rotating handle, and push the sliding switch forward into the compress position. Turn the handle clockwise to screw the plunger on to the ground sample that is now in the grain cup. Correct compression is reached when the clutch clicks a few times.
11. Press and hold  to display the moisture content of the sample. When the reading has stabilized, release button to freeze the %H2O value for approximately 7 seconds. Note and record this value as required.
12. If necessary, display the temperature of the sample by pressing  or  only after releasing. Note and record this value as required.
13. Having noted the moisture (and/or temperature) reading, turn the handle anti-clockwise until the clutch clicks (to fully retract the plunger). Remove the grain cup and the tested sample, and clean the grain cell with the brush prior to commencing another test.

2.1 Adjusting the Pre-Programmed Calibrations

If required, each of the 15 pre-programmed crop calibrations (i.e. all except the 0-100 scale) can be adjusted individually by $\pm 1.5\%$ to allow for subtle changes that can be caused by crop variety, growing conditions or geographical region. Pragmatic users may choose to adjust their meter to match the results obtained from a local instrument used commercially.

Note: Whenever a user adjustment is active, the “+/-” symbol flashes on the screen.

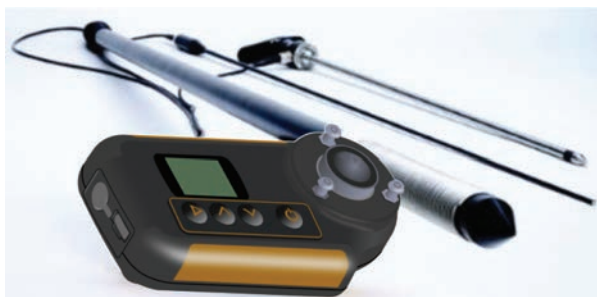
To adjust calibrations, complete the following steps:

1. Select the required crop and measure the moisture content of a sample as outlined in Section 2.
2. While holding  to display the %H2O value, press  to increase the calibration or press  to decrease the calibration in increments of 0.1. A +/- symbol appears on the display as shown earlier, indicating that the calibration has been adjusted by the user.
3. Remove a calibration adjustment by pressing  while pressing . The +/- will not appear on the display once the adjustment is removed.

Note: The adjustments are separate for each crop and are stored in the instruments non-volatile memory until cleared in Step 3 above or in Section 4 (setup mode). No adjustment is provided for temperature readings.

3. Optional External Moisture and Temperature Probes

A range of external moisture and temperature probes are available for use with the GrainMaster i2. The external probes connect to the instrument via the edge connector socket on the left hand side of the instrument. These ports are protected by a blanking grommet when not in use.



3.1 Using the Optional Moisture and Temperature Probe (GRN3005)

Nine calibrations for the external moisture and temperature probe are pre-programmed in to the GrainMaster i2, as shown below in Table 2.










Table 2: Optional Moisture and Temperature Probe Calibration

Wheat	Canola	Oats
OSR (Oilseed Rape)	Beans	Barley
Linseed	Peas	0-100 Relative

Note: The optional probe can be used with the GrainMaster i2 for checking the moisture and temperature levels of stored grain. This probe is used to monitor the condition of stored grain quickly; it is not a substitute for moisture measurements taken from ground samples as in Section 2. Ground sample measurements are more reliable than external probe measurements

Note: Be sure that the instrument's internal grain cell is empty while using the external moisture probe. Avoid contact with the center pad of the cell while using the grain probe.

Use the optional external moisture and temperature probe as follows:

1. Push the probe into the grain and initially allow a few minutes for the temperature to stabilize. Connect the probe to the instrument.
2. Press and release  to switch ON, confirm that the instrument senses external moisture probe flagged by display showing “TEMP PROBE.” If not, press  once to do so.
3. As with the internal grain cell, if the crop shown is not the required one, press  or  to select it. Note: Some crops are not available with the external moisture probe.
4. Press and hold  to display either the temperature or moisture level. Release  and press  or  to switch from moisture to temperature displays as required. Pressing  will toggle back to the internal grain cell.







Note: The user adjustments may be made in the same manner for the internal grain cell. These are stored separately.

The spiral wound electrodes (that make the moisture measurement) should be wiped clean with a cloth at regular intervals to prevent the accumulation of dust that may attract moisture and give an erroneous reading. A temperature sensor is mounted close to the tip of the probe near the spiral wound electrodes. This is easily damaged if the probe tip is rammed against hard surfaces; hence, care needs to be taken.

3.2 Using the Optional Temperature Probe (GRN6046)

Note: An optional Temperature Probe GRN6046 can be used with the GrainMaster i2 for checking the temperature of stored grain.

Use the optional temperature probe as follows:

1. Push the probe into the grain and initially allow a few minutes for the temperature to stabilize. Then, connect the probe to the instrument.
2. Press and release  to switch ON, confirm that the instrument senses external moisture probe by displaying “TEMP PROBE.” If not, press  once to do so.
3. Press and hold  to display the temperature of the grain. Note:  and  have no effect in this mode;  will toggle back to the internal grain cell.



3.3 Using the Optional Bale Probe (GRN6138)

Note: An optional Bale Probe GRN6138 can be used with the GrainMaster i2 for checking the moisture level of bales of hay and straw.

Use the optional Bale Probe as follows:



1. Push the probe into the bale, and connect the probe to the instrument.

Note: Be sure that the instrument's internal grain cell is empty while using the Bale Probe. Avoid contact with the center pad of the cell.




2. Press and release  to switch ON. Then, confirm that the instrument senses the probe by displaying "BALE PROBE." If not, press  once to do so.

Note: Crop selection is not possible in bale probe mode.

4. Setup Mode

The setup mode is entered from the switched OFF state, by pressing  while switching ON using . This action displays the firmware version of the instrument followed by the product part number and the firmware date in yy-mm-dd format and then enters in to the configuration mode.

4.1 Language

The selected language is displayed on the screen in the box. Language can be changed by toggling with  or . Once the intended language is displayed in the box, press  to save the language.



4.2 Backlight

To turn the backlight on/off, press ▲ or ▼. To set the status, press ⏻ when the intended option is on the screen.



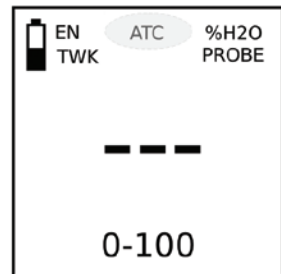
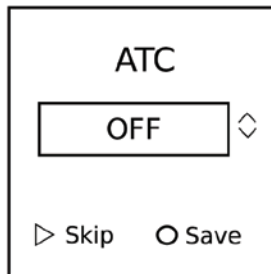
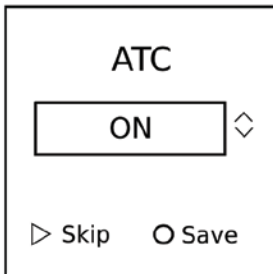
4.3 Beeper

The beeper can be turned OFF and ON by pressing ▲ or ▼, and then pressing ⏻ to save.




4.4 ATC

Automatic Temperature Compensation (ATC) allows probe temperature to be considered and compensated on the moisture reading. Protimeter recommends that ATC is always enabled. If ATC is not enabled, the display will flash the text "ATC" to alert the user.



4.5 Unit

Based on user needs, measurement units can be set to METRIC or NON-METRIC. To change the measurement units, toggle the ▲ or ▼, and then saved by pressing .

UNIT

METRIC

▶ Skip ○ Save

UNIT

NON-METRIC

▶ Skip ○ Save

4.6 Auto-Off

Automatic-off timing can be set to: 5sec, 10sec, 15sec and 20sec. The unit will automatically power off according the selected time interval from the last key press.

AUTO-OFF

5

▶ Skip ○ Save

AUTO-OFF

10

▶ Skip ○ Save

AUTO-OFF

15

▶ Skip ○ Save

4.7 Reset

Reset the unit to factory default settings.

RESET

YES

▶ Skip ○ Save

RESET

NO

▶ Skip ○ Save

5. Care and Maintenance

When not in use, store the GrainMaster i2 in a stable, dust free environment and out of direct sunlight. Remove the battery from the instrument if it is to be stored for periods of more than four weeks, or when the low battery power symbol starts blinking on the display. Check the condition of accessories used with the instrument on a regular basis, and replace them if they become worn or damaged.


5.1 Grinder-Compressor

The grinder-compressor unit should be cleaned and lubricated at regular intervals, especially when testing wet or oily crops that tend to clog the thread of the plunger spindle. Follow the maintenance procedure as detailed in below:

1. Disengage the two halves of the grinder-compressor unit by twisting the yellow locking ring counter clockwise and pulling apart.
2. Open the blade retaining wings and lift out the plunger and blade assembly.
3. Separate the blade from the plunger assembly, and remove the yellow feeder ring from inside the top half of the grinder-compressor unit.
4. Clean the blade, feeder ring and both halves of the grinder-compressor unit with the brush provided.
5. Clean the thread of the plunger unit, and ensure it spins freely. Lubricate with a light oil.
6. Replace the feeder ring in the top half of the grinder-compressor unit.
7. Put the blade on the plunger assembly and reposition in the bottom half of the grinder-compressor unit. Clamp in place by closing the retaining wings.
8. Slide the two halves of the grinder-compressor unit together, ensuring that the location lugs and plunger spindle are correctly aligned.
9. Replace the yellow locking ring.

6. Calibration Check

The GrainMaster i2 is supplied with a “Quickcheck” device for verifying that the instrument calibrations are correct with respect to factory settings. The procedure is detailed in the following steps:

1. Ensure that no external probe is connected and that the internal grain cell is clean and dry.
2. Deactivate ATC, as detailed in Section 4.3.
3. Select the 0-100 Relative Scale, as detailed in Section 2.0.
4. Place the Quickcheck over the grain cell and hold in position to ensure contact with the concentric electrodes.
5. Press and hold . The instrument should then display 36.5 ± 1.0 . If the reading is not within these limits, the instrument should be returned to Protimeter for servicing.
6. Reactivate ATC, as detailed in Section 4.3, before continuing to use the instrument.

7. Information Codes

The instrument displays a range of codes that represent various conditions as detailed in Table 3 below.

Table 3: Code Interpretation

Code	Interpretation
---	Standby mode. When showing, use ▲ or ▼ to select required crop, or leave 7 seconds to switch off automatically.

8. Specifications

Weight of instrument c/w Grinder-Compressor unit:	1KG
Dimensions of instrument c/w Grinder-Compressor unit:	195mm length X 185mm height X 100mm width
Power:	6F22R 9V Battery

Customer Support Centers

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