Raw Cashew Moisture Tester

**HB-600**

# Operating Manual

Thank you for purchasing this product.
Please read the operating manual carefully and use this product properly.

# Safety Precautions

If the safety precautions for the raw cashew moisture tester are not observed, injuries or damage to property may result. The utmost care has been given to the safety of the product, however take care to read the precautions in this operating manual for proper handling.

## ■Be sure to carefully follow all safety precautions.

Carefully read the operating manual.

## ■Do not use the unit if it is not functioning properly.

Immediately contact our service representative if the unit malfunctions or does not operate properly.

# Contents

# 1. Features

This unit is a raw cashew moisture tester that applies electric resistance of an object to be measured. Only putting the bar sensor into raw cashew displays their moisture content (%). This moisture tester needs only simple operation for quick measurement without selecting an operator or measurement environment.

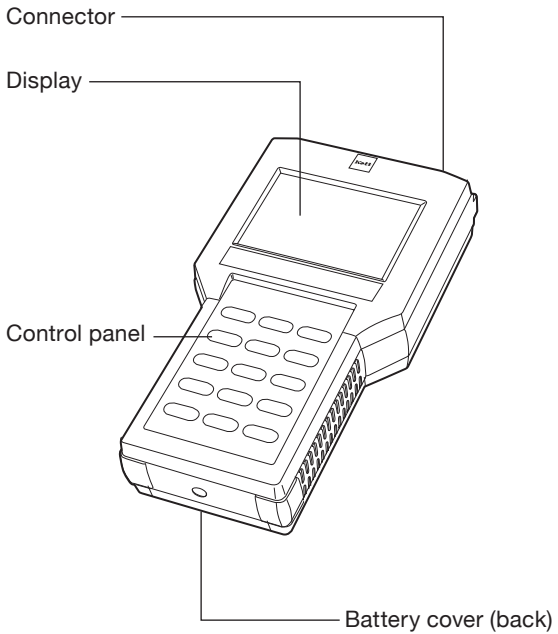
- **Auto power off function**
  If no measurement is made or key is operated for approximately 5 minutes, the power is automatically shut off and avoids wasting the batteries.
- **Upper limit setting function**
  Setting any moisture value enables a buzzer to sound when a measured moisture value exceeds the set moisture value.
- **Able to compensate for moisture values**
  A moisture value can be corrected in the range from -9.9 to +9.9%.
- **Up to 14 types of user original calibration curves registrable**
  In order to support various conditions, user-originated calibration curves can be registered under numbers from 02 to 15.

# 2. Specifications

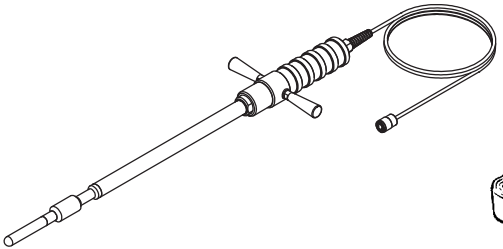
| | | |
|---|---|---|
| Measurement method | : | Electrical resistance |
| Applications | : | Raw cashew nuts (Cashew nuts with shell) |
| Measurement range | : | 7-30% |
| Repeatability | : | 1.8% |
| Display | : | Digital (LCD, minimum displayed digit is 0.1%) |
| Operating Temperature | : | Operating temperature: 0 to 40°C (no condensation) |
| Functions | : | Upper limit alarm setting (7 to 30% and OFF), Moisture value bias adjustment (-9.9 to 9.9%), Auto power off (automatically turned off in approx. 5 minutes), Average value display, Continuous measurement mode, Calibration curve memory function (14 types) |
| Power supply | : | 1.5 V batteries (AA alkaline) x6 |
| Power consumption | : | 0.54W |
| Dimensions | : | 110 (W) x 210 (D) x 50 (H) mm |
| Mass | : | 0.5kg |
| Accessories | : | Bar sensor (PU-360), Shoulder strap, 1.5 V batteries (AA alkaline) x6, Operating manual |

# 3. Part names

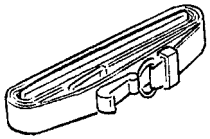
**<Main unit>**



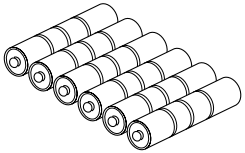

**<Accessories>**



Bar sensor (PU-360)



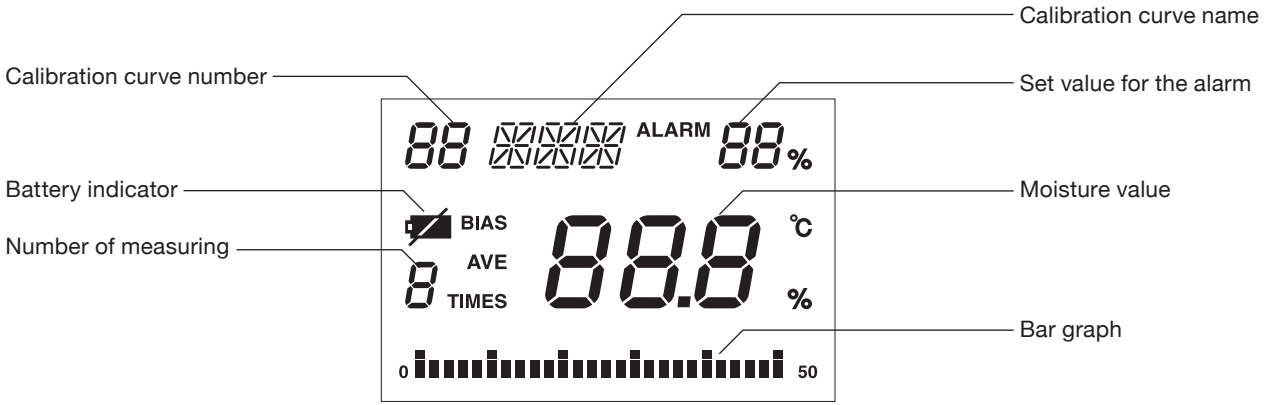
Shoulder strap



1.5 V batteries (AA alkaline) x6

Operating Manual

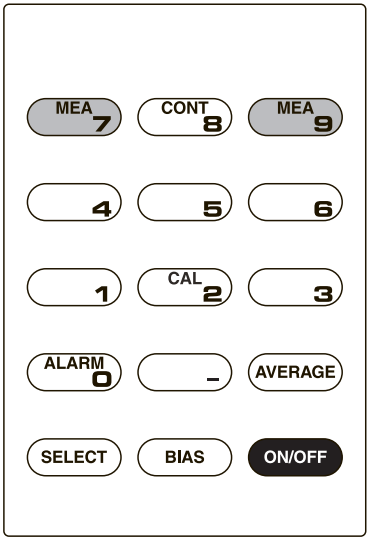
# 4. Display


Calibration curve name
Calibration curve number
Set value for the alarm
Battery indicator
Moisture value
Number of measuring
Bar graph
ALARM
BIAS
AVE
TIMES
℃
%
0
50

# 5. Description of Main Unit Keys (control panel)

*** The numerical keys from 0 to 9 are used for number input. Some keys combine numerical input and other functions.functions.**

<Control panel>




| Key | Functions |
|---|---|
| ON/OFF | Turns the power “ON” and “OFF”. |
| BIAS | Adjusts a moisture value bias. |
| SELECT | Selects a sample number. |
| AVERAGE | Averages measured values. |
| – | Enters a minus correction value. |
| ALARM 0 | Activates an alarm. |
| CAL 2 | Enters a calibration curve and a value. |
| MEA 7 MEA 9 | Conducts measurement. |
| CONT 8 | Changes the current mode to the continuous measurement mode. |

# 6. Before Measuring

(1) The unit is powered by six 1.5 V batteries (AA, alkaline). Remove the rear battery cover, place the batteries into the compartment taking care to correctly orient the positive "+" and negative "–" terminals. Then attach the battery cover.

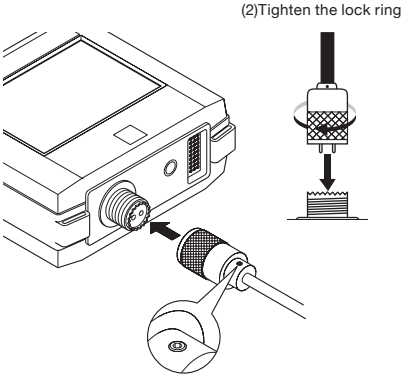
* **is displayed when the batteries become low. Replace all six with new batteries.**

(2) Plug the connector of the bar sensor into the main unit securely, and tighten the lock ring to secure the connection.

* **At this moment, direct the silver indentation to the front side, or measured values may be affected.**

(3) Prepare a sample to be measured, and allow the sample to equilibrate to the same temperature as this unit.

* **Errors may occur when there is a large difference in the temperature between the sample and this unit. To make more accurate measurements, allow the temperature of a sample to equilibrate to that of this unit.**



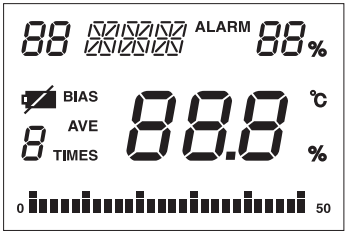

(1) Direct the silver indentation to the front side and securely insert the connector

# 7. Directions

## 7-1. Measurement

(1) Press the ON/OFF key to turn on the power. All elements of the LCD will be displayed for about 3 seconds. Subsequently, "calibration curve name," and "%" will be displayed.

* **At this time, if the display shows something other than the above, this unit may be in the abnormal state. Refer to "9. Warnings and Errors" on page 20.**

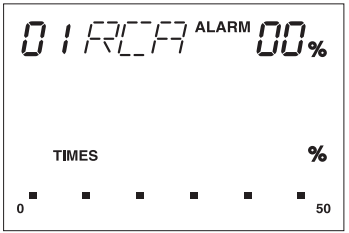



(2) Select the number of the calibration curve to be measured. This instrument has only one pre-installed calibration curve, but this function is required when a user calibration curve is created.

**<Calibration curve No. 01: For the pre-installed calibration curve>**

Successively press keys in the order of SELECT → ALARM 0 → 1.

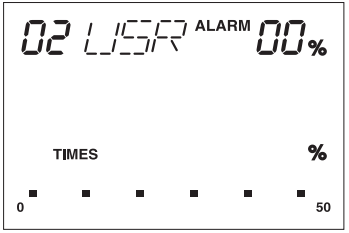
<Calibration curve No. 01: Selection screen>




**<Calibration curve No. 02: For user calibrations>**

Successively press keys in the order of SELECT → ALARM 0 → CAL 2.

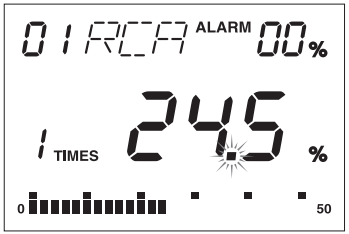
<Calibration curve No. 02: Selection screen>



(3) Insert the bar sensor into raw cashew.

* **When the bar sensor is inserted, push the sensor firmly into the sample to place more than half of the sensor in the sample. If insertion is not deep enough, contact between the bar sensor and the sample is not sufficient and an accurate measurement result may not be obtained.**
* **Do not stir, twist, or wrench the sample with use of the bar sensor in a reckless manner. Failure to observe this may apply excessive load to the bar sensor and accordingly cause damage to it. In addition, the state of contact with a sample significantly changes, which may greatly affect a measurement result.**

(4) Press the MEA 7 or MEA 9 key. The decimal point will blink. After approximately 3 seconds a “beep” will sound and the “Measurement number”, “Moisture value”, and “Bar graph” will be displayed.

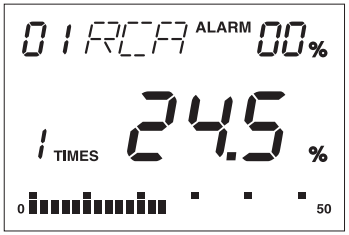



* **The bar graph will display up to 50% in units of 2%.**
* **When the moisture value is outside of the measuring range, "HI" will be displayed if the value is higher than the measuring range, and "LO" will be displayed if the value is lower than the measuring range.**

* The ☼ symbol denotes a blinking display.

(5) Remove the bar sensor from the sample. At this time, the moisture value remains on the display. To continue to make further measurements, start the procedure from the step “(3) Insert the bar sensor into the sample" on page 11.

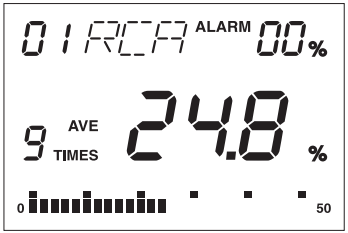
When measurement is completed, press the ON/OFF key to turn off the power.




* **The auto power off function turns off the power of this unit automatically if no measurement or operation is conducted for 5 minutes.**
* **Clean the bar sensor unit with a dry cloth or the like after use. If the bar sensor is dirty, it may deteriorate.**

## 7-2. Average display

Pressing the AVERAGE key when the number of measurements is from 2 to 9 displays "measurement number" and "average value". At this time, “measurement number” and “average value” remain displayed, but if a measurement is continuously made, “measurement number” will be 1.



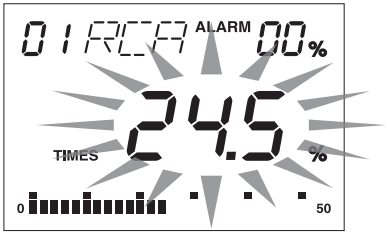

* **If the number of measurements exceeds 9, the measured value up to that point resets and measurement starts from measurement number 1.**
* **Due to the presence of moisture distribution in a bulk, a single measurement may not be representative of the moisture in the entire bulk. Therefore, it is recommended to conduct measurement multiple times and use the average value function.**

## 7-3. Continuous measurement mode setting

If the continuous measurement mode is selected, measurements can be made without pressing the MEA 7 or MEA 9 key for each measurement.

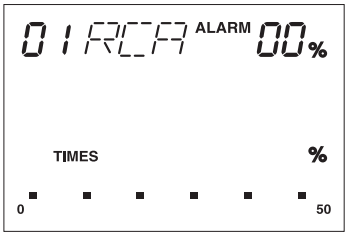
### (1) Continuous measurement mode setting

In the step "7-1. Measurement (4)" on page 11, pressing the CONT 8 key causes the decimal point to blink and display the moisture value and bar graph. When the bar sensor is not inserted into the sample or the moisture content is below the measurement range, “LO” will be displayed, and the numeric display will blink.




### (2) Canceling the continuous measurement mode

Hold down the CONT 8 key for 2 seconds or more until a “beep” sounds. The display will momentarily go blank. When you take your finger off the key, the unit will return to normal measurement mode.




* **Pressing the ON/OFF key turns off the power and automatically cancels the continuous measurement mode.**
* **Note that the battery life is shorter in the continuous measurement mode. The battery life is approximately 48 hours when measurements are continuously conducted (at 20°C).**

* The ☼ symbol denotes a blinking display.

## 7-4. Moisture Content Value Correction

The moisture value scale of this unit is created by statistically processing the relationship between a standard method and electric resistance. However, depending on various conditions, there are cases where the standard method and the moisture value do not agree. In such cases, a moisture value bias can be adjusted (–9.9 to 9.9%) by the following method.

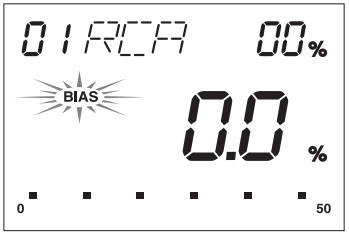
(1) Press the BIAS key.
The "BIAS" indicator will blink, and the previously entered bias value will be displayed. The initial value is 0.0%.

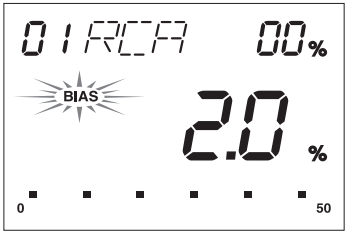
(2) Enter a correction value. Enter a 2-digit number.
To enter "2.0%", press the CAL 2 and ALARM 0 keys in succession.
To enter a negative value, press the key (–) prior to pressing the numerical keys.

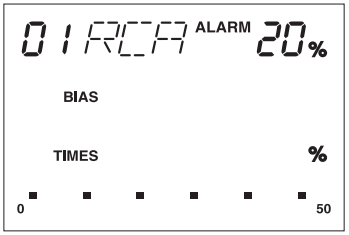
(3) Press the MEA 7 or MEA 9 key to make measurements.

* **If a correction value has been entered, "BIAS" will be displayed.**

* **To cancel the correction value, enter "0.0%".**



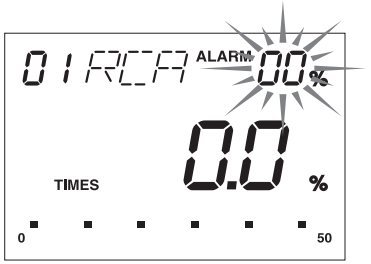




* The ✳ symbol denotes a blinking display.

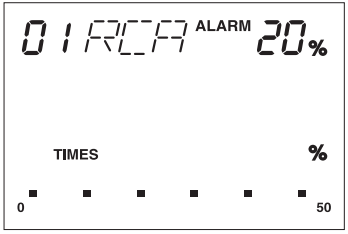
## 7-5. Setting the Alarm

When the sample having moisture higher than the set moisture value are measured, a buzzer sounds to issue an alarm.

(1) Press the ALARM 0 key.
The numbers to the right of “ALARM” will blink.




(2) Enter the alarm value.
Enter a 2-digit number. To enter “20%”, press the CAL 2 and ALARM 0 keys in succession.




(3) The alarm setting value is displayed.
Press the MEA 7 or MEA 9 key to make measurements.

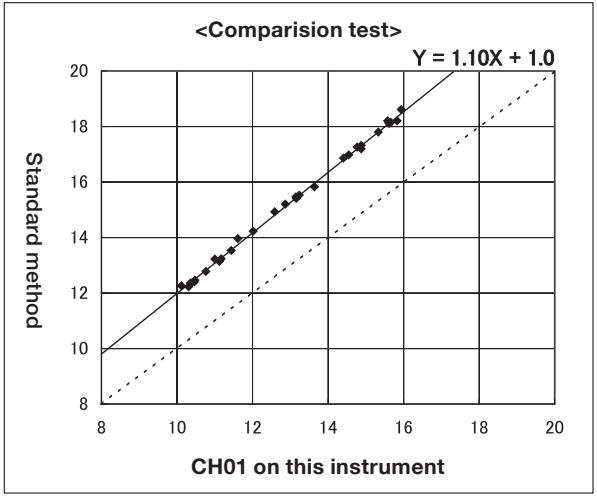
* **To cancel the alarm setting, enter “0.0%”.**
* **The setting range is 7 to 30%.**
* **If the continuous measurement mode is selected, the alarm setting cannot be used.**

* The ☼ symbol denotes a blinking display.

# 8. Making a user calibration curve

The moisture value can be corrected by the following linear equation with the range of the calibration curve slope 0.1 to 1.9 and intercept -9.9 to +9.9. Overmore, the corrected calibration curve can be stored in cannel No.02 to 15 as a user calibration.

* **As an example, if the measurement values from the channel No.01 have a relationship as shown in the right graph compared to the standard method, correction values obtained by regression analysis from comparison test results on several moisture level of sample are 1.10 slope and 1.0 intercept.**




The user correction formula is shown as follows:

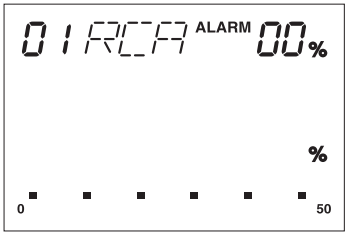
**Measurement Value after Correction (%) = Correction Coefficient A × Measurement Value before Correction (%) + Correction Coefficient B**

* **If channel No.01 has already been corrected by another correction method shown in 7.4 on page 15, cancel this correction and then perform a comparison test with the standard method.**

* **Since the unit of the set value of the slope is the magnification, the slope of 1.00 is the original slope. The unit of the intercept set value is the same as the unit of moisture, so 0.0 is the original intercept. A state of slope 1.00 and intercept 0.0 means no correction.**

**Ex.) When 1.1 and 1.0 are entered into the correction coefficients A and B respectively of the user calibration curve No. 03**

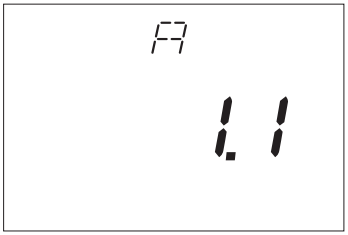
(1) Press the ON/OFF key to turn on the power. All elements of the LCD will be displayed for about 3 seconds. After that, "RCA" and "%" are displayed.



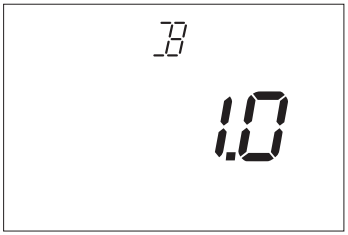

(2) Press the CAL 2 key, and the unit will be the calibration curve input mode.


(3) Enter a user calibration curve number (02 to 15) to be registered. In this case, "03" is selected for user calibration curve registration.
Successively press keys in the order of ALARM 0 → 3 → AVERAGE.

(4) Enter a number for the correction coefficient A (0.1 to 1.9). The default value is "1.0". In this case, "1.1" is entered for the correction coefficient A. Successively press keys in the order of [1] → [1].

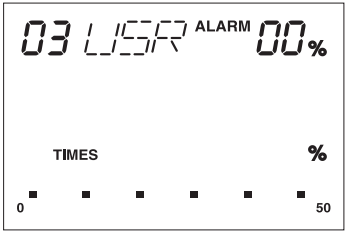



(5) Enter a number for the correction coefficient B (-9.9 to 9.9). The default value is "0.0". In this case, "1.0" is entered for the correction coefficient B. Successively press keys in the order of [1] → [ALARM 0].



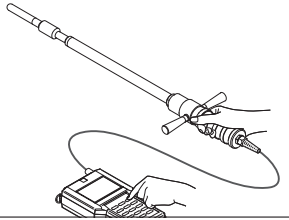
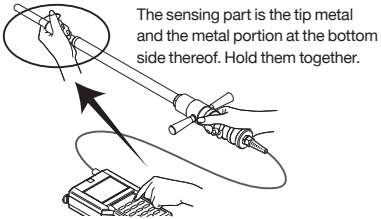

(6) After the entry is completed, the unit is in the state where the registered calibration curve is selected. Pressing the [MEA 7] or [MEA 9] key enables measurement.

* **When user correction coefficient is viewed by a calibration curve number, conduct the steps (2) to (5), enter the calibration curve number to be viewed, and view the displayed coefficient.**



# 9. Warnings and Errors

The following warnings and errors are displayed when an abnormality is present in this unit or the measurement condition.

| Display | Description |
|---|---|
| -5°C | This indication is displayed when the temperature of this unit decreases to -5°C or less. It is measurable. |
| 50°C | This indication is displayed when the temperature of this unit increases to 50°C or more. It is measurable. |
| 001 | There is a problem with the temperature sensor. Servicing is required. The power is turned off after error display (in 4 seconds). |
| 002 | There is a problem with the electronic circuit used for moisture measurement. Servicing is required. The power is turned off after error display (in 4 seconds). |
| HI<br>(always) | If the measurement value is always displayed as "**HI**", an abnormality may occurs in this unit.<br><br>Press the [ON/OFF] key to turn on the power.<br>Direct the bar sensor in the air with the sensing part untouched, and press the [7] or [9] key.<br>If "HI" is displayed even after the operation above, repair is needed.<br>  |
| Lo<br>(always) | If the measurement value is always displayed as "**Lo**", an abnormality may occurs in this unit.<br><br>Press the [ON/OFF] key to turn on the power.<br>Press the [7] or [9] key while holding the sensing part of the bar sensor.<br>If "Lo" is displayed even after the operation above, repair is needed.<br>  <br>The sensing part is the tip metal and the metal portion at the bottom side thereof. Hold them together. |

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