

# NIR Moisture Analyzer KB-230



# **Operating Manual**

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

# Contents

| 1. For safety measurement                                    | 4  |
|--|----|
| 2. Features and part names                                   | 6  |
| 2-1. Features  | 6  |
| 2-2. Parts of main unit                                      | 6  |
| 2-3. Accessories   | 7  |
| 3. Specifications  | 8  |
| 4. Description of operation keys                             | 9  |
| 5. Preparing the main unit                                   | 10 |
| 6. Specifying measuring conditions                           | 11 |
| 6-1. Selecting the sample cell (container)                   | 11 |
| 6-2. Deciding whether to use the light shielding cover       | 12 |
| 6-3. Deciding whether to rotate the rotation table           | 12 |
| 6-4. Setting the sampling amount                             | 13 |
| 7. Making the calibration curve                              | 14 |
| 7-1. Setting the measurement range and the number of samples | 14 |
| 7-2. Setting the sampling times                              | 14 |
| 7-3. Preparing the samples                                   | 15 |
| 7-4. Moisture preparation                                    | 15 |
| 7-5. Measuring the standard moisture content                 | 15 |
| 7-6. Optical measurement (entering the calibration data)     | 18 |
| 9 Making macauramente  | 10 |
|  | 19 |
| 9. Zero calibration  | 20 |
| 10. Setup  | 21 |
| 11. Communication  | 26 |
| 11-1. Printer output   | 26 |
| 11-2. Computer interface                                     | 26 |
| 12.Maintenance   | 27 |
| 13.Error display   | 28 |

# 1. For safety measurement

Improper use of the NIR moisture analyzer in violation of the following safety notes may result in death, injury or damage to property due to fire, etc. While the safety of the product has been given considerable attention, read the precautions in the operating manual and use the instrument properly.

### ■ Observe the safety precautions.

Read the precautions noted in the operating manual.

The safety measure of the unit may be impaired if instructions are ignored during use.

### Do not use if broken.

If you suspect a problem or malfunction in the unit, contact the vendor, or the Kett Tokyo office sales division, a local branch or sales office.

### Meaning of warning symbols

In order to prevent damage resulting from erroneously operating the equipment, the following symbols are indicated in the operating manual and on the product.

The following describes their meanings.





- Do not use the unit in a place where explosive, inflammable gas, or liquid substance exists. Otherwise, it may cause explosion, fire, or electric shock, etc.
- Do not use other than rated power supply voltage.
   If overvoltage is applied, the unit will be heated and it may cause malfunction, fire, or electric shock.
- Make sure to ground the power cable.
   With the 2P outlet, use a conversion plug to ground.
   In the case of 3P, it will be automatically grounded. If not grounded, it may cause fire or electric shock.
- If any of the cables including the power cable is damaged (broken), do not use it.
   Otherwise, it may cause fire or electric shock, etc. For purchasing the spare parts, contact the vendor, or the Kett Tokyo office sales division, a local branch or sales office.
- If you see fire coming from the unit or notice smoke, an odd smell, or any other sign of abnormal functioning, turn off the power and remove the power plug from the outlet, or take whatever measures that would be appropriate to deal with the problem. Otherwise, it may cause fire or electric shock, etc.
- Do not attempt to disassemble or modify the unit.
   Otherwise, it may cause malfunction, fire, or electric shock, etc. If you believe the unit may be malfunctioning, contact the vendor, or the Kett Tokyo office sales division, a local branch or sales office.
- Do not allow the unit to come in contact with water.
   The infrared moisture tester is not waterproof. Do not allow water or other liquids to get into the unit's enclosure as this may lead to electric shock or malfunction.



### Operating environment for safety use

This product is designed to be used safely in the following conditions. Make sure of the operating environment before use.

- Indoor use
- Altitude: up to 2000 m
- Temperature: 5 to 35°C
- Relative humidity: environmental temperature up to 31°C, max. 80%; at 35°C, max. 65%
- Power supply voltage fluctuation: within 10% of nominal voltage
- Transient overvoltage: within the Overvoltage Category II (conforms to IEC60664-1:2007)
- Pollution Degree 2 (conforms to IEC60664-1:2007)

### Installation and storage

- Avoid using or storing the unit in a location where it would be exposed to excessively high or low temperatures, high levels of humidity, direct sunlight, electromagnetic interference, corrosive gases, or large amounts of dust.
- Place the unit on a flat and stable surface where it will not be subjected to significant vibration during use.
- When moving the unit, never tilt it any more than necessary.
- Take care never to drop or bump the unit or otherwise allow it to be subjected to strong shocks or the application of excessive force.
- When removing the power cable or other cables, never pull on the cord or cable and instead hold the plug or cable connector.
- Use the supplied power cable and make sure to connect to the protective earth.
- Do not install the unit in a place where handling the power cable and connectors or turning the power switch is made difficult.
- Install the unit at least 10 cm away from the walls so that the ventilation openings provided on the rear of the unit are not blocked.
- When the unit is not to be used over an extended period of time, turn off the power and remove the power plug from the outlet.

### Cleaning

- To clean the surface of the unit, wipe off using a soft dry cloth.
- Do not use abrasive detergent such as paint thinner or benzene when cleaning this product.
- If measurement sample such as powder, grains, or dust gets into gaps between rotation table, remove it to prevent malfunction.

# 2. Features and part names

### 2-1. Features

This unit measures the near-infrared absorption of the measuring object, and converts the obtained data to the moisture.

It uses the measurement principal totally different than drying method or Karl Fischer method.

### 2-2. Parts of main unit



#### <Rear>



### 2-3. Accessories



Petri dish (90mm) (Sample cell)



Sample cell holder (For petri dish, 90mm)



Zero-adjustment plate



Spare fuse



Power cable



Light shielding cover







Operating manual

# 3. Specifications

| Measurement method          | : | Near-infrared reflection (filter spectroscopy)  |
|-----------------------------|---|---|
| Light source                | : | Tungsten lamp   |
| Measuring diameter          | : | approximately ø25 mm  |
| Number of wavelength        | : | 3   |
| Channel number              | : | 50  |
| I/O connector               | : | USB, Printer output   |
| Display format              | : | Organic EL  |
| Display content             | : | Channel number, Channel name, Moisture, Absorbance  |
| Operating temperature range | : | 5 to 35°C (no condensation)   |
| Power supply                | : | 100 - 120V AC/220 - 240V AC (50/60Hz)   |
| Power consumption           | : | 50W   |
| Dimensions and weight       | : | 415 mm (W) x 370 mm (D) x 230 mm (H), 11 kg   |
| Maximum sampling amount     | : | 2kg   |
| Maximum diameter of sample  | : | 150 mm (when using rotation table)Rotation table rotation error   |
| Accessories                 | : | Petri dish 90 mm (sample cell), Sample cell holder for Petri dish<br>90 mm, Zero-adjustment plate, Spare fuse, Power cable, Light<br>shielding cover, First Guide, Operating Manual |
| Options                     | : | PC software, USB cable VZC-61, Printer VZ-800 (printer cable VZC-54, papers, AC adapter, and AC cord included)  |

# 4. Description of operation keys



| Operation key                 | Description   |
|-------------------------------|---|
| [MENU] key                    | Used for setting up and making a calibration curve. |
| [ENTER] key                   | Used to determine the currently selected item.      |
| [MEA.] key                    | Used for measurement.                               |
| [TABLE] key                   | Used to set ON/OFF of the rotation table.           |
| [ZERO] key                    | Used for zero-adjustment.                           |
| [CALC.] key                   | Used for a making calibration curve.                |
| [EXIT] key                    | Used to exit the operation.                         |
| [MODE] key                    | Used to select the measurement mode.                |
| [CH] key                      | Used to change the channel.                         |
| [ <b>↑</b> ]/[ <b>↓</b> ] key | Used to scroll (up/down) the display.               |
| Numeric keypad                | Used for entering values or characters.             |
| [clear] key                   | Used for cancelling entered values or characters.   |

# 5. Preparing the main unit



Clean the measurement window. If it is not clean, measurement may not be performed correctly.
When closing/opening the light shielding cover, be careful not to pinch the fingers.

#### ① Install the main unit.

Install the unit in a place where direct sunlight is avoided and not be subjected to significant vibration.

#### **2** Attach the light shielding cover.

Attach the light shielding cover by inserting the columns provided on the top surface of the unit into the mounting holes on the cover.

#### **③** Connect the power cable.

Connect the main unit and the power cable. Plug into the socket, and make sure to ground.

#### ④ Attach the zero-adjustment plate.

Open the light shielding cover, and set the zero-adjustment plate onto the rotation table of the unit. Then, close the cover.



#### **(5)** Turn on the power switch.

Turn on the power switch located at the rear of the unit.

#### **6** Warm up the unit.

When the unit is powered on, the rotation table will automatically start rotating to warm-up. At the same time, a message "SET THE STD PL." will be displayed. Set the zero-adjustment plate if it was not set in step (4).

When the warm-up is done (after 5 to 6 minutes), the indication "WARMING UP" turns off and the zero-calibration screen will be displayed.

#### Perform zero-adjustment.

Press the [ENTER] key to execute zero-adjustment. The zero-adjustment will proceed while displaying the absorbance in real-time. When the calibration is completed, the initial screen will be restored.

\* If the power is cycled, repeat the operation from step (6). Make sure that the zero-adjustment plate is set.

|   | S | E | W<br>T | A | R<br>T | M<br>H | I<br>E | N | G<br>S | Т      | U<br>D | Ρ      | Ρ      | L      |        |
|---|---|---|--------|---|--------|--------|--------|---|--------|--------|--------|--------|--------|--------|--------|
| Z | E | R | 0      | Þ |        | X<br>X | 1<br>2 |   | -      | 0<br>0 | •      | 0<br>0 | 0<br>0 | 0<br>0 | 6<br>9 |
| Z | E | R | 0      |   |        | X<br>X | 1<br>2 |   |        | 0<br>0 | •      | 0<br>0 | 0<br>0 | 0<br>0 | 1<br>2 |
| 0 | 1 |   |        |   |        |        |        |   |        |        |        | (      | ).     | (      | )      |

# 6. Specifying measuring conditions

### 6-1. Selecting the sample cell (container)

According to the form of the measuring sample, select a sample cell from four types listed in the following.

\* Make sure that the selected one fully covers the measurement window. Also, use the same one in making calibration curve and actual measurement.



### 6-2. Deciding whether to use the light shielding cover

The light shielding cover can avoid effects from external light. It is preferable to use the cover in order to avoid external light.





\* Perform measurement closing the light shielding cover if possible.

\* The cover may not be usable depending on the sample cell or sample form. In the case of not using the cover, it can be removed.

### 6-3. Deciding whether to rotate the rotation table

When measuring uneven shape of sample, rotating the sample will help improve averaging accuracy of the measurement values.

Each time the [TABLE] key is pressed, the rotation of the table can be enabled or disabled.



- \* Some sample may not be rotatable. (ex. A large sample, or when the sample moves, etc.)
- \* When rotating the table using a 90 mm of Petri dish, use the sample cell holder.
- \* Use caution for falling off of the samples during rotation.

### 6-4. Setting the sampling amount

Put the sample in the sample cell selected in section 6-1 and determine the sampling amount.

- \* If the sampling amount (sample height) is not consistent, it may affect the absorbance.
- \* When not using the light shielding cover, determine the sampling amount under the same condition of external light as measurement.
- \* Use the same amount in making calibration curve and measurement.

#### ① Set the absorbance measurement mode.

Enter the absorbance measurement mode by pressing the [MODE] key.

 $(\rightarrow 8.$  Measurement (P.19))

Immediately before performing this operation, it is recommended to perform zero-adjustment. ( $\rightarrow$  9. Zero-adjustment (P.20))

| 0 1 | X 1 | 0 | 0 | 0 | 0 | 1 |
|-----|-----|---|---|---|---|---|
|     | X 2 | 0 | 0 | 0 | 0 | 2 |

#### **②** Measure the absorbance.

Measure the absorbance after setting the sample to the sample cell selected in the previous section 6-1.

| 0 | 1 | Х | 1 | 0 | 9 | 3 | 4 | 0 |
|---|---|---|---|---|---|---|---|---|
|   |   | Х | 2 | 0 | 7 | 5 | 0 | 8 |

#### **③** Observe the change of absorbance.

As the sample is gradually raised, the fluctuation of displayed absorbance, X1 and X2, will become stable at a point where the near-infrared pass-through is stopped. Consider the sampling amount at this point as "absorbance saturated sampling amount". If the sampling amount is sufficiently prepared, set the sampling amount more than the "absorbance saturated sampling amount".



\* Refer to P.29, if the absorbance saturated sampling amount cannot be prepared.

## 7. Making the calibration curve

#### Necessity of calibration curve

The infrared moisture analyzer measures the near-infrared absorption of the measuring object, and converts the obtained data to the moisture. Therefore, a conversion formula that calculates actual moisture from near-infrared absorption is required. This is called "calibration curve". The calibration curve differs depending on the measuring object. Therefore, it is required to make calibration curve per object in advance. This unit is capable of making calibration curve easily.

#### 7-1. Setting the measurement range and the number of samples

Set the moisture range and the number of samples required for making calibration curve. The samples with different moisture that fully covers the measurement range are required.



- \* If samples cannot be prepared in the regular moisture control process (drying or adding water), refer to section 7-4 Moisture preparation.
- \* The larger number of samples will make better reliability of the calibration curve. It is recommended to prepare more than five samples. At least three samples are required to make a calibration curve.
- \* The measurement result obtained from outside of the moisture range used in making calibration curve will not be reliable.
- \* The moisture of the samples should be balanced in the measurement range.

#### 7-2. Setting the sampling times

Set the sampling times per moisture.

Generally, three to five times is appropriate. However, if the shape of sample is not consistent, set a larger number.

### 7-3. Preparing the samples

The sampling amount set in section 6-4 is represented as  $\blacksquare$ . The sampling times set in section 7-2 is represented as  $\blacksquare$ . At least the sampling amount of  $\blacksquare \times \blacksquare$  per moisture is required. Prepare enough samples to be used in the measurement of standard moisture content (section 7-5) as well.



### 7-4. Moisture preparation

If samples to fully cover the measurement range cannot be prepared in the regular moisture control process (drying or adding water), prepare the samples by moisture preparation. To derive a sample with different moisture by moisturising or drying a source sample is called "moisture preparation". There are various ways to change the moisture content, such as spraying water using an atomizer or drying the high moisture content sample. Make samples with different moisture by selecting an optimum method according to the measuring object. Also, when samples are made by moisture preparation, wait five to seven days until added water is well soaked to obtain better consistency of moisture. Then, perform measurement following the next section "7-5 Standard moisture content" and "7-6 Optical measurement".

### 7-5. Measuring the standard moisture content

Precisely measure a part of each sample in the over-drying method or the like. Then, consider the obtained moisture data as the standard moisture content. Set this value in step (5) of "7-6 Optical measurement".

- \* The official method or a measurement using an infrared moisture analyzer is available.
- \* Note that the sample cannot be reused if moisture is measured in the over-drying method.
- \* If the sampling amount is not sufficient or when performing the measurement of standard moisture content and actual measurement using the same samples, perform the optical measurement described in "7-6 Optical measurement" first, then measure the standard moisture content.

### 7-6. Optical measurement (entering the calibration data)

Set the main unit. (⇒ 5. Preparing the main unit (P.10))
 Perform measurement under the same condition in making calibration curve and regular measurement.

Following the procedures below, enter the channel names and sample calibration data obtained in section 7-1 to 7-5. The calibration data consists of standard moisture content and absorbance. The absorbance can be obtained automatically by performing the optical measurement, or it can be directly input using the numeric keypad.

\* Just prior to this operation, it is recommended to perform zero-adjustment. ( $\rightarrow$  9. Zero-adjustment (P.20))

| Step | Display   | Operation   |
|------|---|---|
| 1    | PASS?<br>   | <ul> <li>Pass code input         Press the [MENU] key and enter the pass code using the numeric keypad.         </li> <li>At the time of shipment, "9999" is set.         Refer to "Setting the pass code" (P.25).     </li> </ul>  |
| 2    | 1.CH PARAMETER ► 2.CH DUPLICATE 3.CALIBRATION ► 4.CH RESET  | <ul> <li>Select the menu (calibration).<br/>The menu screen will be displayed.</li> <li>* Pressing the [EXIT] key will restore the initial screen.</li> <li>Press the [↓] key twice. Move the cursor over "3. CALI-BRATON", and press the [ENTER] key.</li> </ul>   |
| 3    | 3.01<br>02 ×  | <ul> <li>Select the channel number.<br/>The channel selection screen will be displayed.<br/>Using [↑]/[↓] key, move the cursor to the channel number<br/>to which the calibration curve is to be registered. Then,<br/>press the [ENTER] key.</li> <li>* Pressing the [EXIT] key will restore the menu screen.</li> <li>* Referring to "Channel status icon" (P.18), avoid overwriting<br/>data unintentionally.</li> </ul>   |
| 4    | 01<br>NAME? FLOU<br>01<br>NAME? FLOU  | <ul> <li>Enter the channel name.<br/>The channel name input screen will be displayed.<br/>(The cursor is at the left end.)</li> <li>Input the channel name from the 1st character using the numeric keypad moving the cursor one by one with the [Enter] key.<br/>Up to 6 characters can be entered.<br/>After input is done, move the cursor to the right end [▶] using the [ENTER] key. Press the [ENTER] key to set the channel name.</li> </ul>   |
| \$   | Channel 01 1st<br>sample<br>0 1 N 0 1<br>C O N T E N T ?<br>↓<br>0 1 N 0 1 C O N T E N T ?<br>↓ 1 3 . 1 ► | <ul> <li>Enter the standard moisture content.<br/>The standard moisture content input screen will be displayed.<br/>Input the 1st standard moisture content using the numeric keypad. Then, move the cursor to the right end [&gt;] with the [ENTER] key.<br/>The standard moisture content can be left blank and input later.</li> <li>Press the [ENTER] key again, and complete the input of standard moisture content.</li> <li>* The standard moisture content can be left blank and input later. Refer to "7-5 Standard moisture content" (P.15).</li> </ul> |

| Step | Display  | Operation   |
|------|--|---|
|      | 0 1 N 0 1 X 1<br>MEA X 2   | Input the absorbance.<br>The absorbance input screen will be displayed.   |
| 6    |  | To automatically obtain absorbance by optical measure-<br>ment, set the sample on the measurement window, and<br>press the [MEA.] key,<br>The absorbance will be input automatically.<br>(If measurement is failed, press the [MEA] key again to<br>retry.)   |
|      | 0 1 N 0 1 X 1 ◀ 0 . 5 4 5 6 ►<br>M E A X 2 ◀ 0 . 5 1 1 5 ►   | To directly input the absorbance, or to edit data, use the numeric keypad.  |
|      |  | TER] key.   |
| Ī    | 0 1 N 0 1 N E X T . N = 0 2<br>S A V E . E X I T<br>0 1 N 0 1 N E X T . N = 0 3<br>S A V E . E X I T         | <ul> <li>Enter the standard moisture content and absorbance of 2nd and later samples.</li> <li>Press the [ENTER] key when "NEXT, N=2" is displayed after 1st input is done.</li> <li>Repeat steps (5), (6), and (7) to enter the following points.</li> </ul>   |
| 8    | 0 1 N 0 5 N E X T . N = 0 6 ►<br>S A V E . E X I T<br>0 1 N 0 5 S A V E . E X I T ►<br>C A N C E L . E X I T | <ul> <li>Save the calibration data.<br/>When the standard moisture content of all samples are input, select [SAVE.EXIT] with [↓] key.<br/>The calibration data will be saved when the [ENTER] key is pressed while [SAVE.EXIT] is selected.</li> <li>* Note that if the [ENTER] key is pressed while [CANCEL.EXIT] is selected, the input calibration data will not be saved.</li> </ul>  |
| 9    | 3.01 FLOUR ✓ ►<br>02 ×   | <ul> <li>Complete the calibration data input.<br/>The check mark icon will be displayed in the channel<br/>selection screen.</li> <li>Proceed to "Calculating coefficient" (P.18)</li> <li>* Referring to "Channel status icon" (P.18), avoid overwriting<br/>data unintentionally.</li> <li><entering content="" in="" later="" moisture="" process="" standard="" the=""><br/>The icon X may be displayed.<br/>Operate step (1) to (4), and then enter the standard moisture<br/>content in step (5).<br/>If you press the [ENTER] key twice when entering the absorb-<br/>ance in step (6), you can go to next step without changing the<br/>absorbance.</entering></li> </ul> |

### 7-7. Calculating coefficient

From the calibration data input from the optical measurement described in the section 7-6, calculate the regression of coefficient.

| Step | Display                        | Operation   |
|------|--------------------------------|---|
| 1    | 3.01 FLOUR ∨ ►<br>02 ×         | ● Select the channel number and calculate the regression.<br>Perform (1) to (2) described in P.16.<br>Using [↑]/[↓] key, move the cursor to the channel number<br>to which the calibration curve is to be registered.<br>Make sure that the check mark icon 🐨 is displayed, and<br>press the [CALC.] key.                 |
| 2    | 3.01 r: 0.99955<br>Se: 0.03320 | <ul> <li>Check the result of regression calculation.</li> <li>The calculation is internally executed. When the result is displayed, scroll with [↑]/[↓] key and check the result.</li> <li>Regression correlation coefficient → r</li> <li>Standard error of regression → Se</li> <li>Coefficient → a0, a1, a2</li> </ul> |
| 3    | 3.01 SAVE►<br>N05 CANCEL       | <ul> <li>Register the coefficient.<br/>Move the cursor to [SAVE] with [↑]/[↓] key, and press the [ENTER] key. The coefficient will be registered.</li> <li>* The coefficient will not be saved, if the [ENTER] key is pressed with [CANCEL] selected with [↑]/[↓] key.</li> </ul>   |
| 4    | 3.01 FLOUR ►<br>02 ×           | <ul> <li>Complete registration of coefficient.<br/>When the coefficient is registered, the icon turns off and<br/>the measurement will be ready.</li> <li>* When the [CALC.] key is pressed while selecting the channel<br/>number with no icon, the calculation result can be displayed<br/>and checked.</li> </ul>      |

#### [Channel status icon]

When changing the measurement channel, or during setup, the following icon will be displayed in the channel selection screen.

| Icon      | Measurement | Calculating coefficient | Status  |
|-----------|-------------|-------------------------|---|
| ×         | ×           | ×                       | Calibration data is not input, or data is insufficient.<br>(For making calibration curve, at least three or more calibration data is required.) |
| ~         | ×           | 0                       | Effective coefficient is not set.<br>(The main unit updated the calibration data, but the calculation is not done.)                             |
| (No icon) | 0           | ×                       | Effective coefficient is set.   |

\* If the effective coefficient is set in any of the following method, the measurement is ready (no icon is displayed).

· Setting the effective coefficient using PC software

- Setting the effective coefficient referring to "Setting the channel parameter" (P.22)
- Making the effective coefficient referring to "7-7 Calculating coefficient" (P.22)
- \* When changing the measurement channel, the channel with the icon ... or 🔺 cannot be selected.
- \* Making calibration curve is available with any icon status (channel can be selected while making a calibration curve). However, the calibration data or coefficient may have been input even when the channel name is blank. Use caution in selecting a channel when making a calibration curve.

### 7-8. Calibration curve calculation

Setting offset value and slope correction value will enable correction of measurement value.

Moisture value (displayed moisture) after correction = Moisture value before correction x Slope correction value + Offset value

\* For how to set the offset value and slope correction value, refer to the items described in "Setting the channel parameter" (P.23).

# 8. Making measurements

Measure the sample in the same measurement condition as making calibration curve. ( $\Rightarrow$  6. Setting the measurement conditions (P.11))

\* It is recommended to perform zero-adjustment. (⇒ 9. Zero-adjustment (P.20))

#### <Step 1>

Select the channel number.

In the initial screen, select the channel operating [CH.], [♠], [♣], and [ENTER] keys.

#### <Step 2>

#### • Select the measurement mode.

Press the [MODE] key and select the measurement mode.

There are three modes: normal measurement mode, continuous measurement mode, and absorbance display mode.

#### 8-1. Normal measurement mode

Following step 1 and 2, select the normal measurement mode.

| 0 | 1 |   |   |   |  |  |  |
|---|---|---|---|---|--|--|--|
| F | L | 0 | U | R |  |  |  |

Set the sample and press the [MEA.] key. The moisture will be displayed after measurement.

0.

0

\* Set the number of display digits and the number of measurement as required. (⇒ Setting the channel parameter (P.22))

#### 8-2. Continuous measurement mode

Following step 1 and 2, select the continuous measurement mode.

| 0 1 CO | -1 | 2  | Δ |
|--------|----|----|---|
| FLOUR  | 1  | З. | U |

The continuously measured moisture will be displayed regardless of whether the sample is set.

\* Set the number of display digits and smoothing as required. ( $\Rightarrow$  Setting the channel parameter (P.22))

#### 8-3. Absorbance display mode

Following step 1 and 2, select the absorbance display mode.

| 0 | 1 |     | X 1 | 0. | 5 | 4 | 5 | 6 |
|---|---|-----|-----|----|---|---|---|---|
| F | L | OUR | X 2 | 0. | 5 | 1 | 1 | 4 |

The continuously measured absorbance will be displayed regardless of whether the sample is set.

\* Set the smoothing as required. ( $\Rightarrow$  Setting the channel parameter (P.22))

# 9. Zero calibration

#### What is zero-adjustment?

If errors occur in the measurement results, read the absorbance obtained from reflection on the zero-adjustment plate. The measurement result will be stabilized by setting the absorbance as zero.

Make sure to perform this operation when making calibration curve or in the regular measurement as well.

Also, the zero-adjustment is required after the power is turned on.

If performing zero-adjustment without cycling the power, operate the following:

#### ① Attach the zero-adjustment plate.

Open the light shielding cover, and set the zero-adjustment plate onto the rotation table of the unit. Then, close the cover.





#### 2 Perform zero-adjustment.

Press the [ZERO] key. The zero-adjustment screen will be displayed.

| Ζ | Е | R | 0 | Х | 1 | 0 | 0 | 0 | 0 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|
|   |   |   |   | Х | 2 | 0 | 0 | 0 | 0 | 2 |

Press the [ENTER] key. The zero-adjustment will be started.

When the zero-adjustment is completed, the initial screen will be restored automatically.

| 0 1   | 0 0  |
|-------|------|
| FLOUR | 0. 0 |

# 10. Setup

Each setting can be checked or changed.

#### ① Setting modes

Press the [MENU] key. The unit will go into each setting mode.

#### 2 Pass code input

At the time of shipment, "9999" is set.

PASS?

#### **③** Selecting each setting

Highlight the item to set with  $[\uparrow]/[\downarrow]$  key. Pressing the [ENTER] key will enable the setting. Set the item referring to the corresponding pages.

| Display          | Contents                      | Page |
|------------------|-------------------------------|------|
| 1.CH PARAMETER ▶ | Setting the channel parameter | P.22 |
| 2.CH DUPLICATE   | Duplicating a channel         | P.24 |
| 3.CALIBRATION    | Making the calibration curve  | P.14 |
| 4.CH RESET       | Initializing the channel      | P.24 |
| 5.PASS CODE      | Setting the pass code         | P.25 |

\* To cancel the setting during operation, press the [EXIT] key. The initial screen or the previous screen will be restored.

\* The set item is kept until it is changed even after the power is turned off.

## Setting the channel parameter (Following six items can be set per channel)

| 1. Channel name (6 alphanumerics)                               | 2. Smoothing of continuous measurement (0 to 5)   | 3. Measurement value display digits              |   |  |  |
|---|---|--|---|--|--|
| A channel identification. It will<br>be displayed when changing | It is set to minimize the variation<br>when observing the time variation in<br>the continuous measurement mode.<br>If a large value is set to the smooth- | The display range char ing to the display digits | The display range changes accord-<br>ing to the display digits setting. |  |  |
| measurement value.  |   | Number of<br>display digits                      | splay range   |  |  |
|   | ing of continuous measurement, a  | ***. * 0.0                                       | ~ 999.9   |  |  |
|   | will be observed. However, it will  | **. * 0.0  | ~ 99.9  |  |  |
|   | deteriorate the response. Therefore,  | ***. ** 0.00                                     | $\sim$ 999.99   |  |  |
|   | it should be avoided to set unneces-  | **. ** 0.00                                      | ~ 99.99   |  |  |
|   | sarily large value.   | **. *** 0.000                                    | $\sim$ 99.999   |  |  |
|   |   | *. *** 0.000                                     | $\sim$ 9.999  |  |  |
|   |   | *. **** 0.0000                                   | $0 \sim 9.9999$   |  |  |
|   |   | **** 0   | $\sim$ 99999  |  |  |
|   |   | ****. * 0.0                                      | ~ 9999.9  |  |  |
| ⇒ step (3)  | $\Rightarrow$ step (4)  |  | $\Rightarrow$ step (5)  |  |  |

| Step | Display                            | Operation  |
|------|------------------------------------|--|
| 1    | 1.CH PARAMETER ►<br>2.CH DUPLICATE | ● Select the channel parameter.<br>Press the [MENU] key, and enter the pass code.<br>Move the cursor to [1. CH PARAMETER] with [↑]/[↓] key.<br>Then, press the [ENTER] key to set the code.  |
| 2    | 1.02 COOKIE<br>03 CRISPS           | ● Select the channel to set.<br>Move the cursor to the desired channel with [♠]/[♣] key.<br>Then, press the [ENTER] key to select.   |
| 3    | NAME?                              | <ul> <li>Enter the channel name.</li> <li>If the channel name is already entered, move the cursor to the right end [b], and press the [ENTER] key. The channel name will be set.</li> <li><to edit="" enter="" or=""></to></li> <li>Move the cursor using the [EXIT] and [ENTER] keys.</li> <li>Input the channel name from the 1st character using the numeric keypad moving the cursor one by one with the [Enter] key. Up to 6 characters can be entered. After input is done, move the cursor to the right end [b] using the [ENTER] key. Then, press the [ENTER] key again to set.</li> </ul> |
| (4)  | SMOOTHING? 1<br>2                  | ● Enter the smoothing of continuous measurement.<br>Select the smoothing (0 to 5) using [↑]/[↓] key, and press<br>the [ENTER] key to set.  |
| 5    | DIGIT?                             | ● Select the measurement value display digits.<br>Select a display digits from nine types using [↑]/[↓] key,<br>and press the [ENTER] key to set.  |

| 4. Calibration curve coefficient                                    | 5. Correction parameter  | 6. Averaging times in normal measurement (Default: 1 time)   |  |
|---|--|--|--|
| A formula (coefficient) to calcu-<br>late moisture from absorbance. | Setting offset value and slope cor-<br>rection value will enable correction<br>of measurement value.                                     | The averaging times in normal meas-<br>urement can be set. The default is "1<br>time". This unit count one data by                       |  |
|   | Moisture value (displayed moisture)<br>after correction = Moisture value<br>before correction x Slope correction<br>value + Offset value | averaging 6 data. Therefore, keep the<br>default in the regular operation. It will<br>help improve averaging accuracy of<br>the samples. |  |
|   |  | Measurement averaging times<br><once><br/>The required time for measurement is<br/>approximately 7 seconds</once>                        |  |
|   |  | <twice><br/>The required time for measurement is<br/>approximately 10 seconds</twice>  |  |
| $\Rightarrow$ step (6)  | ⇒ step (7)(8)  | ⇒ step (9)   |  |

| Step | Display   | Operation  |
|------|---|--|
| 6    | a 0 ?<br>◀ 2 1 . 9 4 4 1 ▶  | <ul> <li>● Enter the coefficients: a0, a1, a2         If the channel name is already entered, move the cursor to the right end [▶], and press the [ENTER] key. The channel name will be set.     </li> <li><to edit="" enter="" or="">         Move the cursor using the [EXIT] and [ENTER] keys. Input from the 1st character using the numeric keypad moving the cursor one by one with the [Enter] key. After input is done, move the cursor to the right end [▶] using the [ENTER] key. Then, press the [ENTER] key again to set.     </to></li> </ul> |
| 7    | OFFSET ?<br>◀ - 0 . 3 0 0 0 0 ▶   | Enter the offset value.<br>To correct, enter the value in the same procedure as step (6).<br>Enter "0" if correction is not needed.  |
| (8)  | SLOPE?<br>◀ 1.05000►  | <ul> <li>Enter the slope correction value.<br/>To correct, enter the value in the same procedure as step<br/>(6).</li> <li>Enter "1" if correction is not needed.</li> </ul>   |
| (9)  | MeasNT? <u>02</u> ►<br>03   | ● Enter the averaging times in the normal measurement.<br>Select the averaging times (01 to 16) using [↑]/[↓] key, and press the [ENTER] key to set.   |
| 0    | C H : 0 2<br>N A M E : C O O K I E<br>:<br>M e a s N T : 0 2<br>O K ►<br>E D I T ►<br>C A N C E L ► | <ul> <li>Check the setting.<br/>When the averaging times is set in step (9), the input content check screen will be displayed. After checking the items scrolling with [↑]/[↓] key, [OK] will be selected.<br/>Press the [ENTER] key to save the channel parameter.</li> <li>* The channel name input screen will be restored if the [ENTER] key is pressed while [EDIT] is selected.</li> <li>* Note that if the [ENTER] key is pressed while [CANCEL] is selected, the input data will not be saved.</li> </ul>  |

\* To cancel the setting during operation, press the [EXIT] key. Then, the previous screen will be restored.

### Duplicating the channel

- The channel can be duplicated.
- \* To cancel the setting during operation, press the [EXIT] key. Then, the previous screen will be restored.

| Step | Display                             | Operation  |
|------|-------------------------------------|--|
| 1    | 2.CH DUPLICATE ►<br>3.CALIBRATION   | ● Select the channel duplication.<br>Press the [MENU] key, and enter the pass code.<br>Move the cursor to [2. CH DUPLICATE] with [↑]/[↓] key.<br>Then, press the [ENTER] key to set the code.  |
| 2    | 2.01 FLOUR<br>02 COOKIE             | ● Select the duplication source channel.<br>Move the cursor to the desired channel duplication source<br>with [↑]/[↓] key, and press the [ENTER] key.  |
|      | ■ 0 1 >>> 0 1 FLOUR ><br>0 2 COOKIE | When the confirmation screen is displayed, press the [EN-<br>TER] key to set the duplication source.   |
|      | ■ 0 1 >>> 0 4<br>0 5                | ● Select the duplication destination channel.<br>Move the cursor to the destination of channel duplication<br>with [↑]/[↓]] key, and press the [ENTER] key.  |
| 3    | 04<br>REWRITE? Y:▶ N:◀              | <ul> <li>When the confirmation screen is displayed, press the [ENTER] key to overwrite the channel at the duplication destination. Press the [EXIT] key. The selection screen for duplication destination channel will be restored.</li> <li>* Note that when a channel exists in the destination of channel duplication, it will be overwritten as well.</li> </ul> |
| (4)  | 2.04 FLOUR ►<br>05                  | The screen with the channel selected as the duplication destination will be displayed.   |

### Initializing the channel

The channel parameter can be initialized.

\* To cancel the setting during operation, press the [EXIT] key. Then, the previous screen will be restored.

| Step | Display                     | Operation  |
|------|-----------------------------|--|
| 1    | 4.CH RESET ►<br>5.PASS CODE | ● Select the channel reset.<br>Press the [MENU] key, and enter the pass code.<br>Move the cursor to [4. PASS CODE] with [↑]/[↓] key.<br>Then, press the [ENTER] key to set the code.                 |
| 2    | 4.04 FLOUR ►<br>05          | ● Select the channel to initialize.<br>Move the cursor to the channel to initialize with [↑]/[↓]<br>key. Then, press the [ENTER] key to set.   |
| 3    | 4.04 FLOUR<br>RESET?Y:▶ N:◀ | <ul> <li>Execute the initialization.</li> <li>Press the [ENTER] key again to initialize the channel parameter.</li> <li>* Note that the values will not be restored after initialization.</li> </ul> |

### Setting the pass code

Setting the pass code will disable the setup operation, and alteration of data can be avoided. At the time of shipment, "9999" is set.

Be careful not to forget the changed pass code.

\* To cancel the setting during operation, press the [EXIT] key. Then, the previous screen will be restored.



# 11. Communication

### 11-1. Printer output

The Printer VZ-800 is available as an option. The normal mode measurement data can be printed.

- ① Make sure that the power of KB-230 and the printer are turned off.
- ② Connect the printer cable VZC-54 (designated one) to the printer output port provided on the rear of the main unit of KB-230. Then, tighten the screw.
- ③ Connect the printer cable VZC-54 (designated one) to the input connector provided on the bottom of the printer, and tighten the screws.
- ④ Turn on the power of KB-230 and the printer.

<Printout example>



### 11-2. Computer interface

A PC software is available as an option.

Various operations such as zero-adjustment, measurement, setting the calibration curve, device setting, and maintenance can be performed.



## 12. Maintenance

### 12-1. Replacing fuses

When replacing the fuse, use the safety standard compliant product.

1 Turn off the power and disconnect the power cable.

2 Remove the fuse holder provided in the rear side of the main unit.

③ Take out the fuse from the fuse holder.

④ If there is a burned-out fuse, replace it with new one.

5 Return the fuse holder to its original position in the main unit.

Safety standard compliant productRated voltage250VRated current3A or 3.15AFuse charac-<br/>teristicsFast acting<br/>Non time lag

\* Ask for repair if a fuse blows out again after it is replaced. There may be a problem with the unit.

### 12-2. Consumable parts

To use the unit in the best accuracy, it is recommended to replace consumable parts at an interval of two years.

Do not replace the consumable parts yourself.

Contact the vendor from which you purchased the unit or the Kett Tokyo sales office or a local Kett office or sales office for assistance.

#### <Consumable parts>

 $\bigcirc$  Filter wheel motor

○ Light source lamp

 $\bigcirc$  Rotation table drive motor

### 12-3. Inspection

It is recommended to inspect the unit before use when it has been stored over a long period (more than 6 months).

Contact the vendor from which you purchased the unit or the Kett Tokyo sales office or a local Kett office or sales office for assistance.

# 13. Error display

The following errors are displayed when there is a problem with the unit or the use condition. When an error is displayed, check the status and take measures following the procedures described below.

| Error display | Description  | Remedy   |  |
|---------------|--|--|--|
| E-01          | System parameter memory error  |  |  |
| E-02          | Arithmetic error   | Contact the vendor from which you purchased the unit<br>or the Kett Tokyo sales office or a local Kett office or<br>sales office for assistance.   |  |
| E-03          | Motor rotation error   |  |  |
| E-04          | Sensor internal temperature error  | Check the ambient temperature.   |  |
| E-05          | Sample low reflection<br>(The reflectivity of sample is<br>low, and the signal level is be-<br>low the requirement.) | <ul> <li>When sample is not set on the measurement window<br/>Set the sample, and make sure that the measure-<br/>ment value is displayed.</li> <li>When zero-adjustment plate is set<br/>The lamp may have blown. Contact the vendor from<br/>which you purchased the unit or the Kett Tokyo sales<br/>office or a local Kett office or sales office for assis-<br/>tance.</li> </ul> |  |
| E-06          | Channel parameter not set  | Set an appropriate channel parameter.  |  |
| E-07          | Sensor data input error  |  |  |
| E-08          | Channel parameter memory error   |  |  |
| E-09          | Calibration curve data memory error  | Contact the vendor from which you purchased the unit<br>or the Kett Tokyo sales office or a local Kett office or<br>sales office for assistance.   |  |
| E-10          | Device data memory error   |  |  |
| E-11          | Rotation table rotation error  |  |  |

### <Remarks>

#### • When the absorbance saturated sampling amount cannot be prepared



#### Notes

- · Copying some or all of the contents of this user manual without prior written consent is strictly prohibited.
- The contents of this user manual may be changed at any time in the future without any prior notice.
- The appearance and/or representations of the products and parts depicted in this user manual may not appear exactly as their actual counterparts, but this does not affect their operation or functionality.
- This user manual was intended to be written as clearly and accurately as possible. However, if you are unclear about anything in this user manual or notice any missing information, please contact us directly.
- We cannot be held responsible for any actions or effects resulting from the execution of any operations outlined in this user manual.



# **KETT ELECTRIC LABORATORY**

1-8-1 Minami-Magome Ota-Ku, Tokyo 143-8507 Japan Tel.+81-3-3776-1121 Fax.+81-3-3772-3001 URL http://www.kett.co.jp/ E-mail overseas@kett.co.jp