

Multiple Moisture Tester PM-790 Pro (Version 6514)



Operating Manual

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

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1. Features

This instrument can measure the moisture content of many kinds of grain, seeds, and other products. Using a fixed sample volume allows the weight, temperature, and capacitance (dielectric) of the sample to be measured. After processing this information with the use of the embedded microprocessor, the "Moisture Value" is displayed. Refer to "Product List" on page 30 for measurable grain coverage. Because the calibration curves of products on the "Product List" have been already stored, the measurement of a sample on the list can be instantly performed by simply pressing the product number.

[Note]

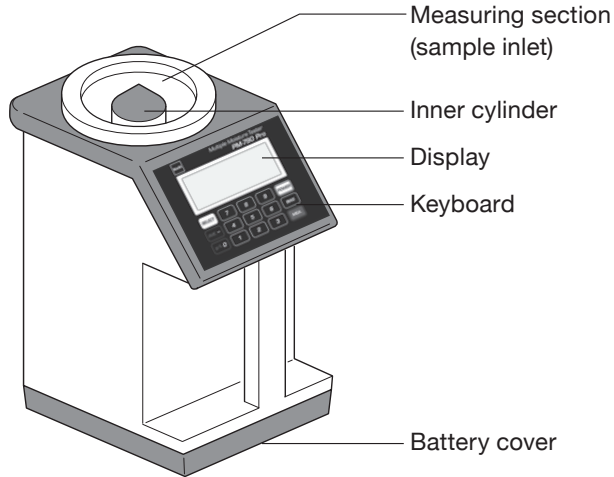
The entered product versions may be different even among the same PM-790 Pro models. The display may be different between examples in the Operating Manual and the real ones on the actual tester, but the usage is the same.

2. Specifications

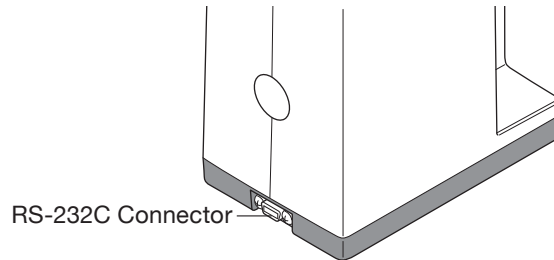
Measuring principle	:	Capacitance(Dielectric) (50MHz)
Applications	:	Grain, seeds, powders, spice, nuts, coffee, tea, etc.
Measurement range	:	1 - 40 % (product dependent)
Product volume	:	240 mL
Operating temperature range	:	0 - 40 °C
Precision	:	<Moisture> Standard error of 0.5 % or less versus drying method (all products with moisture content of less than 20 %)
Compensation function	:	<Mass> By integrated weighing scale
	:	<Temperature> By thermistor
	:	<Bias function> -9.9 to +9.9 % (entry from keyboard)
Other functions	:	Average, auto power off, volume weight unit of g/L (sample weight/sample volume)
Display	:	Digital (LCD)
Power supply	:	Batteries (1.5 V Alkaline "AA" size, x4)
Power consumption	:	240 mW
Dimensions and weight	:	125 (W) x 205 (D) x 215 (H) mm, 1.3 kg
Accessories	:	Funnel, Manual hopper, Brush, Batteries (1.5 V Alkaline "AA" size, x4), Operating manual
Options	:	200g standard weight, Printer VZ-390, Printer cable VZC69, Shutter, Funnel, Manual hopper with base, Shooter

3. Part names

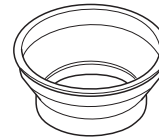
<Front>



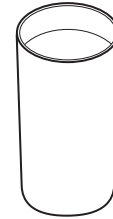
<Rear>



<Accessories>



Funnel
381111



Manual hopper
381112



Brush
ZLT501016



Batteries (1.5V "R6" or "AA" size, x4)
ZBA10030406

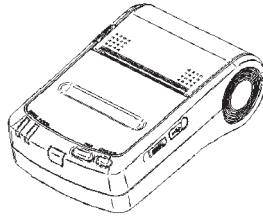


Operating Manual

<Options>



200g standard weight
ZTL803200

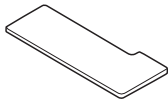


Printer VZ-390
003614

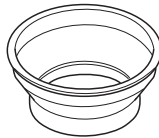


Printer cable VZC69
003016

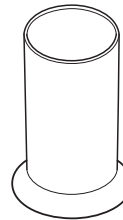
• Measuring kit for the volume weight of pepper products



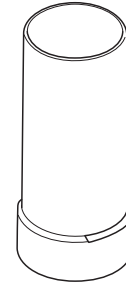
Shutter
113886



Funnel
381111

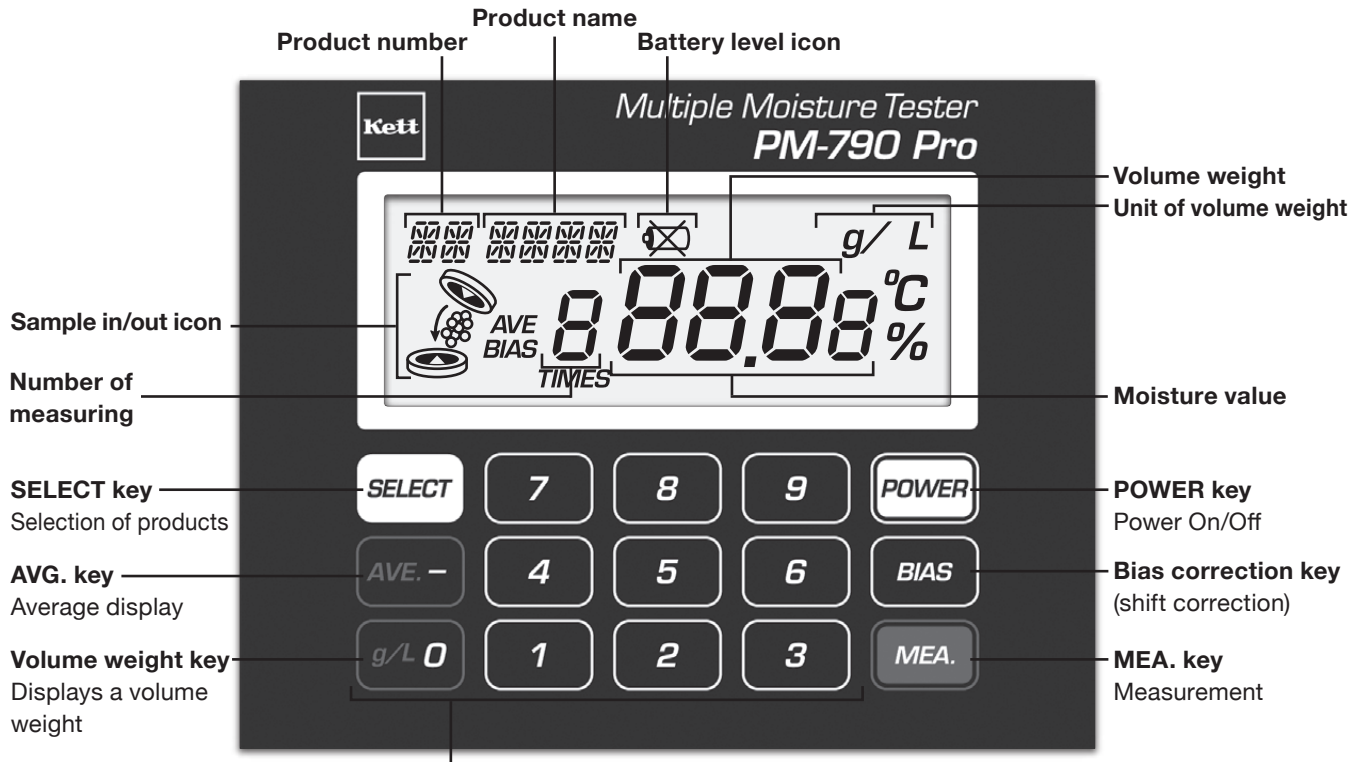


Manual hopper with base
003630



Shooter
381339

4. Display / Keyboard



Numeric keypad
Used for number entry

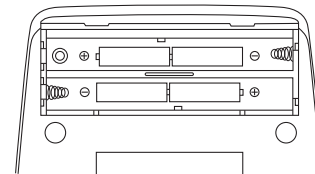
* The AVG. key and volume weight key are also used for "-" (minus) and "0", respectively.

5. Preparation and Configuration


- This instrument is equipped with an integrated weighing scale. For optimal results, this instrument should be placed on a horizontal surface and used in locations where the wind is not strong and the instrument isn't subject to vibration.
- Do not hit the instrument during operation and do not leave the instrument upside down.
- Although this instrument performs automatic temperature correction, for optimal measurement, leave this instrument at ambient temperature for 2 hours or more before use.
- The temperature sensor embedded in the main unit measures the ambient temperature around the measuring unit and automatically performs temperature correction. If the temperature difference between the main unit and a sample is ± 10 °C or more, a measurement error may be generated and, therefore, the displayed measured value blinks (warning indication) (See "8. Error Display" on page 27).

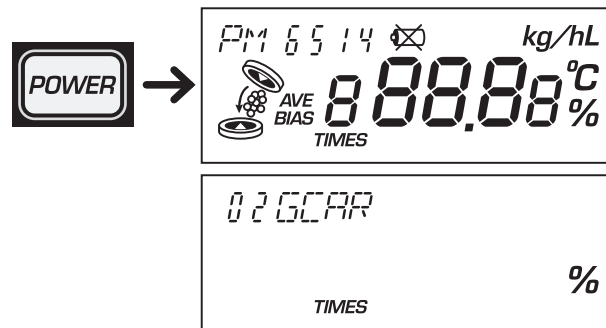
5-1. Battery Installation

The unit is powered by four 1.5 V batteries (AA, alkaline). Remove the bottom battery cover, place the batteries into the compartment, ensuring to correctly orient the positive (+) and negative (-) terminals. Then replace the battery cover.



5-2. Product number viewing


- (1) Press the  key.
(A buzzer sounds for 2 seconds, and all contents are displayed)
- (2) The number of the product that was measured during the last test is displayed. In the case of the figure at right, the product measured last time is "02 GCAR (green coffee, arabica)".

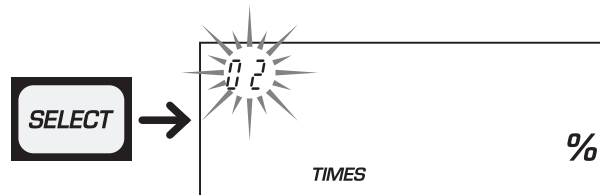


5-3. Product number selection

Select a product number to be measured from the "Product List".



- Selection of product number "1 to 99" → procedure below

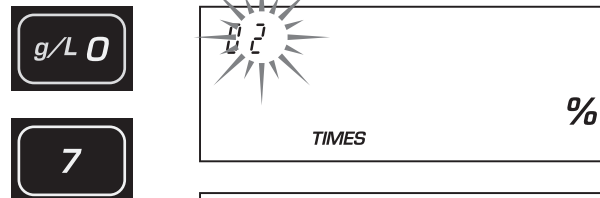
- (1) Press the  key, and the product number that was measured last time blinks (in this case, 02).



- (2) For example, to now measure "07 DRYC".

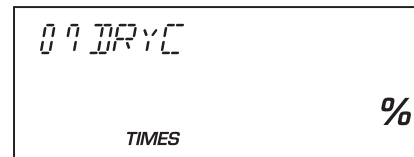
- (3) Enter "07".

First, press the  key for the ten's place. After "2" on the unit's place blinks, press the  key.



- (4) Now, "07 DRYC" is selected.

[Note] The product number is memorized while the instrument is off, and therefore, the last selected number is displayed when the instrument is turned on the next time.

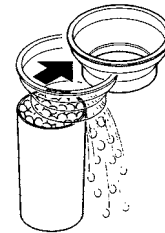


5-4. Sample extraction

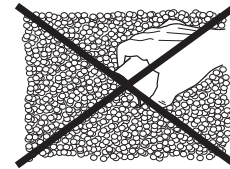
(1) Mount the funnel on the manual hopper, and load a sample into the funnel to one-third of the funnel depth.



(2) Displace the funnel to remove surplus sample and to level off the sample.




[Note] Never extract a sample directly with the manual hopper.




5-5. Measurement

[Note] When a volume weight is measured, "Be sure to follow the procedure in section 7-1. page 21 to 23 (to check the accuracy of the weighing scale) before going further".

- (1) Make sure that there is no residual sample in the measuring section, and press the  key.

[Note] First, the decimal point blinks.

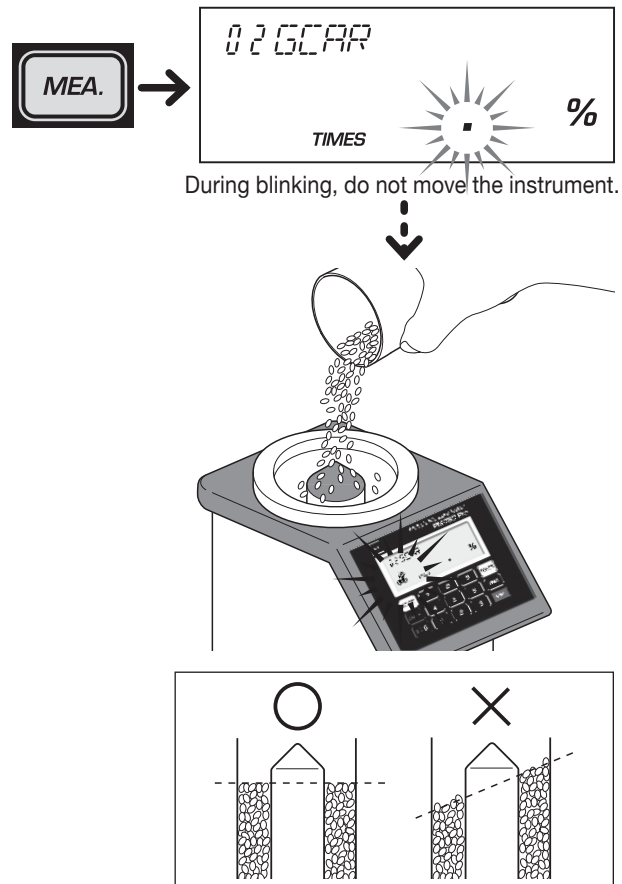
During the blinking, a zero adjustment (tare) of the weighing scale is performed. Therefore, never move the instrument. If the instrument vibrates even slightly, a zero adjustment cannot be performed, and the decimal point blinking may not stop.

- (2) After the sample in icon  starts to blink, load the sample from the manual hopper into the center of the measuring unit as shown in the drawing on the right. Load the sample at a constant speed for the entire sample to be loaded within 5 to 6 seconds.

[Note] Especially for volume weight measurement, be sure to load the whole volume of the sample in the manual hopper into the measuring unit.

The sample should be level within the measuring section.


[Note] If the sample is not level in the measuring section, the moisture content may not be correctly measured.



(3) After the decimal point blinks for approx. 5 seconds, the measuring count and moisture content are displayed.

Display example : 02 GCAR 1TIMES 13.52 %
(Product number : 02 GREEN COFFEE ARABICA 2018,
1st measurement, moisture content 13.52 %)

The measuring count is displayed from 1 to 9.
The 10th measuring count is displayed as 1.

When the  key is pressed after the moisture content is displayed, the volume weight is displayed with its unit.

Display example : 02 GCAR 1TIMES 654 g/L
(product number: 02 GREEN COFFEE ARABICA 2018,
1st measurement, volume weight 654 g/L)



<Display example>



[Note 1] For samples with high moisture content, the moisture content difference among individual grains is large. While the moisture content can be displayed, measurement precision is not as good as lower moisture content samples. The displayable range of the volume weight is slightly wider than the measurable range, and therefore, a displayed value may be beyond or below the measurable range on the specifications.


(example of below measurement range)



[Note 2] When the moisture content is below the measurement range, "Lo" is displayed, and when the moisture content is above the range, "Hi" is displayed.

(example of above measurement range)

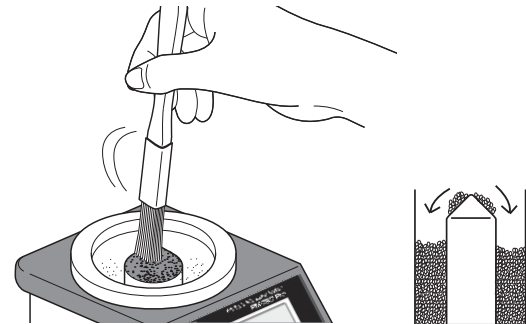


[Note 3] The  key is operable even when the moisture content is beyond or below the measurable range, but the measurement is not counted.

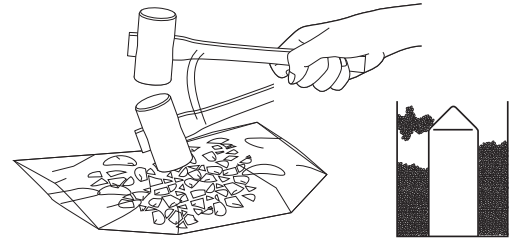
[Note 4] Measurements of tapioca flour, wheat flour, corncob meal, tea, etc.

(items to be measured vary with tester versions)


When the sample is loaded into the measuring unit, some sample may remain on the electrode at the center of the measuring unit. In such cases, use the attached brush to put the sample into the measuring unit within 5 seconds of the decimal point blinking. If a measurement is performed while the sample remains on the electrode, an error may occur.



[Note 5] **Measurement of cashew nut, etc.**
(Items to be measured vary with Instrument versions)
For samples that are likely to be caught by the electrode such as cashew nut, break the samples into fine pieces before measurement or eliminate pieces that are likely to be caught before measuring.



(4) After the sample out icon is displayed, discharge the sample to prepare for the next measurement.

[Note] **The moisture content is displayed even after discharging the sample, but pressing the  key clears the moisture content, blinks the decimal point, and starts the zero adjustment.**

When samples with the same product number are continuously measured, repeat operations from “**5-4. Product extraction**” on page 11.

When samples with different product numbers are measured, repeat operations from “**5-3. Product number selection**” on page 10.



6. Other functions

6-1. Displaying the average moisture value

When the measurement count is 2 to 9, the average value can be calculated (simple arithmetic mean).

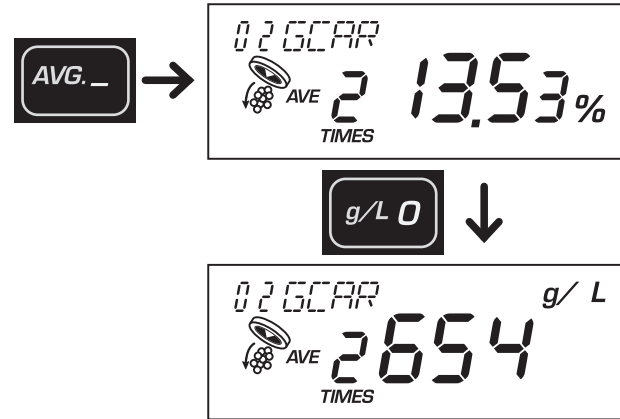
Pressing the **AVG. _** key displays the average value of measurements from 1st to the current (up to 9).

In the example at the right, "the average of 2 measurements is 13.53 %".


Pressing the **AVG. _** key immediately after pressing the **g/L 0** key displays the average of volume weights.

In the example at right, "the average of 2 measurements is 654g/L".

[Note] When the **AVG. _** key is pressed once, the next measurement count starts from 1.




6-2. Bias correction (shift correction)

Use of the  key allows the bias (offset) of the moisture content to be corrected from -9.9% to $+9.9\%$. This mode corrects differences between the reference values and measured values if this tester displays measured values always higher or lower than the reference values.


For example, when the bias correction of the product number 02 is performed by -0.4%

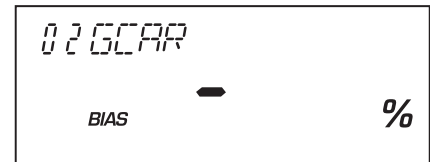
- (1) Check the currently selected product number. If the number is different, follow the procedure in "5-3. Product number selection" on page 10 to set the product number to "02".



- (2) Press the  key, and "BIAS" appears on the display.



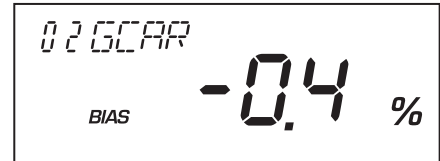
- (3) Enter a bias value.

In this case, press the  key first.
(Not used when the correction value is plus)



- (4) Press the  and  keys to determine the bias correction. When a bias value is entered, "BIAS" is always displayed.





[Note] Once bias correction is set, bias correction is not cleared even if the power is turned off. To return the correction value to 0, enter 0.0.

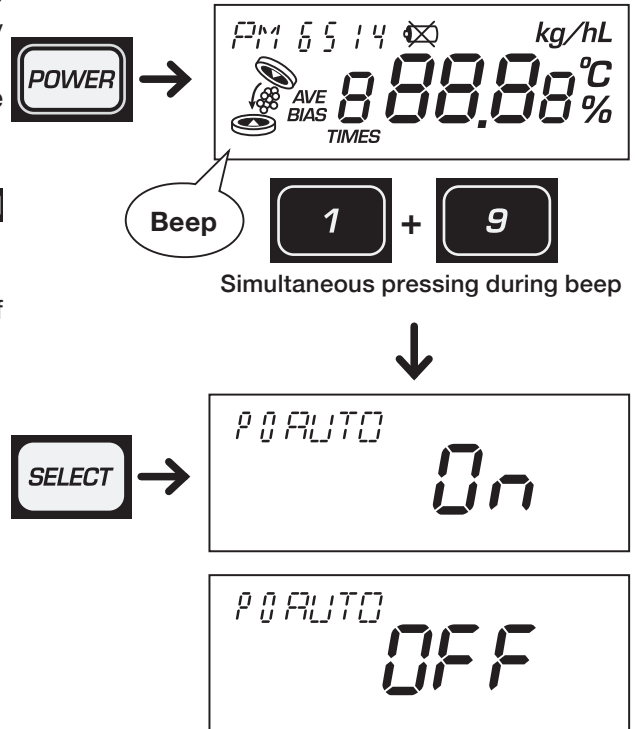


6-3. Auto power off


If no measurement or operation is performed for 3 minutes with the power on, the power is automatically turned off to avoid battery drain.

Set the auto power off function to "OFF" when the data logger software (option) is using.

- (1) Press the  key, and press both of  and  keys simultaneously while a buzzer sounds.
- (2) Each time you press the  key, auto power off function can switch "ON" or "OFF".

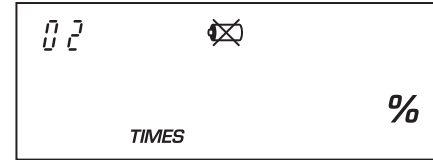


6-4. Battery level icon

When the battery is low, the battery level icon () appears on the display.

When the icon appears, replace the batteries with new ones reference "5-1. Battery installation" on page 9.

[Note] The moisture content may not be properly measured when the battery level icon displayed.



7. Options

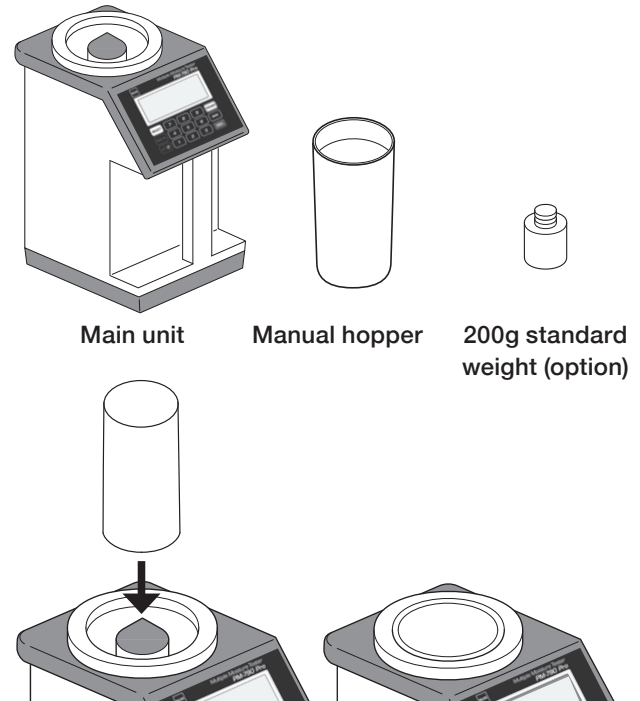
A 200g standard weight (for checking the accuracy of weighing scale), a jig to measure pepper volume weight, and a printer (VZ-390) are optionally available. Follow the procedure below for usage.

7-1. 200g standard weight (for checking the accuracy of weighing scale)

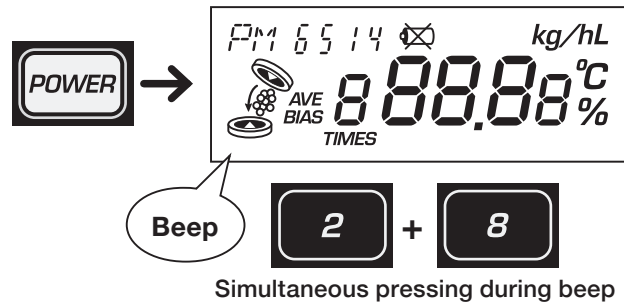
<Items to be prepared>

- Main unit (should be left at ambient temperature for 2 hours or more for thermal stabilization)
- Manual hopper
- 200g standard weight (option)
(Class 3 or higher, diameter of bottom: 30 mm or less)

- (1) Before turning on the power, turn the manual hopper upside down and put it into the measuring unit so that the cup covers the inner cylinder (refer to the drawing on the right).



(2) Press the **POWER** key, and press the **2** and **8** keys simultaneously while a buzzer sounds.



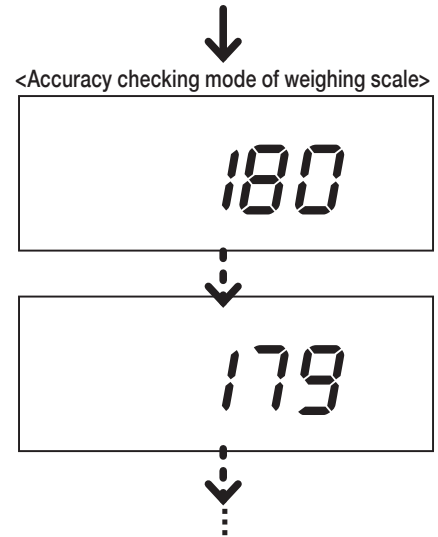
"180" is displayed, and the displayed number starts counting down like "179", "178", and so on in steps of 1 second.

The accuracy checking mode of the weighing scale is now activated.

During the count down, warm up is performed for 180 seconds.

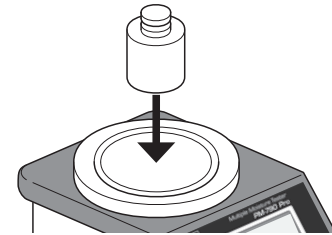
[Note] If a product number, product name, or other items instead of "180" is displayed, the accuracy checking mode of the weighing scale is not activated.

In such a case, press the **POWER** key to turn off the power once, and try the operations again from the step (2) above.



- (3) After the counting down, "0.00 g" is displayed for several seconds and the decimal point blinks.

When the internal weighing scale displays "0.0g" as the zero point, put the 200g standard weight gently on the manual hopper covered on the inner cylinder.



- (4) The weight of the 200g standard weight is displayed. The display example in the drawing on the right is 200.0g.

When the displayed value falls within the range from 199.0 through 201.0 g, the result is normal. If the value is above or below the range, adjustment is required.

- (5) Press the  key to terminate.

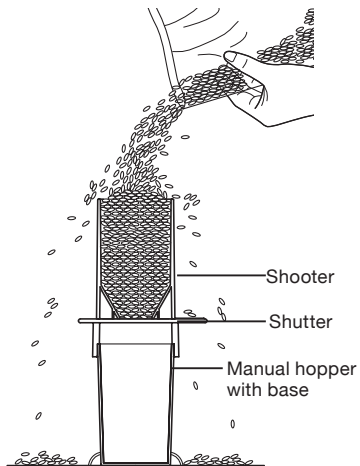
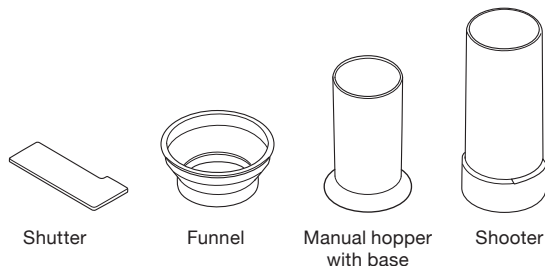
This chapter, "7-1. 200g standard weight (for checking the accuracy of weighing scale)", is described for measuring volume weight, but is also useful for inspection operations using moisture content measurement. These operations in this chapter can be used as a part of inspections before operations for the whole unit.

Normal at 199.0 to 201.0

7-2. How to prepare the sample for measuring the volume weight of pepper products

<Items to be prepared>

- Shutter
- Funnel
- Manual hopper with base
- Shooter



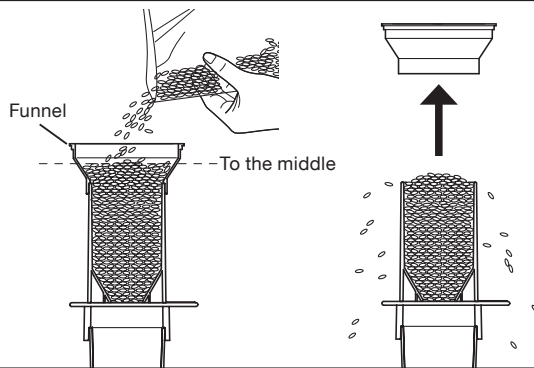
- (1) Assemble the shooter, shutter, and manual hopper with base.
Put a sample into the shooter until the sample overflows as shown in the figure at right.

[Note] If a product is put into a plastic bag and then into the shooter, an appropriate volume of the product can be put in at a constant speed.

If a sample is hard to be put in the shooter or is easy to be scattered, use the funnel.

Fill a sample to one third of the funnel and pull out the funnel straight upward as shown in the figure at right.

[Note] A sample overflows from the shooter, but do not fill the sample into the shooter forcibly.



- (2) Pull out the shutter, and put the sample into the manual hopper with base. Pull the shooter straight upward.

[Note] When the shutter is pulled out, do not stop it on the way, but pull out it in a stroke.

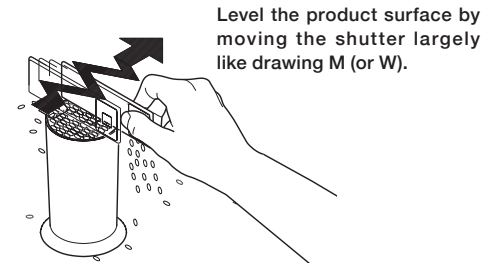
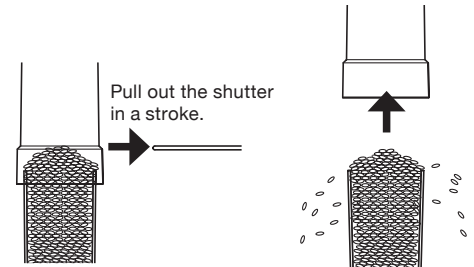
- (3) Erect the shutter vertically on the edge of the manual hopper with base in which the sample is heaped by referring to the figure at right. Move the shutter four times in a zigzag fashion like drawing "W" or "M" to level the sample.

[Note] To level the sample, use the flat side of the shutter, and be careful not to incline the sample surface. To level the sample, use the full width of the shutter and move it as large as possible.

- (4) Now, sample prepering is completed.
Go to "5-5. Measurement".

[Note] The edge of the manual hopper with base may be worn because the edge is rubbed by the shutter. If the edge of the manual hopper with base is excessively worn, which may influence the collected sample amount, replace it with a new manual hopper with base.

[Note] For sample extraction, it is important to obtain a constant volume of sample in an accurate manner with use of the manual hopper with base. Do not cram the manual hopper with sample forcibly or do not prod the bottom.



7-3. Printer (VZ-390)

Connecting the printer, VZ-390 (option), to the connector on the rear panel of the main unit with the cable supplied with the printer allows users to automatically print the measured results after measurement.

[Note] Refer to the operating manual for the printer for how to set up the printer.

RS-232C interface specifications	
Transmission format	Start-stop (asynchronous) transmission, transmission only
Signal format	Baud rate : 9600 bps Data bit length : 8 bits Parity : None Stop bits : 1 bit Code : ASCII

<Printing example>

```
VERSION : PM6514  
DATA VER. NO. : 00006  
PRODUCT No.02  
GREEN COFFEE AR
```

TIMES	[%]	[g/L]
1	13.52	654
2	13.53	656
AVE.	13.53	655

8. Error display

The following error are displayed when this instrument or usage conditions are not normal. In such cases, please contact us because repair may be necessary. This is also true should other error messages be displayed.

Error Display	Description	Remedy
<i>001</i>	Problem with the temperature measurement circuit.	Contact to our distributor.
<i>002</i>	Problem with the capacitance measurement circuit.	
<i>003</i>	Problem with the weight measurement circuit.	
<i>011</i>	The measurement of empty capacitance is too high.	Use the tester in the operating temperature of 0 to 40 °C.
<i>013</i>	Main unit temperature is too high: over 60 °C.	
<i>014</i>	Main unit temperature is too low: under -10 °C.	
<i>015</i>	Main unit board temperature is too high: over 60 °C.	
<i>016</i>	Main unit board temperature is too low: under -10 °C.	Use the tester in conditions that wind is not strong and no vibration is sensed.
<i>017</i>	Tare weighing is unstable for more than 20 seconds.	
<i>018</i>	Tare weight is too high.	Contact to our distributor.
<i>019</i>	Tare weight is too low.	
<i>021</i>	Sample weighing is unstable for more than 20 seconds.	Use the tester in conditions that wind is not strong and no vibration is sensed.
<i>022</i>	Sample pouring speed is too fast.	Load the sample in 5 to 6 seconds.
<i>024</i>	Sample temperature is too high: over 60 °C.	Try measurement after the samples are thermally homogenized in the measurement environment.
<i>025</i>	Sample temperature is too low: under -10 °C.	
<i>028</i>	The sample weight is lighter than the threshold.	Check the measurement condition.

Warning indication (measured value blinking)



- The main unit temperature is above (or below) the operating temperature range.
- The main unit board temperature is above (or below) the operating temperature range.
- The sample temperature is above (or below) the operating temperature range.
- The temperature difference between the sample and main unit board is 10°C or more.

9. Instructions for proper use

- (1) This tester is a precision instrument equipped with an integrated weighing scale. To avoid instrument failure, do not hit the instrument or drop it.
- (2) Do not directly touch the metal part of the measuring unit with your hand. Failure to observe this may generate static electricity which may lead to breakdown.
- (3) When the inner portion of the measuring unit becomes dirty, use a soft damp cloth that to wipe inside. Never wash this tester in water.
- (4) The protrusion inside the measuring unit is the temperature sensor and, therefore, be careful not to break it.
- (5) When this tester is not used for a long period of time, remove the batteries.
- (6) If a displayed measured value is not normal or is questionable, stop using this tester immediately and contact us.

10. Product List

version 6514

Classification	No.	Products	Abbreviation	Range(%)
COFFEE	01	GREEN COFFEE 2004 * ¹	GREE	4 – 30
	02	GREEN COFFEE, ARABICA 2018 * ¹	GCAR	4 – 25
	03	GREEN COFFEE, ROBUSTA 2018 * ¹	GCRB	4 – 25
	04	ROAST COFFEE	ROAS	1 – 20
	05	PARCHIMENT COFFEE, ARABICA	PARA	4 – 40
	06	PARCHIMENT COFFEE, ROBUSTA	PARR	4 – 40
	07	DRY CHERRY COFFEE	DRYC	4 – 40
SPICE	08	BLACK PEPPER 1995 * ²	PEPP	4 – 20
	09	BLACK PEPPER 2018 * ² * ³	BPEP	5 – 17
	10	RED PEPPER 2018 * ³	RPEP	5 – 17
	11	WHITE PEPPER 2018 * ³	WPEP	5 – 17
	12	CLOVE	CLOV	6 – 20
	13	MUSTARD	MUST	4 – 20
GRAIN	14	LONG PADDY	LPAD	9 – 35
	15	SHORT PADDY	PADS	6 – 35
	16	LONG MILLED RICE	LMR	9 – 20
	17	SHORT MILLED RICE	SMR	9 – 20
	18	CORN (MAIZE)	CORN	6 – 40
	19	WHEAT	WHEA	6 – 40
	20	BARLEY	BARL	6 – 40
	21	RYE	RYE	6 – 30
	22	OATS	OATS	6 – 30
	23	SORGHUM	SORG	6 – 30
	24	MUNG BEAN	MUNG	6 – 30
	25	BEANS	BEAN	6 – 30
	26	TRITICOSECALE	TRIT	6 – 30

Classification	No.	Products	Abbreviation	Range(%)
OIL CROPS	27	SOYBEAN	SOYB	6 – 30
	28	SUNFLOWER, SMALL	SUNS	6 – 30
	29	SUNFLOWER, MEDIUM	SUNM	4 – 20
	30	SUNFLOWER, LARGE	SUNL	6 – 30
	31	SAFFLOWER	SAFF	3 – 20
	32	CANOLA	CANO	6 – 30
	33	FLAX SEED	FLAX	6 – 20
NUTS	34	ALMOND	ALMO	2 – 18
	35	CACAO	CACA	4 – 30
	36	CASHEW NUTS, BROKEN * ⁴	CASH	2 – 14
	37	HAZELNUTS	HAZE	4 – 15
	38	PEANUTS	PEAN	4 – 20
	39	PISTACHIONUTS	PIST	4 – 20
TEA	40	BLACK TEA & CTC, BIG	BT B	0 – 15
	41	BLACK TEA, SMALL & DUST	BT S	0 – 15
	42	CTC TEA	CTC	0 – 15
	43	GREEN TEA	GT	0 – 15
	44	OO-LONG TEA, LOW	OOLL	1 – 20
	45	OO-LONG TEA, HIGH	OOLH	20 – 45
TAPIOCA	46	TAPIOCA CHIPS	TAPC	7 – 20
	47	TAPIOCA PELLETS	TAPP	7 – 20
	48	TAPIOCA FLOUR, BROWN	TAFB	7 – 20
	49	TAPIOCA FLOUR, WHITE	TAFW	7 – 20
FEED	50	CORN COB MEAL	COCO	4 – 40
	51	FISH MEAL	FISH	2 – 20
FLOUR	52	FLOUR, LOW PROTEIN	FLOL	8 – 20
	53	FLOUR, HIGH PROTEIN	FLOH	8 – 20

Classification	No.	Products	Abbreviation	Range(%)
VEGETABLE SEED	54	Alfalfa	ALFA	4 – 20
	55	Bitter gourd	BITT	4 – 20
	56	Bottle gourd	BOTT	4 – 20
	57	Broccoli, Small	BROC	4 – 20
	58	Bunching onion	BUON	4 – 20
	59	Cabbage, Large	CABL	1 – 20
	60	Cabbage, Small	CABS	1 – 20
	61	Carrot	CARR	4 – 20
	62	Cauliflower	CAUL	4 – 20
	63	Chilis	CHIL	4 – 20
	64	Chinese cabbage	CHIN	4 – 20
	65	Clover	CLOV	4 – 20
	66	Coriander	CORI	4 – 20
	67	Coronarium	CORO	4 – 20
	68	Cucumber	CUCU	4 – 20
	69	Cucurbita ficifolia	FICI	4 – 20
	70	Eggplant	EGGP	4 – 20
	71	Lady finger (Okura)	LADY	4 – 20
	72	Melon, Large	MELL	4 – 20
	73	Melon, Small	MELS	4 – 20
	74	Muskmelon	MUSK	4 – 20
	75	Onion	ONIO	4 – 20
	76	Pak choi	PAC	4 – 20
	77	Parsley	PARS	4 – 20
	78	Radish, Large	RADL	4 – 20
79	Radish, Small	RADS	4 – 20	
80	Spinach	SPIN	4 – 20	
81	Summer squash	SUSQ	4 – 20	
82	Tomato, Large	TOML	4 – 20	
83	Watermelon, Small	WATE	4 – 20	
84	Winter squash	WISQ	4 – 20	
85	Wild sesame	WSEM	4 – 15	

Classification	No.	Products	Abbreviation	Range(%)
FLOWER SEED	86	Antirrhinum	ANTI	4 – 20
	87	Aster	ASTE	4 – 20
	88	Calendula	CALE	4 – 20
	89	Capsicum	CAPS	4 – 20
	90	Celosia	CELO	4 – 20
	91	Coleus	COLE	4 – 20
	92	Cosmos bipinnatus	COSB	4 – 20
	93	Cosmos sulphureus	COSS	4 – 20
	94	Dianthus barbatus	DIAN	4 – 20
	95	Marigold	MARI	4 – 20
	96	Morning glory early call	MORN	4 – 20
	97	Pansy	PANS	4 – 20
	98	Petunia	PETU	4 – 20
99	Primula polyantha	PRIM	4 – 20	

***1 The values represent the creation year of the calibration curve. The calibration curve of green coffee was updated in order to achieve better conformity to ISO6673. Accordingly, the calibration curve was divided into Arabica calibration curve and Robusta calibration curve.**

***2 The values represent the creation year of the calibration curve. The calibration curve of Black pepper was updated in order to achieve better conformity to ISO939. The calibration curve for the 2018 version was calibrated by the toluene distillation method with a latest measuring kit and peppers collected from various countries and regions.**

- *3 The calibration curve for the volume weight was updated in order to achieve better conformity to ISO939. However, the optional measuring kit is required to use the updated volume weight measurement function. It is necessary to keep the bulk density of the samples in the manual hopper constant. For how to use, refer to the operation manual (page 22-23).**
- *4 It is necessary to grind the samples before measurement. For details, refer to the operation manual (page 15). The moisture measurement of shelled cashew nuts is not possible with this tester. A different model is available for shelled cashew nuts. Please contact our distributor.**

The Kett logo consists of the word "Kett" in a white, bold, sans-serif font, centered within a dark gray square.

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