200J Series Coating Thickness Testers
LE-200J/LH-200J/LZ-200J

Kett

Operating Manual

Coating Thickness Tester Safety Precautions

- Be sure to carefully follow all safety precautions.

  Carefully read operating manual.

- Do not use the unit if it is not functioning property.

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

- Measuring of Warning Indications.

  The symbols indicated below are used in the operating manual and on the unit itself in order to prevent accidents due to misuse of the product.

  These symbols have the following meanings:

Caution	This symbol indicates information important for the understand in order to safety operate the product.

Contents

1. Measuring Principles and Characteristics

- The model LE-200J electromagnetic coating thickness tester is designed to measure the thickness of non-magnetic coatings such as paint or plating on magnetic metal substrates (iron or steel).
- The model LH-200J Eddy Current coating thickness tester is designed to measure the thickness of insulating coatings such as alumite or paint on non-magnetic metal substrates (such as aluminum or copper, etc.).
- The model LZ-200J dual-type coating thickness tester is designed to measure the thickness of either non-magnetic or insulating coatings on either magnetic or non-magnetic metal substrates.

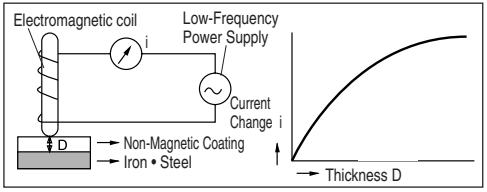
Applicable Coatings

Model	LZ-200J	
	LE-200J	LH-200J
Applicable Coatings	Paint Lacquer Rubber Lining Chrome Copper Other Plastic Resin Enamel Zinc Tin Aluminum	Paint Rubber Enamel Resin Alumite Plastic Lacquer Other
Substrate	Iron Steel	Aluminum, Copper, Brass, etc.

• LE-200J

(Electromagnetic measurement method : For measuring the thickness of non-magnetic coatings on magnetic metal substrates)

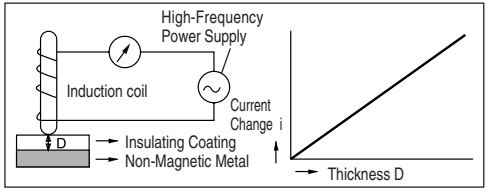
When an alternating current electromagnet is brought near iron (or other magnetic metal) the number of magnetic flux lines passing through the coil changes in proportion to the distance, thereby causing a change in the voltage at the ends of the coil. This change in voltage is determined from the current value and this is used to compute the thickness of the coating.



• LH-200J

(Eddy Current measurement method: For measuring the thickness of insulating coatings on non-magnetic metal substrates)

An eddy current is produced in the surface of a metal when a coil through which a current of fixed frequency is brought near the metal. This eddy current and the voltage at the ends of the coil change in proportion to the distance between the coil and the metal surface. This change can be determined from the current value and this is used to calculate the thickness of the coating.

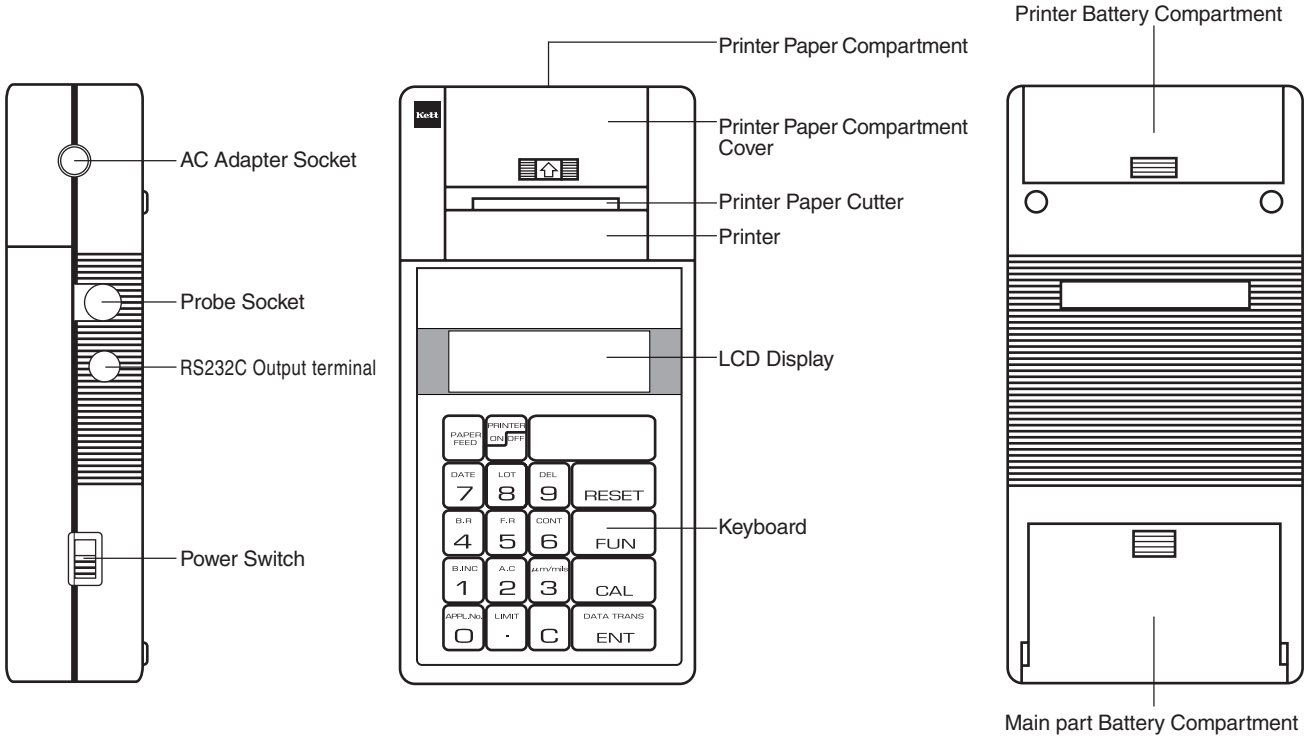


• LZ-200J(Dual Electromagnetic and Eddy Current Type)

The model LZ-200J is a dual type coating thickness tester which features both the electromagnetic and Eddy Current measurement methods.

2. Instrument view

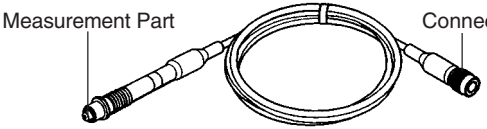
Main part



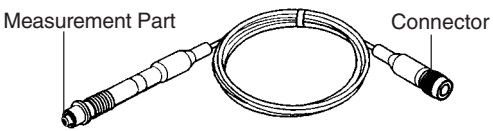
Side View **Front Panel** **Rear Panel**

3. Accessories

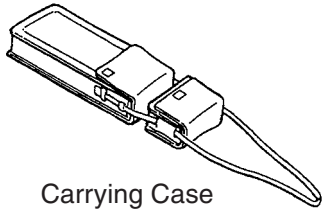
Probe



Fe Probe (Black) Electromagnetic (LEP-J)

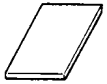


NFe Probe (Gray) Eddy Current (LHP-J)

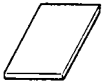


Carrying Case

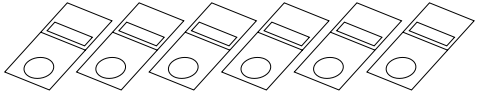
Accessories



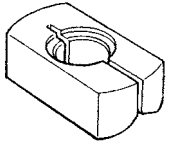
Iron Substrate (FE-J)
(For LE-200J,LZ-200J)



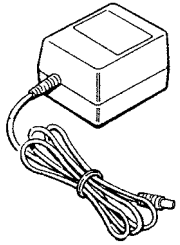
Aluminum Substrate (NFE-J)
(For LH-200J,LZ-200J)



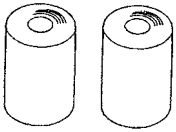
Standard Calibration Foils (6pcs)



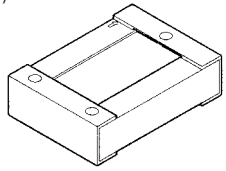
Probe Adaptor



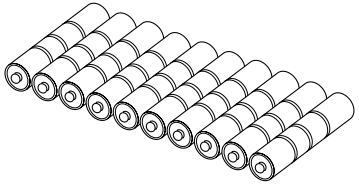
AC Adapter



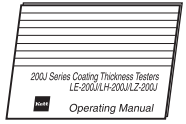
Printer Paper



Calibration Foilcase

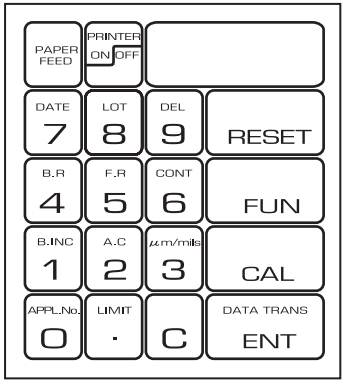


Batteries size AA (10pcs)



Operating Manual

4. Keypad Fanctions



Dual-function Keys : The following keys also have a thing with two functions.
These are called function mode key. These keys are pressed imme diately after presetting a function key.
A result -- as a function mode key -- functioning.

Key	Name	Function
	RESET key	In order to reduce power consumption, the LE-200J • LH-200J • LZ-200J automatically go into the Sleep Mode and "SLEEP" will be displayed on the LCD if the unit is left unused for mor than 10 minutes with the power on.The Reset Key is pressed to turn to the measurement mode.
	CALIBRATION key	The CAL key is pressed to perform the calibration adjustment.
	ENTER key	The Enter key is used to input numeric values when performing the DATE, LOT, CAL, DEL and LIMIT operations. This key is also used to move to the next step when using BR, FR, BINC and AC.

Key	Name	Function
	PAPER FEED key	The Paper Feed Key is used to feed out printer paper.
	PRINTER ON/OFF key	This key used to turn the printer on and off. Lightly pressing this key will turn on the printer's power and the asterisk (" ✻ ") mark in the LCD display will change to sharp ("#"). When measurements are made while this mark appears in the display, measured values will be printed out. Press this Key again to turn the printer off.
	CREAR key	This key is used to clear incorrectly numeric data.
	FUNCTION key	This key is pressed to use the double-definition key function modes (date, lot number statistical results, etc.). The LE-200J • LH-200J • LZ-200J features the function modes described below.
	DATE key	This key is used to input (print) the date.
	LOT key	This key is used to input (print) the lot number.
	DELETE key	This key is pressed to erase the measurement data of incorrectly performed measurements from the data memory.

Key	Name	Function
	BLOCK RESULTS key	This key is pressed to perform statistical calculations for each block.
	FINAL RESULTS key	This key is pressed to obtain statistical results from measurement number N = 1 to the final measurement number.
	CONTINUE key	This key is used to convert the measurement values display between the Hold Mode and Continuous Monitoring Mode.
	BLOCK LNCREMENT key	This key is pressed to change the block number.
	ALL CLEAR key	This key is pressed to clear all measurement data and comments from memory.
	UNIT SELECTION key	This key is used to select between µm and mils and measurement units.
	APPLICATION NUMBER key	This key is pressed to check and/or change the number at which calibration parameters are memorized.
	LIMIT key	This key is pressed to set upper and lower measurement values limits.

5. Specifications

Model	LZ-200J	
	LE-200J	LH-200J
Measurement Mothod	Electromagnetic	Eddy Current
Probe Type	LEP-J(Fe)	LHP-J(NFe)
Object of Measurement	Non-magnetic coatings on iron and steel substrates	Insulating coating on non-magnetic metal substrates
Measurement Range	0 ~ 1500µm or 60.00mils	0 ~ 800µm or 32.00mils
Measurement Units	µm or mils (selectable)	µm or mils (selectable)
Measurement Precision	Under 15µm : ±0.3µm (absolute error) 15µm or greater : ±2% (relative error)	Under 50µm : ±1µm (absolute error) 15µm or greater : ±3% (relative error)
No. of Calibration Parameter Memories	4	4
Resolution	0.1µm (less than 100µm) 1µm (100µm or greater)	1µm
Min. Measurement Surface Area	3 x 3mm	5 x 5mm
Display	16-digit dot-matrix LCD	
Statistical Functions	No. of measurements, number of block numbers, average value, standard deviation, maximum value, minimum value	
Data Memory Capacity	Coating data : 1,500 items No. of blocks per lot : 99	
Printer	24-character thermal printer with 58mm paper width	
Power Supply	100V AC (50/60Hz) or Batteries 6pce size "AA" (main unit) Batteries 4pce size "AA" (printer)	
Operating Temperature	0 ~ +40˚C	
Main Unit Weight	Net : 1.1kg Shipment : 2.5kg	
Dimensions	Main Unit : 120(W) x 250(D) x 55(H)mm Probe : ø11 x 90mm	
Accessories	Carrying Case, Iron Substrate (FE-J For LE/LZ-200J), Aluminum Substrate (NFE-J For LH/LZ-200J), Standard Calibration Foils x 6, Probe Adaptor, AC Adapter, Printer Paper, Calibration Foilcase, Batteries (size AA) x 10, Operating Manual	

6. Preparations for Operation

1. Measurement Preparations

Preparing the power source
The LE-200J • LH-200J • LZ-200J have been designed for use with either 100V/220V AC 50/60 Hz or dry cell batteries as the power supply.

- **Running the LE-200J • LH-200J • LZ-200J on a 100V/ 220V AC power supply**

  Turn the main unit's power switch off and insert the plug of the supplied AC adapter into the AC adapter Socket on the right side of the main unit. Next connect the AC adapter to a 100V/220V power supply socket.

- **Running the LE-200J • LH-200J • LZ-200J • on dry cell batteries**

  Turn the main unit's power switch off and then insert batteries into the rear battery compartments.

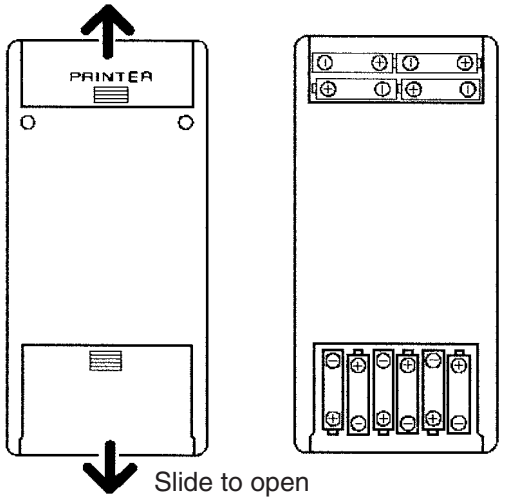
  Main Unit section : 1.5V (size AA alkaline batteries) x 6
  Printer section : 1.5V (size AA alkaline batteries) x 4

  Only use alkaline batteries.tting at the end

- **Running the LE-200J • LH-200J • LZ-200J on both an AC power supply and dry cell batteries**

  When the AC adapter plug is connected to the unit's AC Adapter Socket with dry cell batteries loaded into the com partment the unit will automatically switch over to the AC power supply.

Load baatteries into the main unit

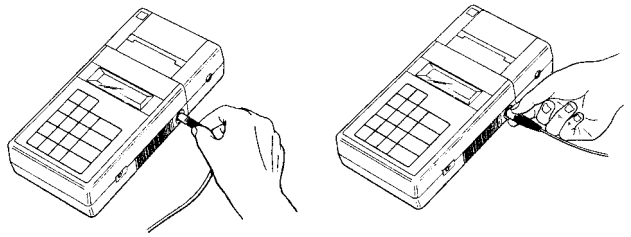


2. Loading Battery in the probe

Use the LEP-J (Fe) probe to measure the thickness of non-magnetic coatings on magnetic metal surface or the LHP-J (NFe) probe to measure insulating coatings on non-magnetic metal surface.

- The probe can be easily connected to the main unit by turning it a little while softly pressing it into the probe socket on the right side of the main unit.
- When removing the probe from the main unit, always be sure to grasp the metal fitting at the end of the probe cord connected to the main unit. Note that the probe cannot be disconnected by pulling on the black portion of the cord.

Connecting the probe



3. Turning on the Power Switch

The power is turned on by sliding the power switch on the right side of the main unit upwards. The type of probe being used and the calibration parameters last used are displayedon the LCD panel.

- **Example : LZ-200J**

∗FE APPL. No = 1
(Electromagnetic format (FE), Calbration Position (1))

∗NF APPL. No = 2
(Eddy Current format (NF), Calbration Position (2))

4. Inserting Printer Paper

- After removing the paper compartment cover, cut the edge of the printer paper with a pair of scissors, etc., so that the paper has a clean edge and then insert the edge fully into the printer through the guide slot in the printer compartment.
- Next press the PAPER FEED button to feed the paper out through the printer.
- If you wish to print out measurement data or the date, etc., turn on the printer by lightly pressing the PRINTER ON/OFF. The asterisk mark ("∗") in the LCD panel will switch to a sharp mark ("#") to indicate that the printer is on and ready to use.

5. Adjustment preparation

Adjustments must be made attempting to make measurements. However, measurement calibrations are stored in the unit's computer memory, therefore new adjustments are not required if the sample to be measured has been measured previously. In this case, the previous adjustments can be recalled from memory.

① A standard "substrate" of the same material,shape and thickness as the sample to be measured is used to make calibration adjustments. Have the standard substrate ready before beginning the adjustment procedure.

- Use bare standard substrates which are free of coatings such as plating or paint. Standard substrates of this type are referred to as "zero foils" in this manual.

② In order to obtain the most accurate precise measurement results possible, adjustments are performed with zero foils and standard foils (samples of known thickness) using the Standard Foil 4-point Adjustment Method.

- Refer to the chart to select a set of 3 standard foils appropriate for making adjustments for the thickness of the coating to be measured.

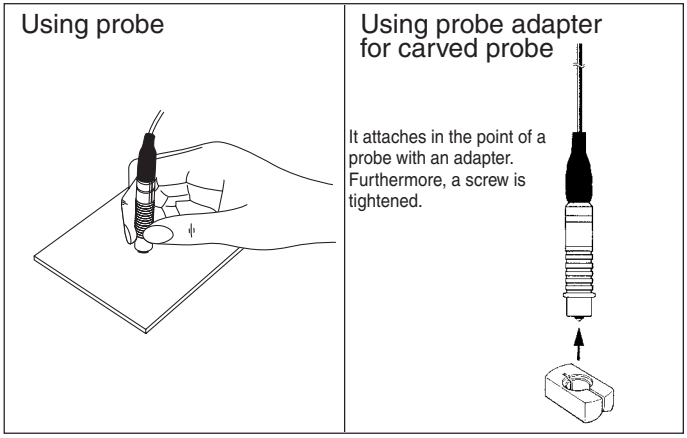
<Standard Foil Combination Example>

- The supplied standard foil values will not necessarily be exactly the same as those indicated in the chart. Instead, standard plates with actually measured values close to these values are supplied.
- An attached standard board is used for an easy accuracy check.

6. Using the probe

The probe features a 1-point contact, fixed pressure design which ensures fixed load applied the chip on the tip the probe. As shown in the diagram, grip the probe near the tip and press it against the measurement surface so that it is perpendicular to the surface. To make the next measurement, lift the probe tip at least 10mm from the measurement surface and then press it down again.

- The probe adapter can be used to obtain stable, reliable measurements when measuring coatings on curved surfaces such as pipes , etc., or when making continuous measurements on a flat surface.



Measuring Range	Adjustment point (Electromagnetic)				Measuring Range	Adjustment point (Eddy Current)			
0~50μm	Iron substrate	10μm	25μm	50μm	0~50μm	Aluminum substrate	10μm	25μm	50μm
50~500μm	Iron substrate	50μm	100μm	500μm	50~300μm	Aluminum substrate	50μm	100μm	300μm
500~1500μm	Iron substrate	500μm	1000μm	1500μm	300~800μm	Aluminum substrate	350μm	500μm	800μm

7. Calibrating the LE-200J • LH-200J • LZ-200J

The LE-200J • LH-200J • LZ-200J can store up to 4 sets each of calibration parameters for both the electromagnetic and high-frequency measurement formats.

Decide which application number you wish to store a particular set of calibration parameters in before performing the calibration procedure.

In order to obtain stable precision, we recommend that you perform 10 to 20 practice measurements to calibrate the unit after turning its power on.

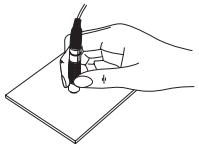
1) The calibration Parameters application number (APPL. No.) is specified. Allowable application numbers are from 1 to 4.

● Example: Set the Application Number to 4. Use the LHP-J probe when making this setting.

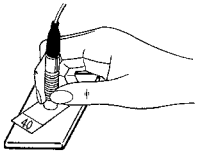
Step	Operation	Display
①	FUN	✱ FUNCTION KEY
②	APPL.No. 0	✱ APPL.No=(1~4)? (Number displayed is the previous application number)
③	B.R 4	✱ APPL. No=4
④	DATA TRANS ENT	✱ NF (Input complete)
		✱✱✱ APPL.No=4 ✱✱✱ (Printout)

2) Performing Calibration

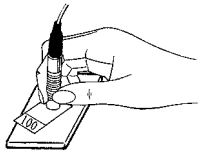
● Example: Performing calibration using the zero foil and standard foils (40, 100 and 400µm foils).

Step	Operation	Display	Explanation
⑤	CAL	* MASTER INF.	Press the CAL key.
⑥	DATA TRANS ENT	* ZERO	Press the DATA TRANS ENT key while holding the probe toward the air.
⑦	**<Calibration using the zero foil>** (Measure 5 times) 	① * ZERO 0.1 µm ② * ZERO 0.5 µm • • • • • ⑤ * ZERO 0.1 µm	Measure the (substrate) 5 times. The buzzer will sound and the measured value will be displayed each time. • Substrate: An uncoated (no plating, paint, etc.) sample of the same shape and material as that to be measured. • Depending upon the type of material, the value displayed may differ greatly from that indicated in the example to the left (a value close to zero). However, the procedure can be continued by setting it close to the setting value by performing steps ⑧.
⑧	DATA TRANS ENT	* STD1	Press the DATA TRANS ENT key while holding the probe toward the air.

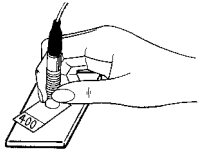
<Calibration using the standard foil (40µm)>

Step	Operation	Display	Explanation
⑨	(Measure 5 times) 	① ✱ STD1 40.1 ② ✱ STD1 40.5 ⋮ ⑤ ✱ STD1 39.9	Place the 40µm calibration foil on the substrate and repeat the measurement procedure 5 times. • Depending upon the type of material, the value displayed may differ greatly from that indicated in the example to the left. However, you can continue the procedure by setting it near the setting value by performing steps ⑩ ⑪ and ⑫.
⑩	DATA TRANS ENT	✱ d=?	Press the DATA TRANS ENT key while holding the probe toward the air.
⑪	B.R 4 → APPL.No. 0 → LIMIT . → APPL.No. 0	✱ d=40.0?	Input the coating thickness of the calibration foil (40.0µm).
⑫	DATA TRANS ENT	✱ STD2	Press the DATA TRANS ENT key while holding the probe toward the air.

<Calibration using the standard foil (100µm)>

Step	Operation	Display	Explanation
⑬	(Measure 5 times) 	① ✱ STD2 101 ▪ ② ✱ STD2 100 ▪ ⑤ ✱ STD2 99.9▪	Place the 100µm standard foil on the zero foil (substrate) and repeat the measurement procedure 5 times. • Depending upon the type of material, the value displayed may differ greatly from that indicated in the example to the left. However, you can continue the procedure by setting it near the setting value by performing steps ⑭ ⑮ and ⑯ .
⑭	DATA TRANS ENT	✱ d=? ▪	Press the DATA TRANS ENT key while holding the probe toward the air.
⑮	B.INC 1 → APPL.No. 0 → APPL.No. 0	✱ d=100? ▪	Input the coating thickness of the calibraiton foil (100.0µm).
⑯	DATA TRANS ENT	✱ STD3	Press the DATA TRANS ENT key while holding the probe toward the air.

<Calibration using the standard foil (400µm)>

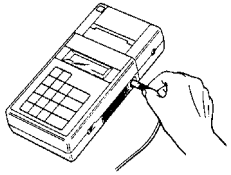
Step	Operation	Display	Explanation
⑰	(Measure 5 times) 	① ✱ STD3 401 ② ✱ STD3 400 ⑤ ✱ STD3 401	Place the 400µm standard foil on the substrate and repeat the measurement procedure 5 times. • Depending upon the type of material, the value displayed may differ greatly from that indicated in the example to the left. However, you can continue the procedure by setting it near the setting value by performing steps ⑱ ⑲ and ⑳ .
⑱	DATA TRANS ENT	✱ d=?	Press the DATA TRANS ENT key while holding the probe toward the air.
⑲	B.R 4 → APPL.No. 0 → APPL.No. 0	✱ d=400?	Input the coating thickness of the calibraiton foil (400.0µm).
⑳	DATA TRANS ENT	✱FE	Press the DATA TRANS ENT key while holding the probe toward the air. Input of calibration parameters for application No.4 is complete.

- 5 measurements are made at each stage of the zero and calibration foil adjustment procedure in order to obtain the average measurement value.
- If you make errors while entering numeric values during the calibration procedure, press the [C] key to delete the value and then input the correct value. However, please note that corrections cannot be made after the [DATA TRANS ENT] key has been pressed. If you press the [DATA TRANS ENT] key after entering incorrect values, press the [RESET] key resume the procedure from step ⑤.

7. Measuring Procedure

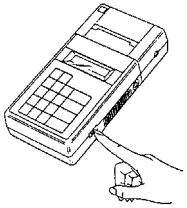
(1) Select & Connect the probe

In the LZ-200J, select the appropriate type of probe for the type of material to be measured. (⇒ P. 6,13)



(2) Turn on the main unit's power

Press the ON key.



(3) Adjustment

Before beginning a measurement, check to see if the unit has been calibration for measurement of that type of material. If calibration has not been performed, perform the calibration operation and register the calibration settings. (⇒ P. 14)

(4) Delete contents of the measurement value memory

Except in cases in which you wish to continue making measurements with data acquired previously, you must delete the entire contents of the measurement value memory. (⇒ P. 26)

(5) Connect the printer

Connect the printer to the unit if you wish to print out results while performing measurement and other operations. (It is also possible to connect the unit to a printer after completing measurements and print out the measurement values and the results of statistical calculations.
(The printer is an optional accessory.)

The LCD panel will repeatedly switch between displaying the asterisk (∗) and sharp (#) marks when the PRINTER ON/OFF key is pressed continuously. The printer is ready for use when the sharp (#) is shown in the display.

(6) Specify calibration settings

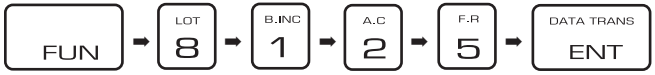
Specify the calibration memory address of calibration settings registered for the type of material being measured. (⇒ P. 15)

Example: Set the Application Number to 4.

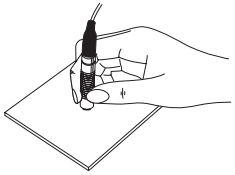
(7) Enter comments such as the date and lot number, etc.

Commentary information which can be entered includes the date, lot number, and upper and lower measurement value limits. This information is input as necessary. (⇒ P. 24,25)

• Example: Inputting lot number 125



(8) Measurement



Quickly press the probe against the surface to be measured in such a way that the probe is perpendicular to the surface. The next measurement can be performed after first removing the tip of the probe at least 10mm from the surface being measured.

(9) Data Processing (Statistical Processing)

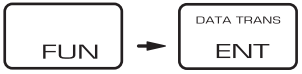
• Example: Lot Statistical Calculations

AV: Average value SD: Standard deviation MAX: Maximum value MIN: Minimum value

1.Performing calculations without using a printer

2.Printing out the results when connected to a printer

3.Batch transmission of data to the printer

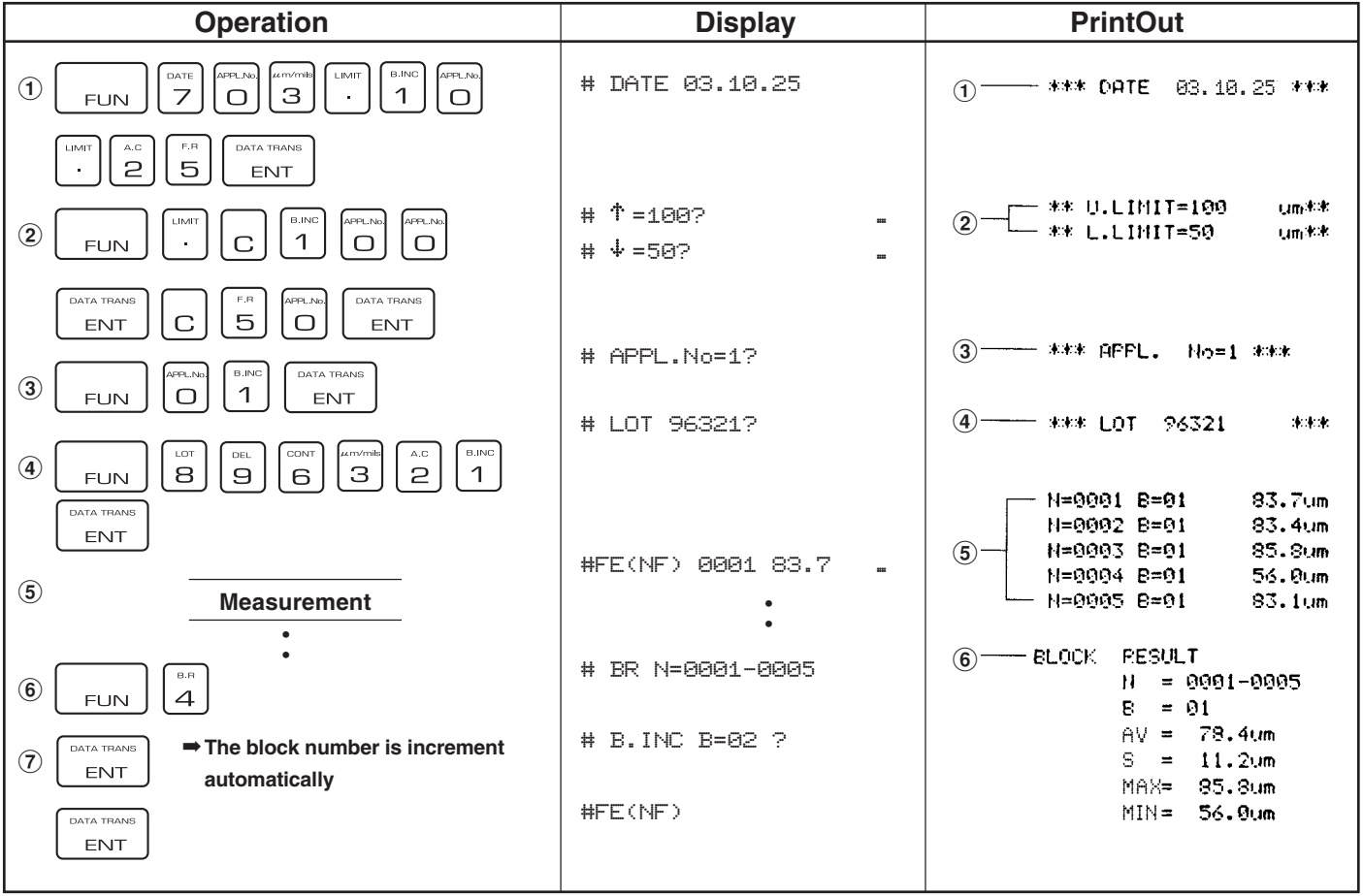


• Data can also be transmitted to a computer in the same way.

(10) Converting Measurement Value Display Units

This function mode is used to switch between µm and mils as the unit of measurement. (⇒ P. 26)

(11) Typical Measurement Example



Operation	Display	Print Out
⑧ Measurement • • • ⑨ FUN, DEL 9, CONT 6, DATA TRANS ENT ➡Previous data is erased. ⑩ FUN, B.R 4 DATA TRANS ENT C ➡Block number is set as desired. ⑪ DEL 9, DATA TRANS ENT ⑫ Measurement • • • ⑬ FUN, DEL 9, DATA TRANS ENT ➡Erase data immediately after measurement ⑭ Measurement • • • ⑮ FUN, B.R 4 C ⑯ FUN, F.R 5	#FE 0006 132 - • • • # DELETE N=6? # BR N=0006-0010 # B.INC B=03? # B.INC B=? # B.INC B=9? #FE 0011 58.3 - • • • #FE 0013 7.4 - # DELETE N=? #FE 0013 58.4 - • • • # BR N=0011-0015 #FE # FR N=0015	⑦ ⑧ N=0006 B=02 132 um N=0007 B=02 83.4um N=0008 B=02 84.2um N=0009 B=02 58.7um N=0010 B=02 86.0um ⑨ N=6 DELETE ⑩ BLOCK RESULT N = 0006-0010 B = 02 AV = 78.1um S = 11.2um MAX= 86.0um MIN= 58.7um ⑪ ⑫ N=0011 B=09 58.3um N=0012 B=09 58.4um N=0013 B=09 7.4 um ⑬ N=0013 DELETE ⑭ N=0013 B=09 58.4um N=0014 B=09 85.5um N=0015 B=09 57.9um ⑮ BLOCK RESULT N = 0011-0015 B = 09 AV = 63.7um S = 10.9um MAX= 85.5um MIN= 57.9um ⑯ FINAL RESULT N = 0015 AV = 73.1um S = 13.1um MAX= 86.0um MIN= 56.0um

8. Functions

(1) Entering the Date

● Example: Entering the date as October 25, 2003

Step	Operation	Display
①	FUN	# FANCTION KEY
②	DATE 7	# DATE ?
③	APPL.No. 0, μm/mils 3, LIMIT ., B.INC 1, APPL.No. 0, LIMIT ., A.C 2, F.R 5	# DATE 03.10.25
④	DATA TRANS ENT	*** DATE 03.10.25 *** (Example)

This function is used to print out the date. To print the date, press the [ON/OFF] key to turn the printer on (the asterisk mark (✱) on the LCD panel is replaced by the sharp mark (#)).If the printer is off, "PRINTER OFF" will appear in the display. If you incorrectly input comment numerals, use the [C] key to erase them and then input them again.

(2) Entering the Lot Number

● Example: ntering 6513 as the lot numbermeasurement.

Step	Operation	Display
①	FUN	# FANCTION KEY
②	LOT 8	# LOT ?
③	CONT 6, F.R 5, B.INC 1, μm/mils 3	# LOT 6513?
④	DATA TRANS ENT	*** LOT 6513 *** (Example)

This function is used to print out lot numbers (numerical comments). This function is used in the same way as the DATE function mode.
When lot numbers are changed during measurement all previous data is erased from memory and the unit begins again from measurement number 0001.

(3) AC (All Clear: delete the contents of measurement value memory)

This operation deletes the measurement data, statistical results and comments from the unit's memory.

Step	Operation	Display
①	FUN	* FANCTION KEY
②	A.C 2	* A.C N=0001?
③	DATA TRANS ENT	* FE

(4) µm/mils (Unit Conversion)

This function mode is used to switch between µm and mils as the unit of measurement.

● Example:

Step	Operation	Display
①	FUN	* FANCTION KEY
②	µm/mils 3	* "mils" ?
③	DATA TRANS ENT	* FE

The measurement data unit are changed to mils.
To return to µm units, repeat the procedure to switch back to µm units.

FUN µm/mils 3 DATA TRANS ENT

(5) LIMIT (Upper and lower limits)

This function mode is used to set upper and lower limits when checking to make sure that measured coating thicknesses fall within a specified range. An electronic beep will sound and an exclamation point (!) will be printed when a measurement value falls outside the specified range.

● Example: Set upper limit at 100µm and lower limit at 50µm

Step	Operation	Display
①	FUN	* FANCTION KEY
②	LIMIT .	* ↑=? -
③	B.INC 1 APPL.No. 0 APPL.No. 0	* ↑=100? -
④	DATA TRANS ENT	* ↓=? -
⑤	F.R 5 APPL.No. 0	* ↓=50? -
⑥	DATA TRANS ENT	**U.LIMIT=100 µm ** **L.LIMIT=50 µm ** (Example)

Use the following procedure to erase upper and lower limit setting values from memory.

FUN → LIMIT . → C → DATA TRANS ENT → C → DATA TRANS ENT

(6) DEL (Partial deletion of measurement value data)

You can delete specific measurement values such as erroneous measurement data which you do not wish to be used in statistical calculations.

● Example: Delete data for the forth measurement made.

Step	Operation	Display
①	FUN	* FANCTION KEY
②	DEL 9	* DELETE N=?
③	B.R 4	* DELETE N=4?
④	DATA TRANS ENT	* FE

After statistical processing has been done it is not possible to delete a portion of the measurement data used for processing in order to change the processed results.

(6) B. INC (Block Increment)

The Block Increment function mode is used to move the block number to the next or another desired block number and continue measurements without obtaining the block results.

● Example: Move (increment) the next block number from 1 to 5.

Step	Operation	Display
①	FUN	* FANCTION KEY
②	B.INC 1	* B.INC B=01?
③	* C	* B.INC B=?
④	* F.R 5	* B.INC B=5?
⑤	DATA TRANS ENT	* FE

To move sequentially to the next block (from 1 to 2), skip pressing the C and F.R 5 keys and immediately press the DATA TRANS ENT key.

(7) BR (Block Calculation Results)

This function mode is used to obtain statistical calculation results for each block separately. Please note that there must be measurement data for at least two measurements in a block in order to obtain statistical calculation results for that block.

● Example: (PRINTER ON)

Step	Operation	Display
①	FUN	# FANCTION KEY
②	B.R 4	# BR N=0001-0005
		N=0001 B=01 87.2um N=0002 B=01 86.6um N=0003 B=01 87.4um N=0004 B=01 88.2um N=0005 B=01 87.6um BLOCK RESULT N = 0001-0005 B = 01 AV = 87.4um S = 0.5um MAX= 88.2um MIN = 86.6um (Example)

(Press the B.R 4 key sequentially if you with to obtain statistical calculation results without a hard copy printout.)

Press the DATA TRANS ENT key to move on to the next operation.

DATA TRANS ENT # B.INC B=02?

When the key is pressed at this point the Block Number is incremented automatically to B = 02.

To move directly to a desired block number, press the C key once to clear the block number, input the desired number and then press the DATA TRANS ENT key.

(Statistical Calculations)		(Calculation Method)
Number of Measurements	N	
Block Number	B	$AV=\frac{1}{N}\sum_{i=1}^{N}Xi$
Average Value	Av	
Standard Deviation	S	$\sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(AV-Xi)^2}$
Maximum Value	Max	N: No. of measurements
Minimum Value	Min	Xi: Measurement Data

(10) F. R. (Final Result: Overall statistical calculations results)

The Final Result function mode is used to obtain the overall statistical calculations results for the measurement data from measurement number N = 0001 to the final measurement made.
The operation is performed in the same way as the block result function except that the F.R 5 key is used instead of the B.R 4 key.

When the final result is obtained the unit will request the lot number for subsequent measurement.
The unit will move to the next measurement after the new lot number is input. The next measurement will begin at N=0001, B=01.
Therefore all previous data is erased from memory when the final result is obtained. Please note, however, the upper and lower limit setting will remain. To change these setting perform the limit setting procedure again.

(9) CONT (Continuance)

Measured values are usually held, but the hold mode can be released to perform calibration and measurement when making measurements on complexly shaped objects for which measurement values tend to be unstable, thus allowing you to obtain stable values.

● Example:

Step	Operation	Display
①	FUN	* FANCTION KEY
②	CONT 6	*

The calibration procedure after releasing the hold mode is the same as in (3)-② above. However, in procedures ⑦, ⑨, ⑬ and ⑰, the key is pressed when the display stabilizes with the probe held against the measurement surface. The value is input when the buzzer sounds. If you wish to print out the measured value, turn the printer on and press the ENT key while the probe is held down against the measurement surface. To return to the hold mode again, repeat the same key operation procedure.

Note: Hold mode set display : * NF (FE)
Hold mode released display : *

9. Master Calibration

The master calibration operation is performed in the following way when the probe is replaced.

1. Turn the power one while holding down both the [LIMIT .] and [LOT 8] keys.

   ✱ ○ ○ ○ ○
   (4-digit number)

   ✱ ○ ○ ○ ○ ○
   (5-digit number)

2. Press the [LIMIT .] key.

   If no number is displayed, press the tip of the probe against the zero base so that a number is displayed.

   ✱ MASTER INF.

3. Press the [LIMIT .] key.

   ✱ ZERO

4. Point the probe up in the air and press the [LIMIT .] key.

   ✱ FE APPL. No=1

5. Press the [LIMIT .] key while holding the probe down against the zero base.

   The buzzer will sound and the display will change.
   The "0.0" value displayed will change by ±0.2.
   Keep the probe held down against the zero base until the display appears as shown to the right.

   ✱ FE0001 0.0

6. This completes the master calibration operation.
   The unit is now in the Measurement Mode and can be used to make measurements.

10. Notes for Measuring and Handling

(1) Confirm the type of material being measured.

Be sure to check the type of material and select the correct probe type before beginning measurements.

(2) Do not damage the probe or get it dirty.

Caution

Accurate measurement results cannot be obtained if the chip on the tip of the probe is damaged or dirty. Do not pound the probe against the measurement surface or move the probe laterally while it is pressed down upon the surface. When finished making measurements, use a soft cloth wet with benzine or alcohol to clean the tip of the probe.

Caution

(3) Handle the calibration foils with care.

The thickness of the calibration foils has been measured very precisely. You will not be able to obtain accurate measurement results if you use calibration foils which have been scratched, bent or otherwise damaged. Be particularly careful not to subject the thinnest foil, the 10µm foil, to wear.

If a standard foil becomes damaged while being used, please contact the dealer from whom you purchased the tester and order a replacement of the same thickness. Although the thickness of replacement foils may slightly different than that of the original foils, this does not pose a problem for calibration adjustments.

Caution

(4) Replace the batteries immediately if the low-voltage indicator is displayed.

The following indicators will be displayed on the LCD panel when the main unit or printer section batteries become weak. Please replace the batteries immediately when these indicators appear.

① % is blinking

Both the main unit and printer section batteries are weak.

② ✱ is blinking

The main unit's batteries are weak.

③ # is blinking

This mark will blink in the display when the printer is used and indicates that either the main unit or printer batteries are weak.

If the asterisk ("✱ ") mark dose not blink when the PRINTER ON/OFF button is pressed to turn the printer off, this indicates that the printer section batteries are weak.

(5) Adjustment & Inspection

In order to maintain precise performance the coating thickness testers should be inspected at least once per year.
Please contact the merchant from whom you purchasd your unit regarding inspection.

● Measurement of paper or a film

After calibration on Iron or Aluminum Substrate, the thickness of paper or a film can be measured on the Iron or Aluminum Substrate.

● The unit will go into the Sleep Mode and "SLEEP" will appear in the display in order to conserve battery power if the unit is not used for measurement for more than approximately 15 minutes with the power on.

Measurements cannot be made while the unit is in the Sleep Mode. To resume measurements, press the RESET key to exit the Sleep Mode. Making 10 ~ 20 practice measurements after exiting the Sleep Mode or immediately after turning the power on will result in higher measurement precision.

MEMO

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

0804•TO•0101•100