Dual Type Coating Thickness Tester
LZ-990

Operating Manual

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

Safety Precautions

The Coating Thickness Tester may cause damage to objects being handled if the precautions are not adhered to for safety purposes. The utmost care has been given to the safety of the product, however take care to read the precautions in this operating manual for proper handling.

- **Be sure to carefully follow all safety precautions.**
  Carefully read the operating manual.
- **Do not use the unit if it is not functioning properly.**
  Immediately contact our service representative if the unit malfunctions or does not operate properly.
- **Measuring or 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 something that must be strictly observed in order to ensure the safe handling of the product.

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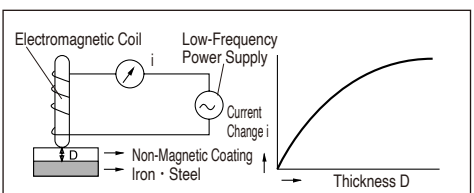
1. Measuring Principles and Features

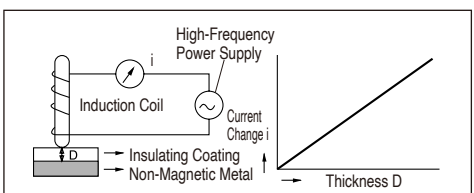
- **Electromagnetic method (measurement of non-magnetic coatings on magnetic metals)**

If an AC electromagnet is brought into the proximity of iron (magnetic metal), the level of the magnetic flux flow through the coil changes resulting in changes in the voltage on each end of the coil. This change in voltage is detected by the current value and is calculated in terms of coating thickness.



- **Eddy Current method (measurement of insulating coating on non-magnetic metals)**

If a coil with a uniform high-frequency electric current flowing through it is brought into the proximity of metal eddy-currents that arise on the surface of the metal, then these eddy-currents fluctuate according to the distance between the coil and the metal surface and thus changes the voltage on each end of the coil. This change in voltage is detected by the current value and is calculated in terms of coating thickness.



<Features>

- **Dual type Coating Thickness Tester with automatically**
  The measurement mode is changed automatically depends whether the substrate is magnetic or non-magnetic. It can also be selected by setting (see page 13).
- **Application Memory Function (Calibration Curve Memory)**
  8 electromagnetic and 8 eddy-current type – up to16 pre-calibrated applications (calibration curves) can be stored in memory so no calibration is required for using the same type of item from the second use. This memory will not be erased even if the power is switched off.
- **Other Functions**
  Automatic ON/OFF switch function. 15 different adjustable settings including upper and lower limits and statistic calculations.

Applications

Model	LZ-990	
Applications	Paint Lacquer Rubber Lining Chrome Copper Other Plastic Resin Enamel Zinc Tin Aluminum	Paint Alumite (Anodic oxide coating) Rubber Enamel Resin Plastic Lacquer Other
Substrate	**Iron / Steel**	**Aluminum, Copper, Brass, etc.**

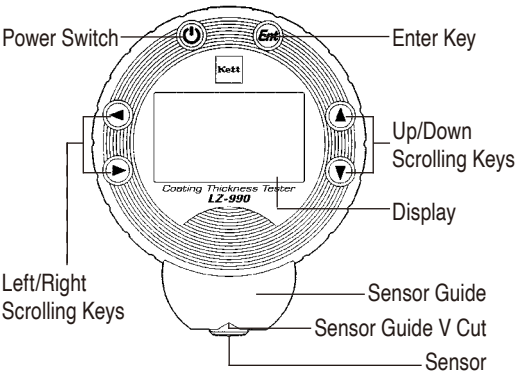
2. Specifications

Model	LZ-990
Measuring Method	Electromagnetic and eddy current method (by automatic or manual changing)
Applications	Non-magnetic coatings on magnetic metal or insulating coatings on non-magnetic metal
Measurable Range	0~2000 μm or 0~80.0 mils
Measuring Accuracy	±1μm under 50 μm ±2% at 50 μm – under 1000 μm, ±3% at 1000 μm – under 2000 μm
Resolution	±0.1 μm under 100 μm 1 μm at 100 μm or greater
Display	Digital (backlit LCD, minimum displayed digit is 0.1 μm)
Data Memory	Approximately 1000 points
Application Memory	8 types each of electromagnetic and eddy-current; 16 total calibration curves can be memorized
Power Supply	1.5 V alkaline batteries (size AAA) x 2
Power Consumption	40 mW (with backlight off)
Battery Life	60 hours (continuous use with backlight off)
Temperature	0 to 40 ˚C
Functions	15 various settings
Output	Personal computer (USB), Printer (RS-232C)
Dimensions & Weight	82 (W) x 99.5 (D) x 32 (H)mm, Approximately 160 g
Accessories	Zero Calibration holder (Iron substrate, aluminum substrate), Calibration foils (50, 100, 1000 μm)*, Batteries (size AAA) x 2, Carrying pouch, Operating manual, Wrist strap.
Optional Accessories	Calibration foils (other than the one furnished), Measuring stand LW-990, Printer VZ-380, Printer cable (VZC71), Data Logger software (LDL-01), USB computer cable

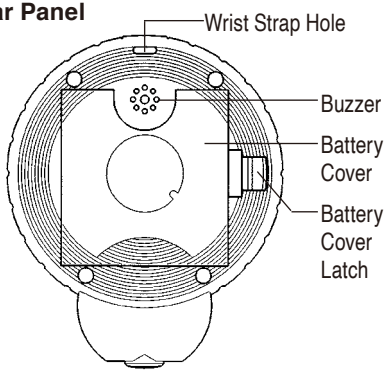
*** The accessory calibration foils supplied have had their actual values measured. For this reason the values indicated above are only approximate and are not exactly the same actual thicknesses of the supplied foils.**

3. Instrument View

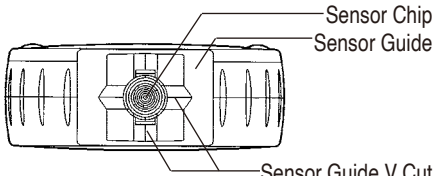
Front Panel



Rear Panel



Bottom

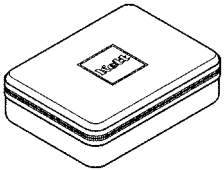


<Accessories>

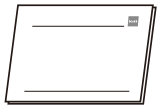
Zero Calibration Holder
(With Iron substrate / Aluminum Substrate)

Calibration Foils

Batteries
(Size AAA) x2



Carrying Pouch



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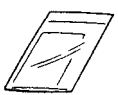
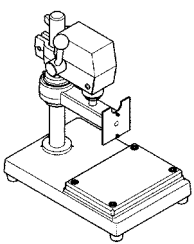
<Optional Accessories>

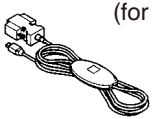


Calibration Foils
(thicknesses other than those supplied)



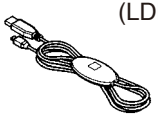
Measuring Stand
LW-990

Printer VZ-380
(for LZ-990)



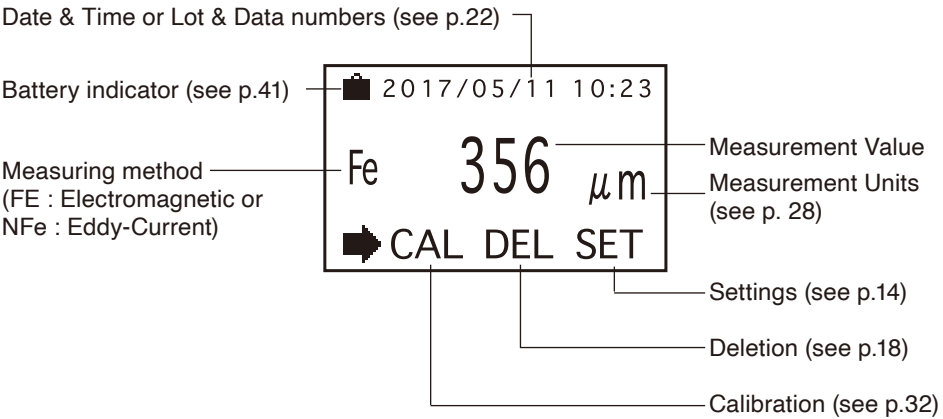
Printer Cable
(VZC71)

Data Logger Software
(LDL-01)



USB Computer Cable (VZC56)

4. Display Pattern



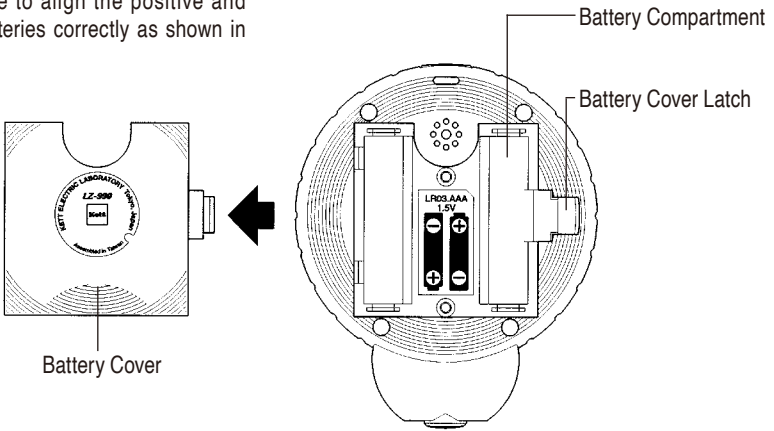
*** Refer to the page indicated in parentheses for the functions or purpose of each pattern.**

5. Keypad Functions

Operation keys	Functions
Power switch 	Turns the power on and off. When ⏻ key is pressed power will come on. If ⏻ key is pressed while the power is already on, the power will turn off.
Enter key 	Confirms the values displayed on the screen. It may also be used with some of the following functions.
Left/Right scrolling key 	Used to move to differing items on the screen or used to change the number values on the screen.
Up/Down scrolling key 	Used to move to differing items on the screen or used to change the number values on the screen. Also used to select the electromagnetic mode or eddy-current mode at power-on.

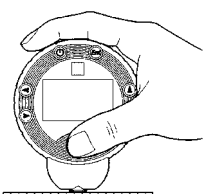
6. Battery Installation

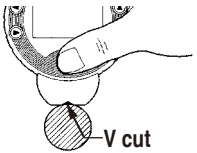
Open the back battery cover. There is a battery cover latch located at the point of below. Insert the batteries (1.5 V alkaline AAA size, 2pcs.) into the battery compartment. Take care to align the positive and negative ends of the batteries correctly as shown in the diagram.



7. Operation

- **This product is a dual type Electromagnetic and Eddy-Current Coating Thickness Tester. When the power is turned on as usually and this tester is pressed against the surface to be measured, the substrate is automatically recognized and the electromagnetic mode or eddy-current mode is automatically activated.**

Step	Operation	Display	Explanation
①	**Start of Measurement** 	 Example of Electromagnetic measuring mode Measureable	Press  key only once to turn the power on. *** If the power switch is on while the sensor is already pressed on surface of sample, it will immediately recognize a substrate and display the measurement value.** *** After switching power on, previous mode is displayed (Fe or NFe and other conditions)** *** If not calibration, proceed to page 32 and try to make calibration by actual your substrate sample.**
②	**Measuring Flat Surfaces** 	 (Example)	**(Measruing Flat Surfaces)** Hold the unit as shown in the diagram and press the measurement section gently against the surface to be measured. The buzzer beeps when the measurement is completed. The measurement value is held (continuously displayed), so the unit can be removed from the measurement surface and the displayed value will not disappear. *** Take care not to press any operating keys while calibration.**

Step	Operation	Display	Explanation
③	**Measuring Curved Surfaces**  	 (Example)	**(Measuring Curved Surfaces)** To measure curved surfaces such as pipes, etc., fit the sensor guide V cut to the R surface.
④	**End of Measurement** ⏻		Press ⏻ key to switch the power off. If you choose to use the Auto Off Time function (see p. 24), then the power will automatically turn off.

• A new measurement may be made while the value from the previous measurement remains in the display. The previously measured value is automatically replaced by the new measurement value.

• The measurement mode can be selected by the operation at power-on.

<To select the mode to the electromagnetic mode>
Press the ▲ key to turn on the power while pressing the ⏻ key.

<To select the mode to the eddy-current mode>
Press the ▼ key to turn on the power while pressing the ⏻ key.

* If the mode is selected, a correct measurement value cannot be obtained when the substrate to be measured is not matched with the measurement mode. The selected mode cannot be cancelled until the power is turned off.

8. Settings

- **The following 15 functions can be selected on SET mode.**

①	Application	(P.16)	⑨	Cal.Methods	(P.25)
②	Delete Data	(P.17)	⑩	Brightness	(P.26)
③	Data Memory	(P.18)	⑪	Lighting Time	(P.27)
④	Limits	(P.20)	⑫	Unit	(P.28)
⑤	Statistics	(P.21)	⑬	Data Output	(P.29)
⑥	Disp.Property	(P.22)	⑭	Lot Splitting	(P.30)
⑦	Date/Time	(P.23)	⑮	Maintenance	(P.31)
⑧	Auto Off Time	(P.24)	⑯	Esc	

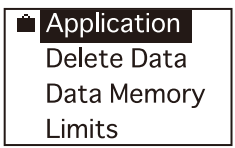
*** Refer to the page indicated in parentheses for the functions or purpose of each pattern.**

● Procedure of Various Functions

(1) To set various function, select SET by pressing ◄ or ► keys. Press Ent key and the various functions will be displayed.

<Display Example>

(2) Select a function you required by ▲ or ▼ keys, and press Ent key. In case of right diagram, Application function is selected.



*** Only 4 functions are displayed in the manner shown on the right, but the other functions will be also displayable in the ①-⑯ order indicated p. 14 by scrolling.**

*** There are 15 various functions that can be set. (⑯ Esc is excluded)**

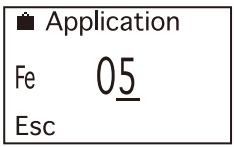
*** Once a function is set, it will remain in memory until changed even if the power is switched off.**

① Application

Total of 16 applications (calibration curves) – 8 for Electromagnetic and 8 for Eddy-Current can be set.

(1) Follow the steps on p. 15 (1), (2).

(2) Select an application (channel) number by ◄, ► or ▼, ▲ keys, and press *Ent* key. Application is fixed and display returns to measuring mode. In case of right diagram, Fe 05 application is fixed.

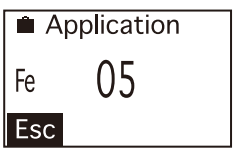


*** 00-07 is selectable for Electromagnetic method application.**

*** 08-15 is selectable for Eddy-Current method application.**

*** Once the application number is set, it will remain in the memory until reset again, even if the power is switched off.**

(3) If you choose not to change application number, select Esc by ◄ or ► keys, and press *Ent* key. Display returns to measuring mode.

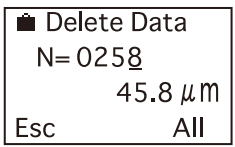


② Delete Data

If the measuring data is stored in memory, you can delete data.

(1) Follow the steps on p. 15 (1), (2).

(2) Select deletion data number you required by ◄, ► or ▲, ▼ keys, and press Ent key. The data in memory is deleted.



(3) In order to delete all data in memory, select All by ◄ or ► keys, and press Ent key. Display returns to measuring mode.

(4) If you choose not to delete data, select Esc by ◄ or ► keys, and press Ent key. Display returns to measuring mode.

③ Data Memory

This function sets whether the measurement data is stored or not in data memory.

(1) Follow the steps on p. 15 (1), (2).

(2) In order to store data in memory, select **Store** by ▲ or ▼ keys, and press *Ent* key. Display returns to measuring mode and **DEL** is displayed automatically.

*** After setting store function, all measuring data is stored in internal memory.**

*** When the statistic function(see p.21) is required, Store should be set before measuring data absolutely. If Store is set after statistic calculation, or set to Null, statistic function is not usable.**

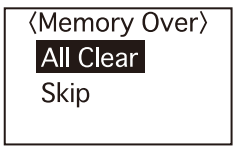
(3) When the **DEL** is displayed, the latest data can be deleted. Select latest data by ◄ or ► keys, and press *Ent* key.

(4) In order to deactivate to Store function, select **Null** by ▲ or ▼ keys, and press Ent key. Store function is activated and display returns to measuring mode.

(5) If you choose not to change Store function, select **Esc** by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode without deactivating store function.

(6) When the data memory is nearly full, right display appears. In order to clear all data in memory, select **All Clear** and press Ent key. Display returns to measuring mode.

When the data output is needed, select **Skip** and press Ent key. Display returns to measuring mode without data clear.

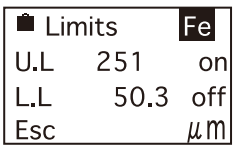


④ Limits (Upper & Lower Limits)

Upper and Lower limit setting can be set so that when the measuring result exceeds upper or lower limit a “beep” signal notify the operator.

(1) Follow the steps on p. 15 (1), (2).

(2) Select limits function, input upper (U.L) & lower (L.L) values and select on/off per each by ◄, ► or ▲, ▼ keys. And then press Ent key. Display returns to measuring mode.



(3) If no needing limits function, select off by ◄, ► or ▲, ▼ keys, and press Ent key. Limits function is needed and display returns to measuring mode.

(4) If you choose not to change anything, select Esc by ◄ or ► keys, and press Ent key. Display returns to measuring mode without making any changes.

⑤ Statistics

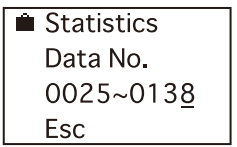
This function displays the maximum value, minimum value, the calibration deviation and the average value and allows the range of data to be calculated and set. In order to calculate statistics, the Coating Thickness Tester must be set to “Store” mode (see p.18) before measuring.

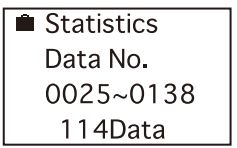
(1) Follow the steps on p. 15 (1), (2).

(2) Set the range of data numbers by ◄, ► or ▲, ▼ keys. By pressing *Ent* key, number of data is displayed. Then *Ent* key is depressed, the statistical values are displayed. If *Ent* key is pressed once more, display returns to measuring mode or data range setting mode.

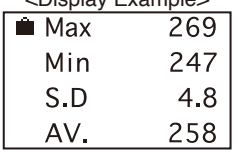
*** If Lot Splitting is activated (see p. 30), the lot number will automatically increase each time statistical calculations are done.**

(3) If you choose not to calculate statistics, select Esc by ◄ or ► keys, and press *Ent* key. Display returns to measuring mode without conducting any calculations.





<Display Example>



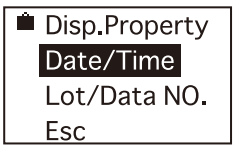
⑥ Disp.Property

The screen of measuring mode can be selected either Date/Time or Lot/Data NO..

(1) Follow the steps on p. 15 (1), (2).

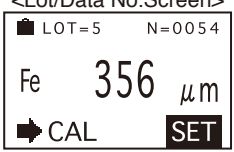
(2) Select either Date/Time or Lot/Data NO. by ▲ or ▼ keys, and press Ent key. Selected screen is set and display returns to measuring mode.

(3) If you choose not to change any functions, select Esc by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode without changing any of functions.



<Date/Time Screen>

<Lot/Data No.Screen>



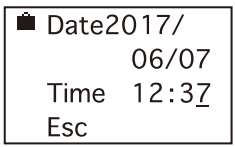
⑦ Date/Time

This function sets the date and time.

(1) Follow the steps on p. 15 (1), (2).

(2) Set the date and time by ◄, ► or ▲, ▼ keys, and press Ent key. The date and time is set and display returns to measuring mode.

(3) If you choose not to change any functions, select Esc by ◄ or ► keys, and press Ent key. Display returns to measuring mode without changing any of functions.



⑧ Auto Off Time

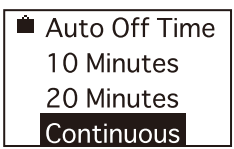
Auto-power Off function (the power can be turned off automatically when no measurement is taken or no key is depressed for preset time (5 or 10 or 20 minutes) and furthermore, No-Auto-power Off can be set when Continuous is preset.

(1) Follow the steps on p. 15 (1), (2).

(2) Select the automatic switch-off time by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode.

(3) In order to deactivate Auto Off Time, Select Continuous by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode with continuous.

(4) If you choose not to change automatic switch off time, select Esc by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode.



⑨ Cal.Methods (Calibration)

Two types of calibration procedures can be available (Simplified and Multipoint).

Simplified ⇨Calibration by using one point on the substrate and one calibration foil (see p.34)

Multipoint ⇨Calibration by using one point on the substrate and a maximum of 4 points calibration foils (see p.37)

(1) Follow the steps on p. 15 (1), (2).

(2) Select calibration method by ▲ or ▼ keys, and press Ent key. Calibration method is set and display returns to measuring mode.

(3) If you choose not to change calibration method, select **Esc** by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode without changing of calibration method.

⑩ Brightness

Backlight brightness level can be set, Off or Dark or Medium or Lightness.

(1) Follow the steps on p. 15 (1), (2).

(2) Select the level of brightness by ▲ or ▼ keys, and press Ent key. Brightness setting is set and display returns to measuring mode.

*** If the backlight is set to operate, the battery consumption increases decreasing the life of the batteries greatly. We suggest setting the "Lighting Time" (see p. 27).**

(3) If you choose not to change the brightness level, select Esc by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode without changing of brightness level.

⑪ Lighting Time

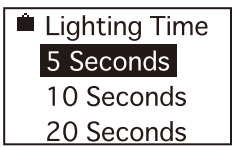
Lighting time for backlight can be set, for 5 seconds or 10 seconds or 20 seconds.

*** If the "Brightness" on p. 26 is deactivated there is no need to set the Lighting Time.**

(1) Follow the steps on p. 15 (1), (2).

(2) Select lighting time for backlight by ▲ or ▼ keys, and press Ent key. Lighting time is set and display returns to measuring mode.

(3) If you choose not to change the lighting time, select Esc by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode without changing of lighting time.



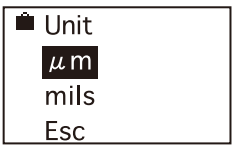
⑫ Unit

Measurement unit can be set, μm or mils.

(1) Follow the steps on p. 15 (1), (2).

(2) Select unit by ▲ or ▼ keys, and press Ent key. Unit is set and display returns to measuring mode.

(3) If you choose not to change the measurement units, select Esc by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode without changing of measurement units.

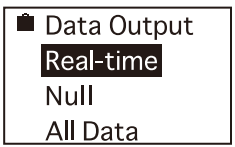


⑬ Data Output

Measured or measuring data can be output to optional printer or personal computer via an optional cable.

(1) Follow the steps on p. 15 (1), (2).

(2) Select data output format by ▲ or ▼ keys, and press Ent key. Data format is set and display returns to measuring mode.



(3) If you choose not to change the output format, select Esc by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode without changing of output format.

Real-time ⇨ The data is output simultaneously with the measurement. Even if the settings are changed or statistical calculations are made, these changes or calculation results will simultaneously be output.

Null ⇨ Deactivates the above mentioned output.

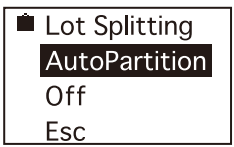
All Data ⇨ Outputs all data in the memory, changes to any settings, results from statistical calculations and deletions of data.

⑭ Lot Splitting

Lot numbers can be automatically increased as statistical calculations are made.

(1) Follow the steps on p. 15 (1), (2).

(2) Select Auto Partition by ▲ or ▼ keys, and press Ent key. Auto Partition is set and display returns to measuring mode.



*** If AutoPartition is activated the lot number will automatically increase each time a statistical calculation is made.**

(3) In order to deactivate lot splitting function, select Off by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode.

(4) If you choose not to change auto partition setting, select Esc by ▲ or ▼ keys, and press Ent key. Display returns to measuring mode without changing of the setting.

⑮ Maintenance

As this mode is used for repairs and adjustments, it is not used for daily operation.

(1) When the screen on the right is displayed, select Esc by ◄ or ► keys, and press Ent key. Display returns to measuring mode.

9. Calibration

- **Preparation for calibration**

  This section describes the calibration methods necessary to obtain accurate measurement values from coating thickness tester. It is always necessary to calibrate the unit before measuring. There are two different calibration methods which are **Simplified & Multipoint**. The **Simplified** calibration is made by one-point calibration foil and a substrate. The **Multipoint** calibration which is made by maximum four-points calibration foils and a substrate, is used when the best possible accuracy is required.

  When conducting measurements that require higher precision, a substrate made of the same material, shape and thickness must be used. **Prepare an uncoated substrate such as plating or painting.**
  Calibrate the unit by selecting a combination of a zero substrate and a calibration foil according to the thickness of the coating you want to measure by referring to the chart on p.33.

  - **Once a calibration procedure has been performed the settings remain in memory until the procedure is performed again, even if the unit's power is turned off.**

- **Procedure for calibration**

  An application channel must be selected before calibrating. (Refer to p. 16 for setting)

  - **Once an application number has been set, the settings remain in memory until the procedure is performed again, even if the unit's power is turned off.**

  Select the method of calibration (Simplified or Multipoint) referring to p. 25. The Coating Thickness Tester is preset to Simplified when sold.

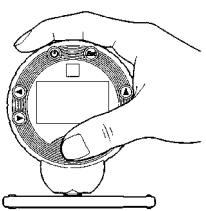
- **Examples of Zero Base and Calibration Foil Combinations**

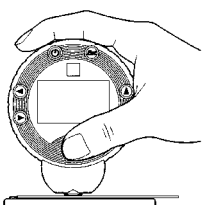
Measurement Range	5-Point Calibration (Electromagnetic / Eddy-Current)				
	2-Point Calibration				
0~50 μm	Zero Base	50 μm	12 μm	25 μm	38 μm
50~500 μm	Zero Base	100 μm	50 μm	300 μm	500 μm
500~2000 μm	Zero Base	1000 μm	500 μm	1500 μm	2000 μm*[1]

*[1] For 2000 μm calibration foil, use 500 μm and 1500 μm foils together.

* The furnished substrate is simply used to test the precision of the unit.
* The calibration foils' values are not always those listed in the table above, but are closest to their actual measured values. For calibration foils of other thicknesses, other than those furnished, please contact customer service.

(1) Simplified <Example: Calibrate by using a substrate and a calibration foil (100μm foil)>

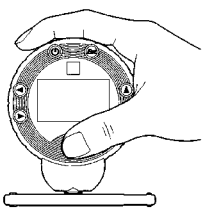
Step	Operation	Display	Explanation
①	◄ or ►	2017/05/11 10:23 Fe 356 μm CAL SET	Turn the power on by pressing ⏻ key, and select CAL by ◄ or ► keys. *** The display will show the previous measurement mode, either "Fe" or "NFe".**
②	Ent	Fe Zero Adjust Mea Tar-get Esc	Press Ent key and the calibration screen will appear.
③	**Measuring the substrate**  Measure the substrate 4-5 times	Example in Electromagnetic Mode ① Fe Zero Adjust Mea 0.1 Tar-get 0.0μm DEL Esc ② Fe Zero Adjust Mea 0.2 Tar-get 0.0μm DEL Esc ⋮ ⑤ Fe Zero Adjust Mea 0.3 Tar-get 0.0μm DEL Esc	Measure an uncoated substrate 4-5 times. Each time a measurement is completed a "beep" will sound and the measurement value will be displayed. • Electromagnetic measuring mode (Fe) is used for ferrous substrate samples, and Eddy-Current measuring mode (NFe) is used for non-ferrous metal substrate. • Depending on the substrate, a measurement value that is greatly different from that shown on the left (a measurement value close to 0) may be displayed, but in step ④ and ⑤ they will be fixed as the set value, so continue with the operation.

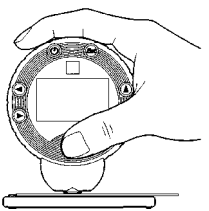
Step	Operation	Display	Explanation
④	◄, ► or ▲, ▼	Fe Zero Adjust Mea 0.3 Tar--get 0.0 μm DEL Esc	Input the coating thickness(0.0 μm) of substrate by ◄, ► or ▲, ▼ keys. (Un-coated substrate means that 0.0 μm coating thickness)
⑤	Ent	Fe Foil Cal Mea Tar--get Esc	Press Ent key, Zero adjustment is fixed and change to foil calibration procedure. *** If Esc is selected and Ent key is pressed during the operation of steps ②-⑤ then the calibration of the substrate will not be fixed.**
⑥	**Measuring the 100 μm calibration foil**  Place calibration foil on substrate and measure 4-5 times	Example in Electromagnetic Mode ① Fe Foil Cal Mea 101 Tar--get 300 μm DEL Esc ② Fe Foil Cal Mea 103 Tar--get 300 μm DEL Esc ⋮ ⑤ Fe Foil Cal Mea 102 Tar--get 300 μm DEL Esc	Place the calibration foil (the 100 μm plastic foil) on the substrate aligning it with the substrate grooves and measure 4-5 times. • Depending on the material, a measurement value that is greatly different from that of the calibration foil thickness may be displayed, but in step ⑦ and ⑧ this will be fixed as the set value, so just proceed. • In the target portion of the display, the previously input calibration foil numeric value is displayed.

Step	Operation	Display	Explanation
⑦	◄, ► or ▲, ▼	Fe Foil Cal Mea 102 Tar--get 100 μm DEL Esc	Input the coating thickness of calibration foil (100 μm) by ◄, ► or ▲, ▼ keys.
⑧	Ent	2017/05/11 10:23 Fe 356 μm CAL SET	Press Ent key and display returns to measuring mode. This completes the Simplified calibration operation. * If Esc is selected and Ent key is pressed during the operation of step ⑥-⑧ then the calibration of the calibration foil will not be fixed.

- The purpose of measuring the substrate and the calibration foil 4-5 times each is to get the average value.
- When DEL is displayed, the latest measured data can be deleted. Select DEL by ◄ or ► keys, and press Ent key.
- When Esc is displayed, you can return to step ①. Select Esc by ◄ or ► keys, and press Ent key. If the calibration procedure is going back before Step ①, all calibration setting will be nullified.

(2) Multipoint <Example: Calibrate by using a substrate and calibration foils (four 100/300/500/700μm foils)>

Step	Operation	Display	Explanation
①	◄ or ►	2017/05/11 10:23 Fe 356 μm ►CAL SET	Turn the power on by pressing ⏻ key, and select CAL by ◄ or ► keys. * The display will show the previous measurement mode, either "Fe" or "NFe".
②	Ent	Standard0 N=0 Latest AV. ESC	Press Ent key and the calibration screen will appear.
③	**Measuring the substrate**  Measure the substrate 4-5 times	Example in Electromagnetic Mode ① Standard0 N=1 Latest 0.1 AV. 0.1 ESC ENT DEL ② Standard0 N=2 Latest 0.0 AV. 0.1 ESC ENT DEL ⋮ ⑤ Standard0 N=5 Latest 0.1 AV. 0.2 ESC ENT DEL	Measure an uncoated substrate 4-5 times. Each time a measurement is made a "beep" will sound and the measurement value will be displayed. • Electromagnetic measuring mode (Fe) is used for ferrous substrate samples, and Eddy-Current measuring mode (NFe) is used for non-ferrous metal substrate. • Depending on the substrate, a measurement value that is greatly different from that shown on the left (a measurement value close to 0) may be displayed, but in step ④ and ⑤ they will be fixed as the set value, so continue with the operation.

Step	Operation	Display	Explanation
④	◄, ►, or ▲, ▼	Standard0 0000.0 μm ESC	Press (Ent) key and input the coating thickness (0.0 μm) of substrate by ◄, ► or ▲, ▼ keys.
⑤	(Ent)	Standard1 N=0 Latest AV. ESC ENT	Press (Ent) key, Zero adjustment is fixed and change to foil calibration procedure. The word on display is changing from **Standard0** to **Standard1**. * If the Esc key is selected and (Ent) key is pressed during the operation of steps ②-⑤ then the calibration of the substrate will not be fixed.
⑥	**Measuring the 100 μm calibration foil**  Place calibration foil on substrate and measure 4-5 times	① Standard1 N=1 Latest 101 AV. 101 ESC ENT DEL ② Standard1 N=2 Latest 103 AV. 102 ESC ENT DEL ⋮ ⑤ Standard1 N=5 Latest 102 AV. 101 ESC ENT DEL	Place the calibration foil (the 100 μm plastic foil) on the substrate aligning it with the substrate grooves and measure 4-5 times. • Depending on the material, a measurement value that is greatly different from that of the calibration foil thickness may be displayed, but in steps ⑦ and ⑧ this will be fixed as the set value, so proceed with the operation. • Measure the calibration foils for calibration in order of thinnest to thickest.

Step	Operation	Display	Explanation
⑦	◄, ► or ▲, ▼	Standard1 100 μm ESC	Press Ent key and input the coating thickness of calibration foil (100 μm) by ◄, ► or ▲, ▼ keys.
⑧	Ent	Standard2 N=0 Latest AV. ESC ENT	Press Ent key again, 100 μm thickness is fixed, and the word on display is changing from **Standard1** to **Standard2**.
⑨	**Repeat step ⑥⑦⑧** **Measure and fix the (300 μm) calibration foil** ⋮ **Measure and fix the (500 μm) calibration foil** ⋮ **Measure and fix the (700 μm) calibration foil**	Standard2 N=0 Latest AV. ESC ENT	Proceed to the calibration of the second calibration foil (300 μm). Confirm that the screen displays the words **Standard2** and repeat Step ⑥⑦⑧.
		Standard3 N=0 Latest AV. ESC ENT	Proceed to the calibration of the third calibration foil (500 μm). Confirm that the screen displays the words **Standard3** and repeat Step ⑥⑦⑧.
		Standard4 N=0 Latest AV. ESC ENT	Proceed to the calibration of the fourth calibration foil (700 μm). Confirm that the screen displays the words **Standard4** and repeat Step ⑥⑦⑧.

• If calibrating 4 points or fewer, calibrate only the number of calibration foils required and then after Step ⑧, select ENT on the display and press Ent key.

Step	Operation	Display	Explanation
⑩	Ent		Press Ent key, Zero & foil calibrations is fixed, and display returns to measuring mode. This completes the Multipoint calibration operation. * If Esc is selected and Ent key is pressed during the operation of step ⑥-⑩ then the calibration of the calibration foils will not be fixed.

- The purpose of measuring the substrate and the calibration foils 4-5 times each is to get the average value.
- When DEL is displayed, the latest measured data can be deleted. Select DEL by ◄ or ► keys, and press Ent key.
- When Esc is displayed, you can return to step ①. Select Esc by ◄ or ► keys and press Ent key. If the calibration procedure is going back before Step ①, all calibration setting will be nullified.

10. Battery Replacement

- **The Battery Alarm**

  When the battery alarm symbol is displayed, immediate replace to new batteries (1.5V alkaline AAA size, 2 pcs.).
  Refer to p.11 paragraph 6, Battery Installation.

11. Notes for Measuring and Handling

- **Handle the Sensor Section with Care**

  Never strike the sensor section against the measurement surface or slide the unit when the sensor is pressed against the measurement surface. Also, accurate measurement may not be possible if the sensor section is dirty.

- **Caring for the LZ-990 Dual Type Coating Thickness Tester**

  The LZ-990 Dual Type Coating Thickness Tester is a delicate electronic instruments. Never drop it, allow it to get wet or leave it where it may be exposed to intense sunlight. When making measurements, use the wrist strap to avoid accidentally dropping the unit. When not using the unit, place it in the supplied carrying case to protect it from iron particles, etc.

- **Handle the Calibration Foils with Care**

  The calibration foils are precisely measured for their thickness. If scratched or bent foils are used to calibrate, accurate measurements are not possible. If the calibration foils are damaged in the process of handling, please contact your service representatiave and purchase a replacement calibration foil specifying its thickness. In such situations, the new calibration foil's thickness may slightly vary from the old calibration foil's thickness, but this will not affect the results of the calibration.

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.
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060247-01