



SANKO Coating Thickness Meter

SWT – 7 0 0 0 III / 7 1 0 0 III

Instruction Manual



CAUTIONS:

Before using the Meter, read this INSTRUCTION MANUAL thoroughly and use the Meter correctly.

Keep this INSTRUCTION MANUAL carefully and refer to this when necessary.

In the event of any doubt arising, the original INSTRUCTION MANUAL (Japanese) is to be of final authority.

SANKO ELECTRONIC LABORATORY CO., LTD.

Tokyo • Osaka • Sendai • Nagoya • Fukuoka • Kawasaki

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Attention for safety (to use in correct ways)

To prevent you and your properties from damaging please take some time to read thoroughly this “Attention for Safety” and correct uses keep these instructions attentive to read when necessary.



Warning

-  ● Do not dump nor wet the gauge unit in water, otherwise it may cause damages.
Keep off water Please contact our distributor or sales office should submerged water into the unit.
-  ● Keep metals or foreign substances from the unit, otherwise it may cause damages.
Prohibition Please contact our distributor or sales office should put any materials or foreign substances in the unit.
-  ● Do not insert a screwdriver into the connector, otherwise that it may cause damages.
Prohibition
-  ● Do not throw, smash, drop the unit, otherwise it may cause damages.
Prohibition
-  ● Never dismantle or modify the gauge unit by yourself, otherwise it may cause errors or damages.
Dismantling prohibited
-  ● Do not use AC adaptors other than an exclusive adaptor for this unit, (SWT-7100III only) otherwise it may cause damages, electric shocks, fires.
Prohibition
-  ● Please use the exclusive adaptor with a designated Voltage only, otherwise it may cause damages, electric shocks, fires.
Prohibition
-  ● Keep the terminals of the adaptor free from metal pieces or dust, otherwise it may cause short circuit, electric shocks, fires.
Prohibition
-  ● Do not handle the AC adaptor with wet hands, otherwise it may cause electric shocks.
Prohibition
-  ● Do not damage, brake, modify, forcefully bend or twist the cord of the AC adaptor. Or, do not load it with heavy staff or pinch it forcefully, otherwise it may cause breaking wires, short circuit, fires.
Prohibition

Attention For Safety (to use safely and correctly)



Warning



Must

- Never fail to remove batteries from the unit when not in use for a long time.
Leakages occurred from deterioration of batteries may cause erroneous reactions or damages.



Must

- Be sure to read this book on the item of 「How to fit batteries」 to replace batteries.



Must

- Store batteries in a place where children and pets are incapable of handling them.
Please call a doctor like in a case that a battery is swallowed.



Must

- Do not put batteries into fire or water. Store them in a cool, dry and dark place avoiding flames, high temperature and moisture.



Must

- Do not get batteries shocked and dismantled, and soldered for processing



Must

- Do not short or recharge batteries and handle with metallic tools like pliers.



Must

- Replace with new (unused) batteries according to the procedure of this Operating Instructions.



Must

- Be sure of paying attention on battery polarity marks, (+、-) to place the batteries.



Must

- In case a battery has leakage please clean up the place with clothes to replace batteries.
And do not touch the leaked liquid and wash skins or clothes in case they are contaminated.



Must

- Comply to regulations and laws in your neighbors when disposing of them.



Must

- Insert a plug of the AC adaptor to the full end, otherwise it may cause electric shocks and fires with burns. And do not use faulty or loose receptacles.







Must

- Switch to OFF and unplug the AC adaptor from the receptacle to avoid electric shocks and damages when inspecting or cleaning the gauge.

Attention For Safety (to use safely and correctly)



Attention

-  ● Do not use Benzene or Thinner for cleaning and spray pesticides on the meter, otherwise it may cause cracks or malfunctions.
Prohibition
-  ● Do not store the meter in places getting high in temperatures such as in a car in strong sunlight or near heaters, otherwise it will be hazardous to the meter and may cause malfunctions.
Prohibition
-  ● Do not step, trample down nor put anything on the meter.
Prohibition
-  ● Keep the meter away off rubber-made articles or vinyl articles. A lengthy contact between meter and them may cause stickiness and it may be difficult to get rid of them.
Prohibition

Notes:

- Please read this manual thoroughly for correct operations before getting started.
- This meter is a precision gauge. Please handle with care.
- Do not tug, bend, fold or curl up forcefully the cables of probes.
- Do not knock or scratch objects with the tip of a probe.
- Keep the tip of a probe clean. A slight amount of dust may cause errors in measurements.
- Clean the meter and store it in free from dust and moisture after operation.
- To keep precision with a gauge please contact our distributor or our sales office once a year for inspection
- Keep the meter away off electric noises, shocks or magnetic fields when in a use.

Get started

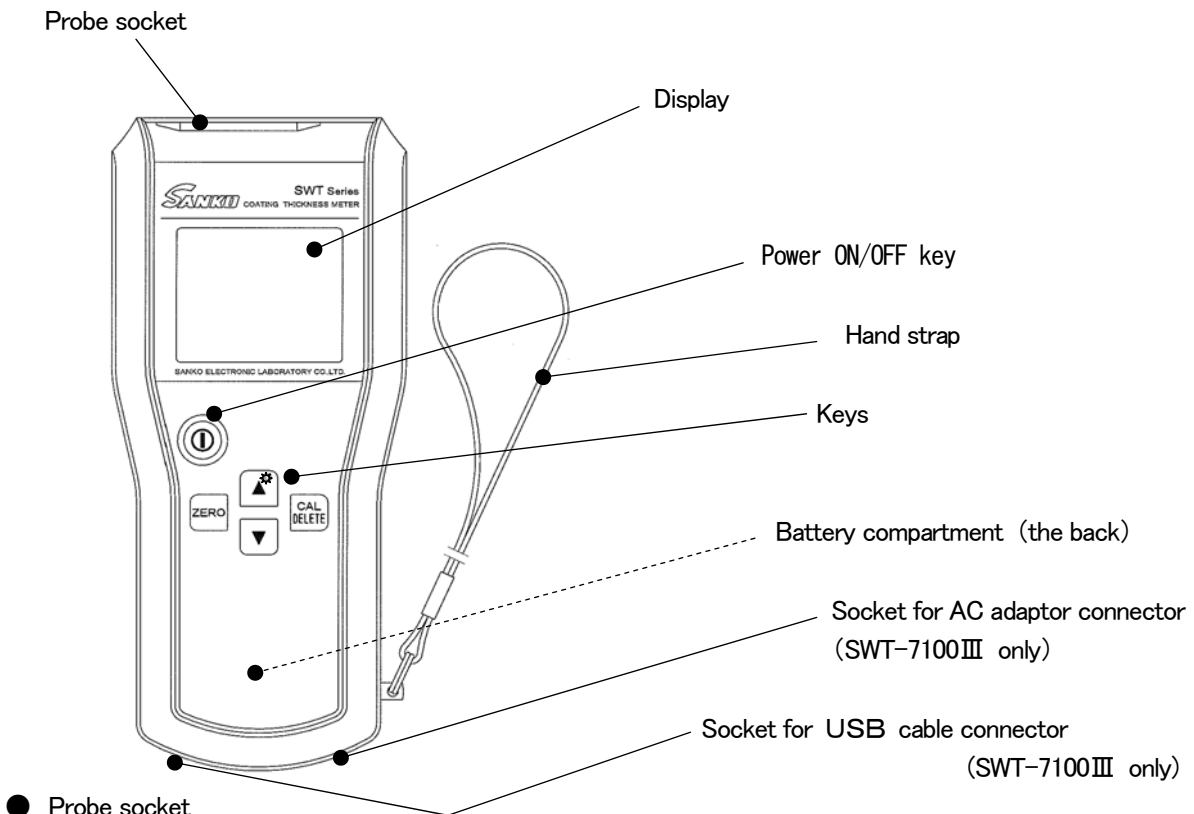
◆ Contents in a package Please make sure if the following items are included.

- Main unit
SWT-7000III, or SWT-7100III
- Dry batteries LR6 (2 pieces)
- Carrying case
- Instruction manual (this manual)
- AC adaptor (SWT-7100III only)
- USB cable (2.0m) (SWT-7100III only)
- USB driver (CD) (SWT-7100III only)

● In case there are optional probes included.

- Probes
For ferrous(Fe), non-ferrous(NFe), for both Ferrous/non-ferrous (FN-325)
- Zero boards for testing (for Fe:ferrous substrates/for NFe:non-ferrous substrates
/for FN: either ferrous or non-ferrous substrates, 2 pieces.)
- Thickness standards (films :2 foils, bake: 1 sheet)

◆ Names of part



● Probe socket

Connect an optional-exclusive SWT probe to the probe socket.

- (1) To measure a film thickness of coated, plated, lining layer on substrates made of ferrous material please use a probe of (Fe) series for the connection.
- (2) To measure a film thickness of coated, plated, lining layer on substrates made of non-ferrous materials such as Aluminum, Copper, etc. please use a probe of (NFe) series for the connection
- (3) To measure a film thickness on either ferrous or non-ferrous substrate please use a probe of (NF-325) f or connection.

● Reading display

It indicates measurement results, operation guides, or malfunction status. With a backlight.

● Power ON/OFF key

It switches On or Off.

● Keys

- (1) 「ZERO」key, 「▲ ⚙️」key, 「▼」key

They are adjusting keys to be pre-used before measuring to obtain correct results.

- (2) 「CAL/DELETE」key

CAL: Initiate or finish adjustment by using standard folils.

DELETE: Deletes incorrect or unnecessary measuring results for adjustment.

(works only when 「ZERO」, 「CALIBRATION」 is processed.)

● Battery compartment

It contains 2 pieces of dry battery (LR6).

● Hand strap

Hang the meter through a strap over your wrist never to drop it.

● Socket for AC adaptor (SWT-7100III only)

This is a socket connected to the exclusive AC adaptor (accessory).

● Socket for USB cable (SWT-7100III only)

It is a socket connected to a USB cable (accessory)

◆ How to fit batteries

- ① Open the battery lid on the back of the unit.
Press down and slide the lid in direction of arrow to open.
- ② Insert batteries.
Ensure correct battery polarity ⊕、⊖ for placement.
- ③ Close the lid.



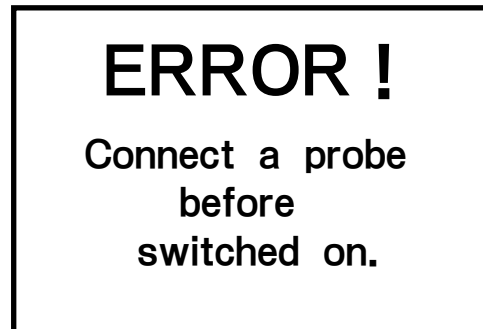
Caution

- Use designated and new (check battery-life) batteries or ones supplied in this package.
- An incorrect use of batteries may cause leakages, bursts. Do not intermingle new ones with old ones.
- Take out batteries to store when not in use for a long absence, and that may avoid Leakages.
- Keep batteries off children and pets.
- Comply to the laws and rules in your Local Authorities when disposing of batteries.

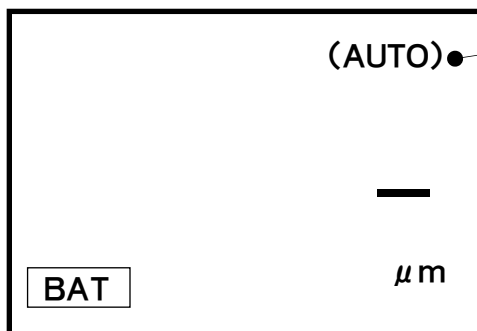
◎ About reading display



When placing batteries in the unit, the messages and warning below on the screen may be indicated. And these are not breakdowns, wait until the reading disappears with a beeping sound.



Batteries have run out when the display on the unit indicates the mark listed below. Replace with new batteries.



In case of using FN-325 probe:

After Power source switched to OFF at Automode, AUTO is indicated on the display and when Fe or NFe substrate is set at mode corresponding to substrate, “**Fe**” for a ferrous substrate, “**NFe**” for a non-ferrous substrate is indicated on the display.

A use of exclusive Fe-probes shows “Fe” and of exclusive NFe-probes does “NFe” on the display.

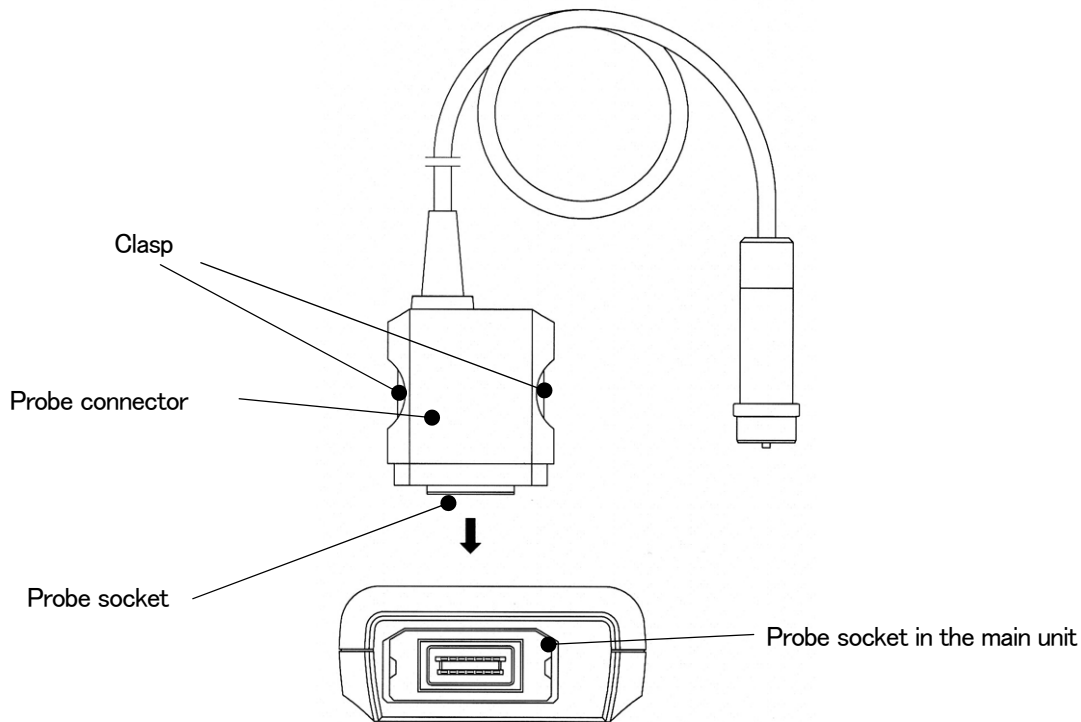
◆ How to connect or disconnect a probe

- ◆ Connect an optional, exclusive SWT probe to the main unit.
Select one of the probes suited for your application.

Insert a probe connector into the probe socket of the main unit.

Make sure of aligning the keyway leading to a smooth joint without doing by force.

Insert and push it until it is locked.



- ◇ Remove the exclusive probe from the unit.

Pull off the probe carefully by bending inward clasp springs at the both ends of the probe connector to release the clasps.

Do not pull off by force or it may cause damages.

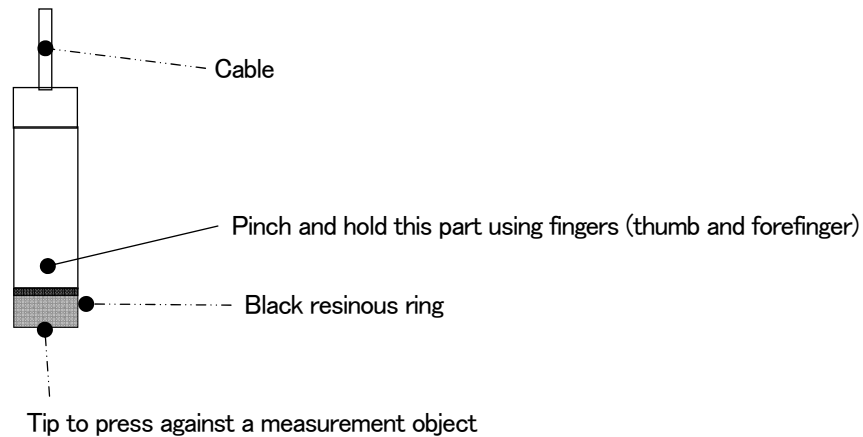


Caution

Make sure that Power switches to off when connecting or disconnecting the exclusive SWT probes.

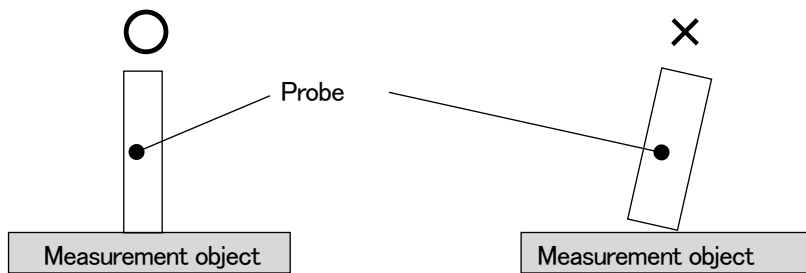
Or else, it may cause damages to connect or disconnect while Power is on.

◆ How to hold probes

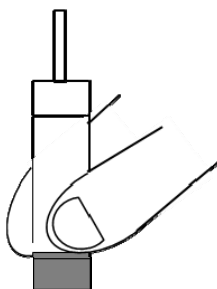


◆ How to press a probe to an object

- Keep the probe 5 cm or over away off metallic objects when not in use of measuring.
- Press the tip of the probe perpendicularly against a measurement object.
Tilting may cause large errors.



- Press the probe quickly and smoothly to objects.
A slow-acting press may cause large errors.



Quickly and calmly press perpendicular against the object by grabbing the probe as illustrated. It beeps and the reading screen shows the measuring result. When it does not beep, lift it 5~7 cm above the object and try again to take measurements.



Caution

- ◆ Do not smash or hit the probe against objects, or it may cause damages to probes and to objects
- ◆ Do not scrape, scrub objects with the probe except in a special measurement.
Or it may break the tip of the probe and cause damages to the tip and surface of objects

How to operate

(1) How to switch Power source

Press **ON/OFF** key.



This message lasts for about 3 seconds.

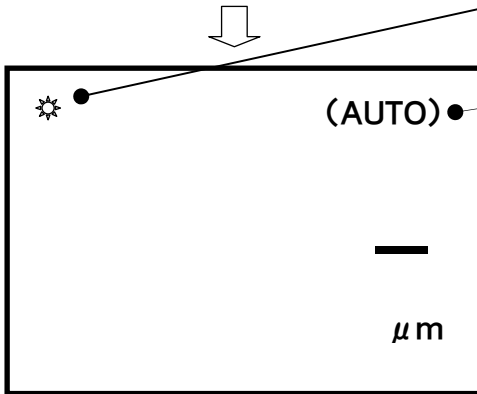


Caution

Hold the probe in air without operation when the reading is on display. Or it may indicate 「ERROR」 and automatically switch off Power.

The buzzer emits a beeping sound.

The Backlight mark is indicated when ON.



In case of connecting FN-325:

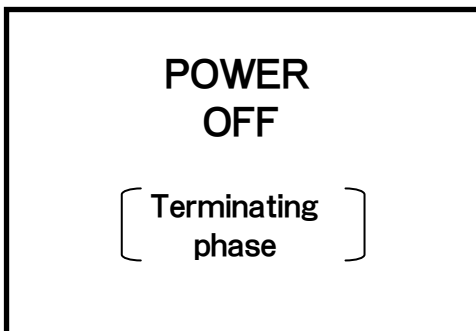
After Power source switched to OFF at Automode, AUTO is indicated on the display and when Fe or NFe substrate is set at mode corresponding to substrate, "Fe" for a ferrous substrate, "NFe" for a non-ferrous substrate is indicated on the display.

A use of exclusive Fe-probes shows "Fe" and of exclusive NFe-probes does "NFe" on the display.

(2) How to switch off

Press **ON/OFF** key.

The buzzer beeps.



The message lasts for about 2 seconds.



Caution

Never remove a probe from a unit when Power is ON. Or the electric shocks may damage the probe and the unit

The buzzer beeps and this unit is switched off.

(3) Zeroing

It is capable of getting started on measurements immediately after the message of 「START UP PHASE」 has disappeared as described on page 9.

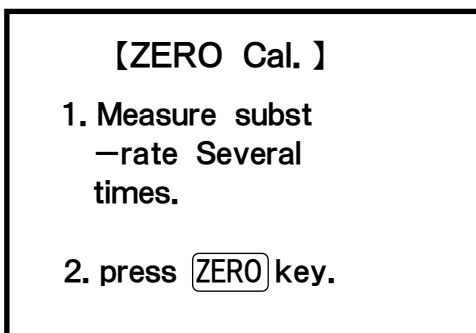
However, it makes errors depending on material formation and shapes to be measured. To minimize measurement errors and obtain as accurate results as possible please be sure of carrying out 2 points of adjustments of 「Zeroing」 and 「Calibration standard」 before measuring process.

- ※ Please prepare for a Substrate plate the identical material, quality and size to a measuring object.
(This substrate plate should be designated as a 「Zero Plate」)

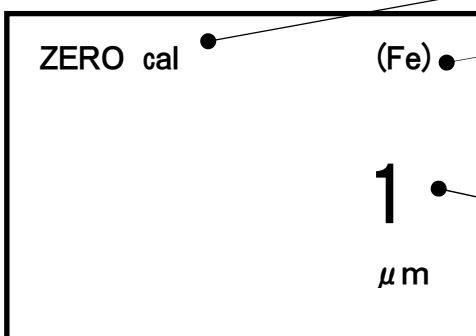
◆ Press **ZERO** key.

The buzzer emits a beep sound.

CAL/DELETE key changes to one data “deletion” function.



Press the probe to the Zero Plate.
The buzzer beeps.



Zeroing is in process.

The reading shows that the unit is set to measure on a substrate material of Ferrous by connecting a 「Fe-325」 probe, or a 「Fe」 series probe.

Measured a mean value
When the measuring value results in largely off the “0”, press **CAL/DELETE** + **▼** key to delete the latest data out of measured values. It indicates “-” to delete all data.

Remove the probe from 「Zero plate」

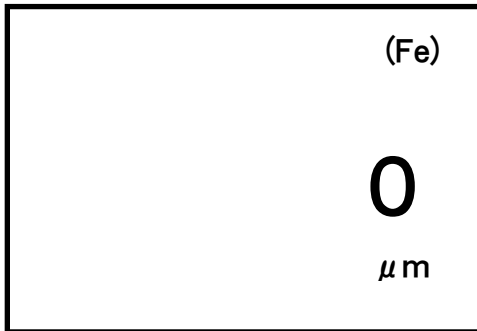


- Repeat a measuring process 1~20 times by pressing the probe to 「Zero plate」. (A mean value is displayed whenever a probe is pressed)
- ◆ When a measuring process reaches the 20th time, the buzzer beeps, beeps 2 times and afterward do not accept any entry.

Press **ZERO** key when finishing adjustment.



The buzzer beeps.



It stops its DELETION function of **CAL/DELETE** key

The reading shows that 「Zeroing」 has completed and it becomes possible to take measuring and adjusting operations of this unit.

- It is correct that numerical values measured by pressing the probe to the 「Zero Plate」 indicates 「0」 or in the neighborhood of 「0」.

When the measured value results in largely off 「0」 μm , please try again zeroing from the beginning.

- [LLLL] indicated on display during a time of zeroing means that the calibration point heavily deviates from the standard please make sure that the material is not in process of being built with others and repeat the zeroing in 2~4 times until a stable 「0」 is obtained.

※ In case of using a dual type probe 「FN-325」, perform 「calibration by ferrous substrate」 and 「calibration by nonferrous」 at the same time as possible as you can.

Note : The latest measured value replaces the previous ones and the new value of 「Zeroing」 is stored.

(4) Calibration standard (CAL)

- Prepare 「Zero Plate」 used for 「ZEROing」
- Prepare 「Thickness standard」、foiles that are the same thick as the measuring film or thicker than that.
- Place the 「Thickness standard」 on the 「Zero Plate」.
- Press the **CAL/DELETE** key.

The buzzer beeps.

CAL/DELETE key changes to one data “deletion” function.



[CAL. W. foil]
1. Measure thick
ness of foil
several times.
2. With ▼ or ▲, Ad
just to thick
ness of foil
3. press CAL key.

Press again **CAL/DELETE** key to interrupt Calibration standard (CAL).

It beeps whenever pressing.



Cal. w. fo ● (Fe) ●
102 ●
 μm

Calibration standard is in process.

The reading shows that the unit is set to measure on a substrate material of Ferrous by connecting a 「Fe-325」 probe, or a 「Fe」 series probe.

Measured a mean value
 When the measuring value results in largely off the “0”, press **CAL/DELETE** + **▼** key to delete the latest data out of measured values.
 It indicates “-“ to delete all data.

- Repeat a measuring process 1~20 times by pressing the probe to 「Zero plate」. (A mean value is displayed whenever a probe is pressed)
- ◆ When a measuring process reaches the 20th time, the buzzer beeps, beeps 2 times and afterward the unit does not accept any entry.

Remove the probe from 「Zero plate」



To adjust the displayed reading until it is correct relative to thickness standard (in this case, 100 μm) use.

▲, **▼** key.



Cal. w. foil (Fe)
100 ●
 μm

Pressing **▲**, or, **▲** key interrupt the delete function of **CAL/DELETE** key.

Pressing **▲** key increases the displayed value.

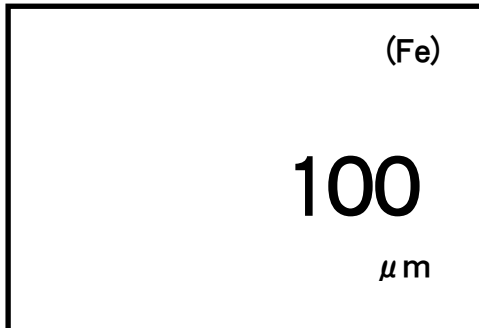
Pressing **▼** key decreases the displayed value.
 (Press and holding key goes fast forward)

Adjust the reading value to the Standard thickness.

After adjusting the reading value to the Standard thickness, press **CAL/DELETE** key.



The buzzer beeps, **【Calibration Standard】** on the upper left disappears and it returns to a measuring mode.



This is a measuring mode.

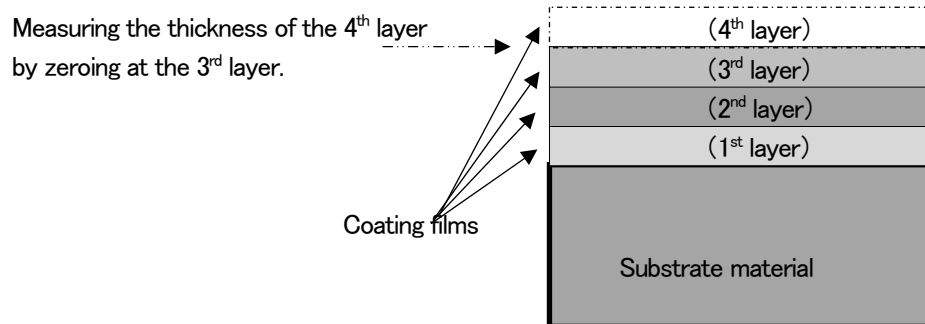
- It is correct that numerical values measured by pressing the probe a few times to the 「Standard thickness」 on the 「Zero Plate」 indicates the thickness in the neighborhood of the 「Standard thickness」.
- When the measured value results in largely off the 「Standard thickness」 please try again the calibration from the beginning.
- ※ In case of using a dual type probe 「FN-325」, perform 「calibration by ferrous substrate」 and 「calibration by nonferrous」 at the same time as possible as you can.

Note:

The latest measured value replaces the previous ones and the new value of 「Calibration standard」 is stored.

(5) Zeroing in special cases (Multi-layers)

- ◎ In case of being painted as shown with multi-layers on the substrate there may be needs to measure thicknesses of each layer. For example, measuring only the thickness of the 4th layer please zero as an assumed ZERO at the surface of the 3rd layer stacked on the substrate.



◆ Releasing of special-case zeroing

When zeroing again on the substrate after having finished the above measurements and if the combined thickness of 3 coating layers from 1st to 3rd exceeds 50 μ m, please zero the meter on the following procedures.

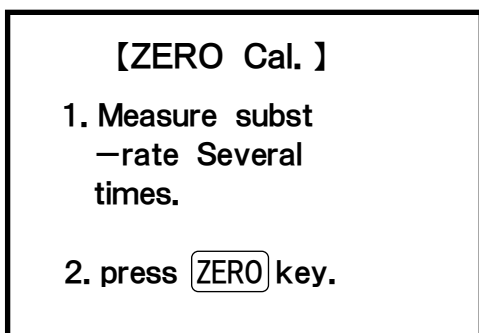
If the thickness of 3 combined layers is below 50 μ m, take the same procedure as usual zeroing to release.

- Prepare the identical material quality, plate size to a measuring object.
(This is a designated as a Zero Plate)

Press **ZERO** key.

The buzzer emits a beeping sound.

CAL/DELETE key changes to one data "deletion" function.



Press the probe to the Zero Plate.

The buzzer beeps, beeps, beeps.



OFFSET.

To continue,
press **ZERO** twice.

Press **ZERO** key. --- ①
The buzzer beeps.



Press **ZERO** key. --- ②
The buzzer beeps.

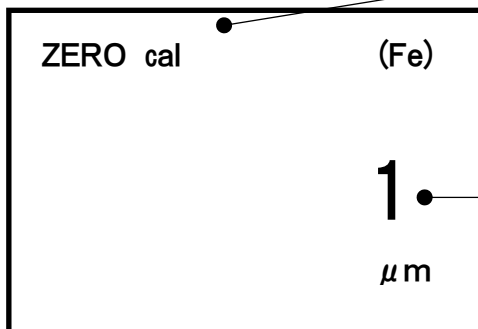


[ZERO Cal.]

1. Measure subst
-rate Several
times.

2. press **ZERO** key.

Press the probe to Zero plate.
The buzzer beeps.



The reading shows that it is process of zeroing adjustments

Measured a mean value

When the measuring value results in largely off the "0", press **CAL/DELETE** + **▼** key to delete the latest data out of measured values.

It indicates "--" to delete all data.

- Repeat a measuring process 1~20 times by pressing the probe to 「Zero plate」. (A mean value is displayed whenever a probe is pressed)
- ◆ When a measuring process reaches the 20th time, the buzzer beeps, beeps 2 times and afterward the unit does not accept any entry.

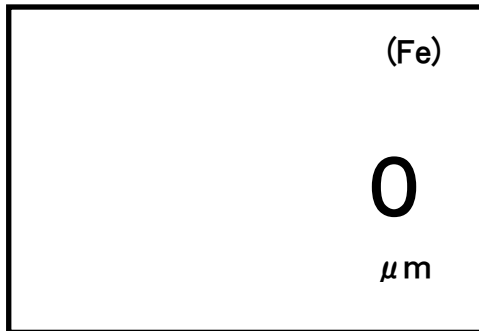
Remove the probe from 「Zero plate」



To finish press **Zero** key



The buzzer beeps.



It stops the DELETE function of **CAL/DELETE** key.

「Zeroing」 has completed (the zeroing letters disappeared) and it becomes possible to take measuring and adjusting operations of this unit.

- It is correct that numerical values measured by pressing the probe to the 「Zero Plate」 indicates 「0」 or in the neighborhood of 「0」.
When the measured value results in largely off 「0」 μm, please try again zeroing from the beginning.
- [LLLL] indicated on display during a time of zeroing means that the calibration point heavily deviates from the standard please make sure that the material is not in process of being built with others and repeat the zeroing in 2~4 times until a stable 「0」 is obtained.

Note:

The latest measured value replaces the previous ones and the new value of 「Zeroing」 is stored.

(6) 2-foil calibration when “Zeroing “ is difficult to perform.

In case zeroing is difficult to perform such as measuring the thickness of the film on the rough surface of Blast-steel plates, a calibration method using 2 different thicknesses of standard plates pinching a thickness of the object is defined as 「JIS K5600」Standard. This calibration method complies to the regulations.



Caution

It is not possible to use both this calibration method and other calibration ones together, or mixing them together. Should were the methods taken, measuring results could be the wrong values.

- Prepare the same blast-steel-plate in material as the objective base or, a rough face on non-ferrous base like aluminum and 2 different thicknesses of Thickness standards.

Please choose the suitable difference of thickness standards from the list below.

Predicting film thickness	Difference of thickness standard
~ 49.9 μm	10 μm or over
50.0 ~ 99.9 μm	25 μm or over
100.0 ~ 499.9 μm	50 μm or over
500 ~ 999 μm	199 μm or over
1.00 ~ 3.00 mm	0.5mm or over
3.01mm ~	2.0mm or over

Press and hold the **ZERO** key for 3 seconds.



The buzzer beeps.

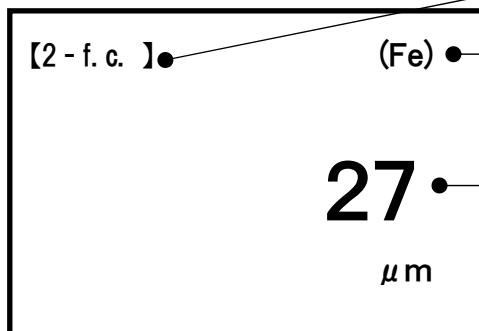
CAL/DELETE

key changes to one data “DELETE” function.



Stack the thicker 「Standard thickness」 on the substrate and press the probe on it.

The buzzer beeps whenever pressing the probe.



It reads that 2-foil calibration is under process.

It reads that a probe of 「FN-325」 or (Fe) series is connected to measure on a ferrous substrate.

Mean value

In case a measured value abnormally deviates, a press of

CAL/DELETE key + **▼** deletes the latest entry and displays the second latest.

All deletion indicates “ - ” on the reading.



↓
Press **ZERO** key afterwards.

↓
The buzzer beeps, beeps.

[2-foil's cal]
Use **▲** or **▼** ,
To set foil
thickness.
Afterwards,
press **ZERO** key.

A press of **▲** or **▼** key makes the buzzer
beep and a last measuring result appear on the reading.

↓
[2 - f. c.] (Fe)
27 • Mean value
 μm

Equate this reading value with thickness Standard (in this example, $25\ \mu\text{m}$)
by pressing **▲** or **▼** key.

[2 - f. c.] (Fe)
25 • Equate this value with the Thickness Standard.
 μm

A press of **▲** key increase a reading value.
A press of **▼** key decreases a reading value.
(Press and holding key goes fast forward)

After equating the reading value with the thickness standard , press **ZERO** key.
The buzzer beeps.



- Try measuring plural times in range of 1—20 times by pressing the probe on a thinner 「Thickness Standard」.
(a mean value is indicated whenever the probe is pressed)
- ◆ When repeating measurements 20 times, the buzzer beeps, beeps 2 times and afterward the unit does not accept any entry.

[2-foil's cal]
 Meseure thicker
 foil on metal
 several times.
 Afterwards,
 press **ZERO** key.

Press the probe on the thicker 「Thickness Standard」 stacked on the substrate.

The buzzer beeps whenever pressing the probe.



[2 - f. c.] (Fe)
 198
 μm

Mean value

In case the measured value abnormally deviates from the thickness standard, a press of **CAL/DELETE** + **▼** key deletes the latest entry and show s the second latest value on the reading. All deletions indicates “—” on the reading.



- Try measuring in the range of 2~10 times by pressing the probe on the thicker 「Thickness Standard」. (A mean value is indicated whenever the probe is pressed)

Press **ZERO** key after completion of measuring processes.
 The buzzer beeps, beeps.




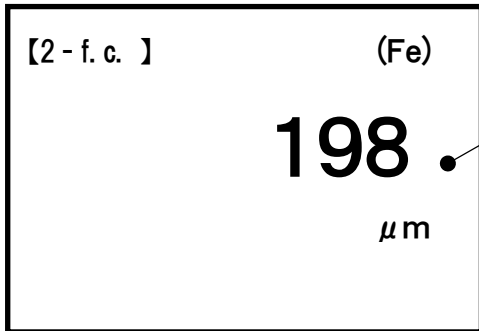
[2-foil's cal]
 Use **▲** or **▼** ,
 To set foil
 thickness.
 Then, ready for
 measure.

- ◆ When repeating measurements 20 times, the buzzer beeps, beeps and the unit does not accept any entry.




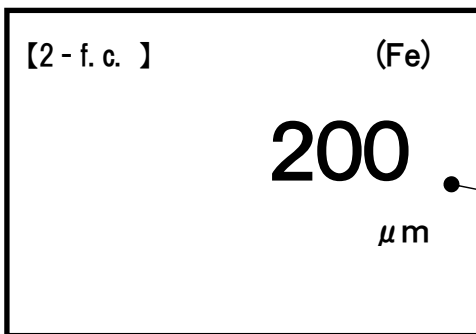
Press **▲** or **▼** key and the buzzer beeps ,and mean values up to the last measurement are displayed.


A press of  or  key makes the buzzer beeps, indicating the last measured value on the reading.




Mean value

Equate the displayed value with the thickness of Thickness Standard (in this example 200 μm) by pressing  key.

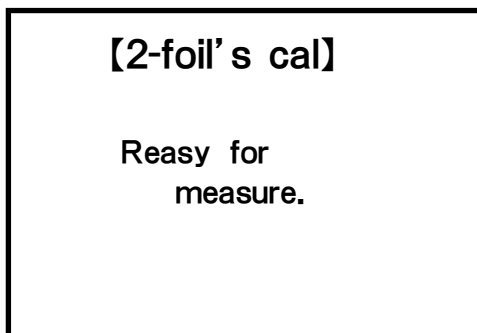


A press of  key increases a reading value.

A press of  key decrease a reading value. (Push and holding key goes fast forward.)

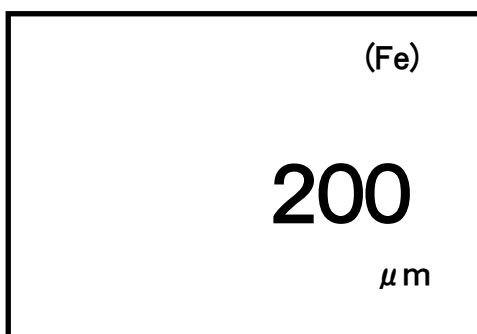
Equate the value with the Thickness Standard.

After adjusting to thickness of the Thickness Standard, Press  key. Then the buzzer beeps, beeps., beeps.



This is on display for about 0.5 seconds.

The buzzer beeps.



Measuring mode

- It is correct that numerical values measured by pressing the probe to the 「Thickness Standard」 placed on the substrate like a blast steel plate indicate 「O」 or in the neighborhood of 「O」.
- When the measured value results deviate largely from 「Thickness Standard」, please try again performing 2-foils calibration from the beginning.

Note:

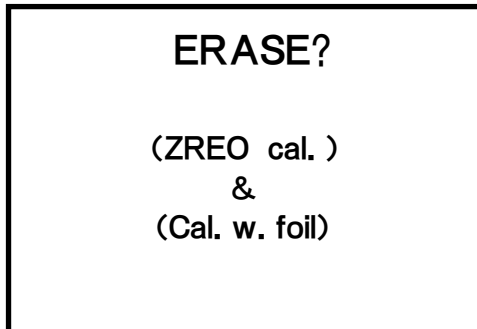
The new entry replaces the previous one and the last data measured with 「2-foils calibration」 is stored.

(7) How to delete calibration

Take the following procedures to delete calibration when the reading on the screen is locked or after batteries replaced or when it becomes impossible to process 「Zeroing」, 「Calibration Standard」(CAL).

When holding key , press key.

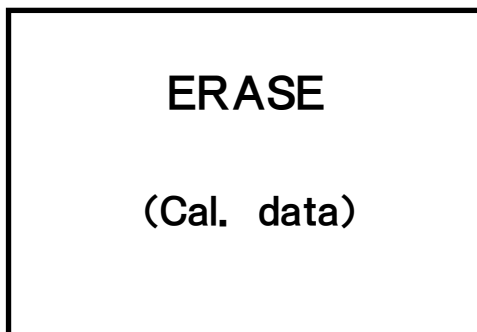
The buzzer beeps, beeps.



※Switch Power to Off when intrruptting the deletion of calibration.

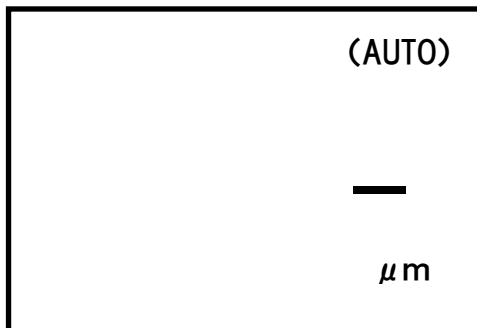
Press key.

The buzzer beeps, beeps.



The deletion of calibration is over.

The buzzer beeps, beeps.

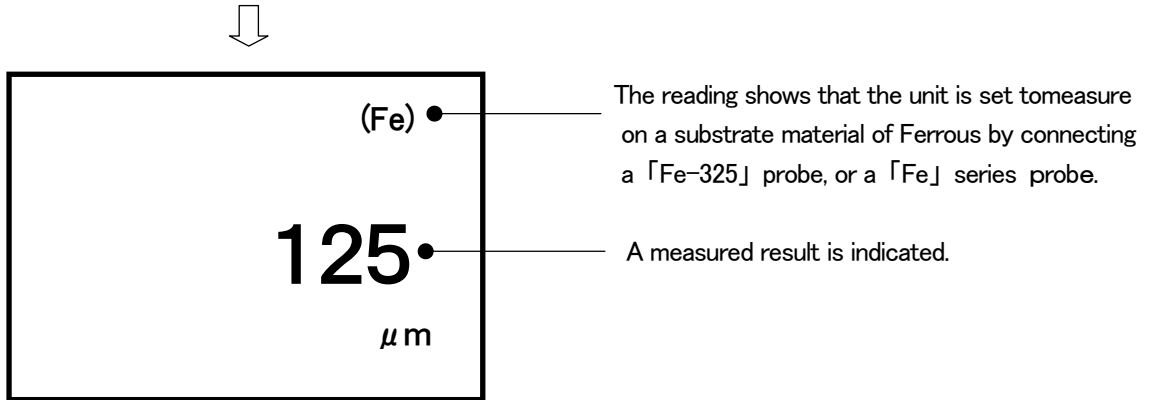


It becomes possible for this unit to take measurements and adjustment procedures.

After deleting,, take 「Zeroing」,「Calibration standard」 procedures proceeding to measuring.

Measuring

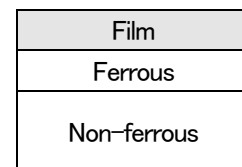
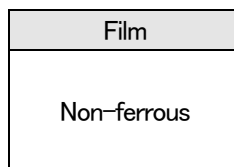
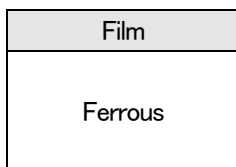
- ! Hang the meter through a strap over your wrist never to drop it.
When pressing the probe against the object, the buzzer beeps.



Each time a probe is pressed to an object the buzzer beeps and the measuring result is indicated.

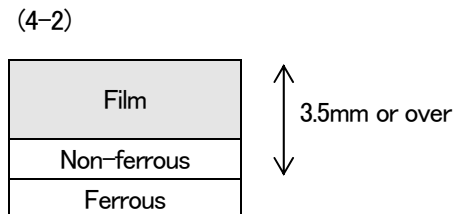
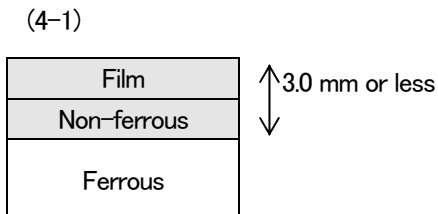
◆ Measuring of Auto-selection by 「FN-325」

- (1) Ferrous substrate Measuring of film thickness at Fe mode
- (2) Non-ferrous substrate Measuring of film thickness at NFe mode
- (3) Ferrous on Non-ferrous layered substrate Measuring at Fe mode regardless of Fe thickness



(4) Non-ferrous on ferrous layered substrate

- (4-1) Layered thickness non-ferrous and ferrous, 3.5 mm or less measure thickness of layered non-ferrous and film
- (4-2) Layered thickness non-ferrous and ferrous, 3.5 mm or over measure thickness of film

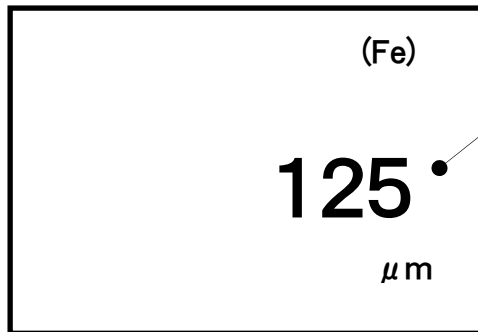
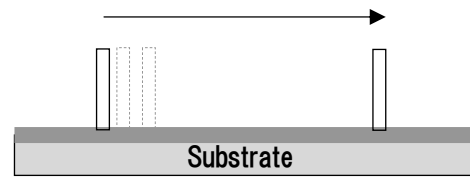


- Note:
- 「HHHH」 is indicated in a between-area of 2 different layers.
 - In case of adjusting by 「Calibration Standard」 foil on Ferrous substrate, 「Calibration Standard」 made of Non-ferrous such as Be, Cu can be used.
 - In case of an example of (4-1), thickness of film only can be measured at 「Non-ferrous」 mode.

Function switching

(1) Switching to Non-Interrupt Measurement Mode

Switch to「non-interrupt measurement mode」when it is necessary to slide a probe along the measuring surface of a substrate as illustrated on the right figure for continuous measurements of films.



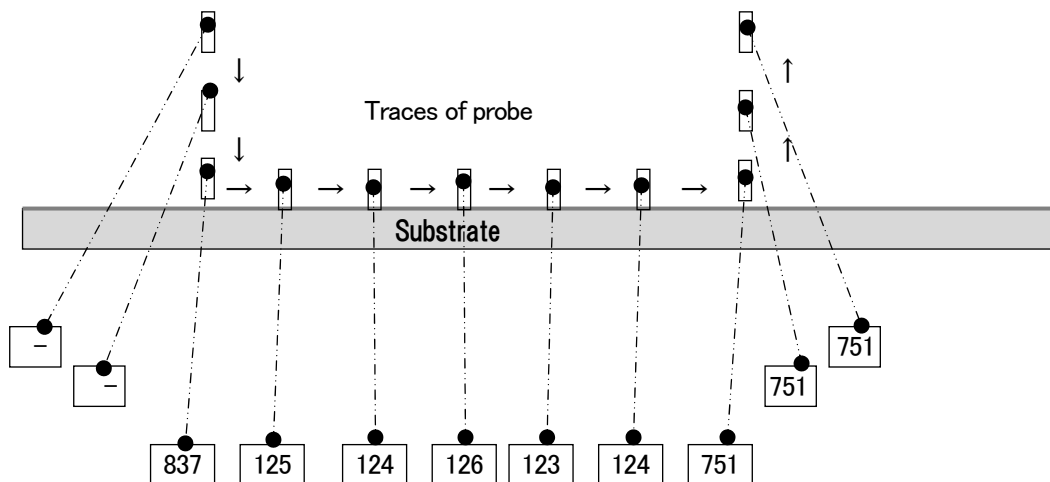
A measuring value is indicated and stored each time a probe is pressed in a normal state.

Hold **ZERO** key and press **▲** key.

The buzzer beeps, beeps 2 times.



This unit has turned into 「non-interrupt measurement mode」. Measurements can be made about 0.5 second intervals and the data is indicated with a beeping sound.



Measuring values on display (indicated successively each 0.5 second interval)

- The non-interrupt function is stored when switching Power to OFF, and can be maintained until re-activating to switch to ON.



Caution

Note that this measuring method may damage the measuring surface or the probe tip due to sliding frictions. Please try fewer to take this method to minimize the frictions.

《Returning to the beginning》

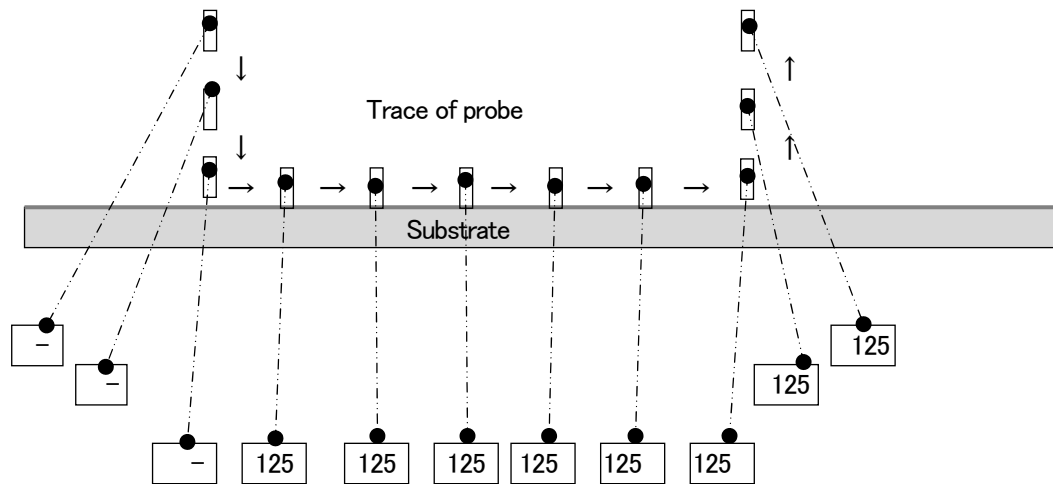
To return 「non-interrupt measurement mode」 to the beginning take the same procedures as at the initial setting.

Hold **ZERO** key and press **▲** key.

The buzzer beeps, beeps 2 times.



「non-interrupt measurement mode」 has been released and returned to the beginning.



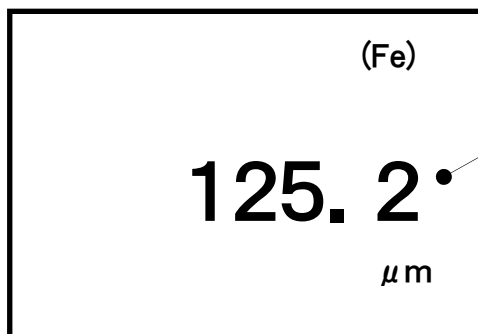
Measured values are stored until a next measurement is taken.

(2) Switching to Resolution

To inspect precisely a thickness up to $500\ \mu\text{m}$ it is possible to take solution measurements by switching to a $0.1\ \mu\text{m}$ ($0\sim 400\ \mu\text{m}$) unit, to a $0.5\ \mu\text{m}$ ($400\sim 500\ \mu\text{m}$) unit. In this case it changes resolution units by taking the following procedures.

- Switch Power to Off.
- Hold **CAL/DELETE** key and press **ON/OFF** key for 3 seconds or over until the buzzer beeps in the following.

The buzzer beeps, beeps.



Indicated :
 $0\sim 400\ \mu\text{m}$ by the $0.1\ \mu\text{m}$ unit,
 $400\ \mu\text{m}\sim 500\ \mu\text{m}$ by the $0.5\ \mu\text{m}$ unit.

■ This function is not released even if switching Power to OFF.

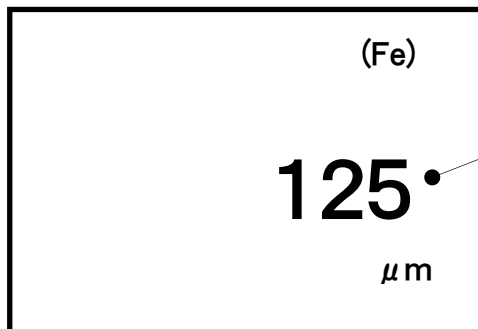
To return to the beginning, take procedures of “Returning to the beginning” described afterward.

《Returning to the beginning》

To return 「 $0.1\ \mu\text{m}$, $0.5\ \mu\text{m}$ 」 display resolution to the beginning take the same procedures as the above.

- Switch power to OFF.
- Hold **CAL/DELETE** key and press **ON/OFF** key for 3 seconds or over until the buzzer beeps in the following.

The buzzer beeps, beeps.

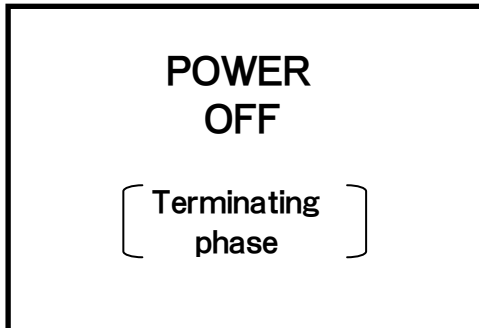


No indication under a decimal point
(The data is rounded off to nearest whole digit.)

(3) Setting of Auto-Power-Off

When no entry of key operations and measuring procedures for 3 minutes, the unit switches automatically to Off to save battery. This function can be released by the following operations.

No entry for 3 seconds continues, and then the buzzer beeps.




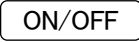
The message is indicated for about 5 seconds.



The buzzer beeps, and the unit is switched to off.

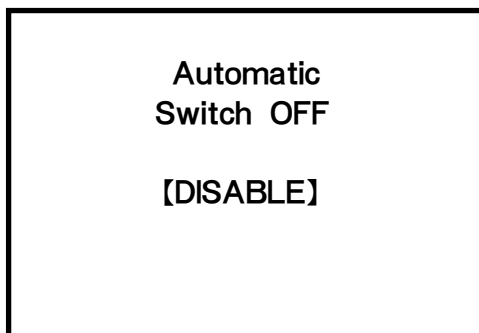
● To release Auto-Power-Off function

Switch to Off when Power is On.

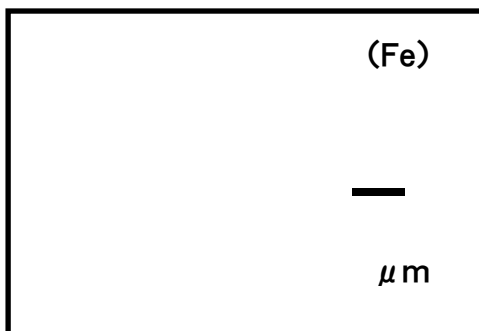
While pressing and holding  key, press  key for 5 seconds or over.



The buzzer beeps., beeps.



It indicates 5 seconds.



It returns to a measurable mode.


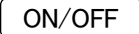
Power switches to Off when  key is pressed.

■ This function is kept even if Power source switched to OFF.

To enable it, take the operation procedure of "To enable Auto-Power-Off function".

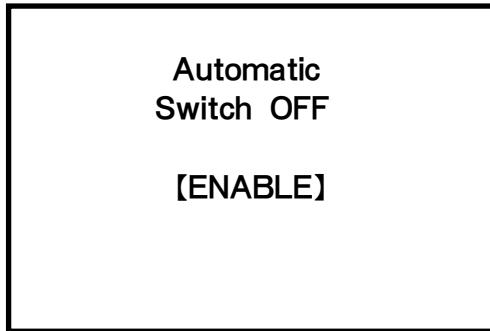
● To enable Auto-Power-Off function

Switch to Off when Power is On.

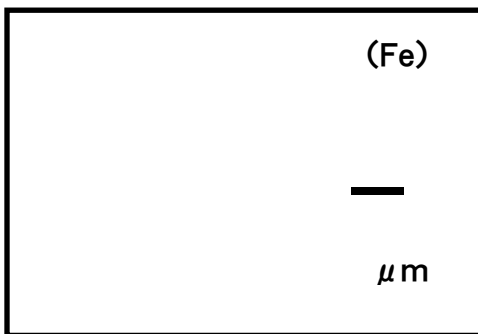
While pressing and holding  key, press  key for 5 seconds or over.



The buzzer beeps., beeps.



It indicates for 5 seconds.



It returns to a measurable mode.
Auto-Power-Off function can be functioned.

When no processing of any entry and key operation lasts for about 3 minutes,
the buzzer beeps and the unit is switched to OFF.

■ This function is kept even if Power source switched to OFF.

To disable it, take the operation procedure of “To disable Auto-Power-OFF function”.

■ AC adaptor is equipped with SWT-7100III as accessory, and even when it is used, the Auto-Power-OFF function is effective.

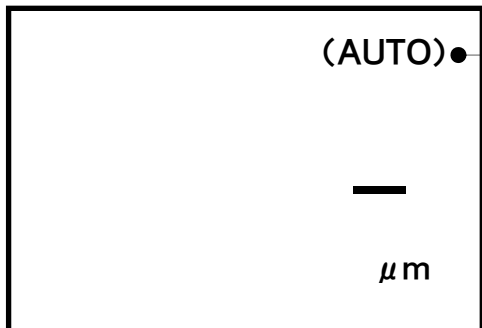
(4) Switching to a corresponding mode to substrate when using FN-325 probe

The unit is set to 「AUTO」 mode when FN-325 probe is connected. (EX-factory setting)

Setting can be switched in the procedures below.

And, modes change as shown below.

【EX-factory setting】

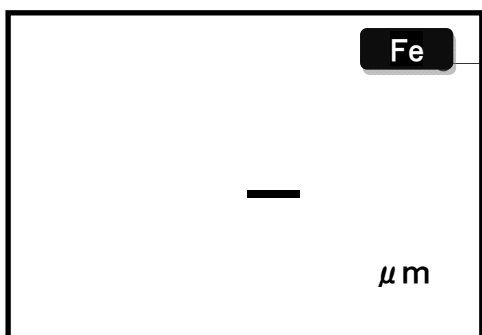


— Ferrous/non-ferrous auto-selection mode

Press and hold **CAL/DELETE** key for 3 seconds.



The buzzer beeps, beeps.



— Moving to a ferrous exclusive mode.

Press and hold **CAL/DELETE** key for 3 seconds.



The buzzer beeps, beeps.



— Moving to a non-ferrous mode.

By pressing and holding **CAL/DELETE** key it for 3 seconds it switches

AUTO → Fe → NFe → Auto →.....

Note: Exclusive Fe and NFe probes do not correspond to this item (4).

(5) ON/OFF of Backlight

This unit has a Backlight function.

The Backlight can be used at the place which is dark and difficult to read messages on display.

● Lighting the Backlight

Press and hold  key for 3 seconds



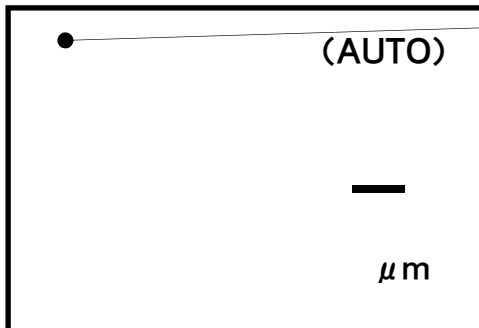
It is shown when the backlight is ON

● Lighting out the Backlight

Press and hold  key for 3 seconds



The buzzer beeps, beeps, and the backlight goes on.



The mark and backlight go off.

※This function is kept even when Power source switched to OFF.

Transferring data (SWT-7100Ⅲ)

Transfer data to a PC (personal computer) by using a USB cable

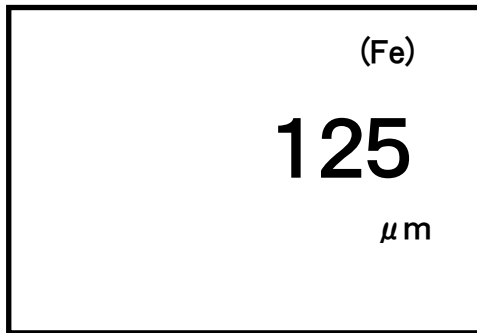
Refer to separately attached information for arrangements to install a driver into a PC side.

※Data is not transferred when the unit is set to 「Non-interrupt measuring mode」.

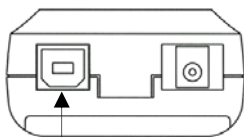
Please make sure that the unit is set to 「General measuring mode」

Outright transferring measured data

- Prepare for a PC side.
- Connect a USB cable to a PC.



- Data is sent out with a beeping sound whenever a measurement is taken.





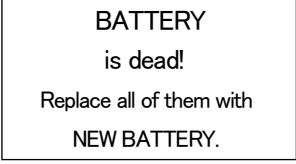

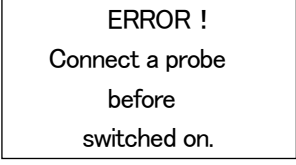
Connect USB cable to this outlet. The other part is connected to PC.

Note to improve measuring accuracy

- ① Zero plate
Prepare the same material, thick and sized plate as the measuring object for zeroing and calibration standard (CAL). Different materials may not bring about correct measuring results.
※As accessories to probe, “zero plates for zeroing” are for testing purpose only.
Select a most optimal zero plate to meet actually measuring objects.
- ② Thickness standard (foils)
Take calibration standard measurements using a Thickness standard which is thicker or as thick as the measuring films.
※Use of a calibration standard with a deviant thickness may cause errors.
Replace worn-out or bent plates with new ones. In case non-accessorized plates are necessary (over 16 μ m), contact a local sales office.
- ③ Quality of films to be measured
Magnetic metal contained films can not correctly be measured. In case of measuring elastic films, place a standard plate of 30~50 μ m thick on the object and subtract the thickness from the measuring value to avoid errors to be caused by elastic dents.
- ④ Measurements of edges or angles
Magnetic fields in the neighborhood of the edges/the angles of a measuring object become uneven. 15~20 mm closer part to the center of the object shall generally be measured.
Pay attention to protruded part, curved part or unexpectedly deformed part.
- ⑤ Measurements of rough faces
Roughness of a substrate, a measuring face affects measuring results.
Take a mean value by measuring several places at a time.
- ⑥ Measurements of stretched part on faces
In some case stretched, rolled part occurred on a substrate, which may cause measuring errors.
Take a mean value by measuring several places at a time.
- ⑦ Temperature
Operating temperature range is 0~40 °C Especially difference between a main unit and a probe causes measuring errors.
- ⑧ Residual magnetism, stray magnetic fields
Pay attention to transportation method of electromagnets, residual magnetism on substrates or arc welding, those of which emit strong magnetic fields to cause measuring errors.

Trouble Shooting






Before contacting us please check with the following points.

Symptoms	Points to check	Measures to be taken
No response upon press of ON/OFF key.	Are batteries worn out?	Replace them with new ones (2 ea.)
No response after replacing batteries and pressing a key	Something wrong inside a meter	Contact us for repair
	Batteries is shorting.	They can be used for a while. Prepare for new batteries.
	Batteries have worn out.	Replace them with new one
	Out of batteries	Replace new batteries
	Started pressing probe to object soon after switching on.	Hold probe in air, keeping it away off objects, metals during a time of the message on screen .
	Press ON/OFF key without connecting probe	Press ON/OFF key after being sure of connecting probe.

Symptoms	Points to check	Measures to be taken
<p style="text-align: center;">TROUBLE !</p> <p>The probe may have trouble. Change it to the other one.</p> <p style="text-align: center;">《Power OFF》</p>	Something wrong with probe	Contact us for repairs
<p style="text-align: center;">TROUBLE !</p> <p>The probe and the main unit may have trouble. Repairing needed.</p> <p style="text-align: center;">《Power OFF》</p>	Something wrong with probe, and main unit	Contact us for repairs
Unable to transfer data.	<p>① Faulty connection of USB cable. or broken wiring.</p> <p>② PC side is not ready to operate.</p>	<p>① Confirm to connect cable firmly.</p> <p>② (1) Install attached CD correctly. (2) Set Comport No.correctly.</p>
Sudden interruption of data transfer.	<p>① Something wrong with PC side.</p> <p>② Nothing wrong with PC side → something wrong with main unit, cable.</p>	<p>① Check if something wrong with PC side.</p> <p>② Contact our sales office for Repair.</p>

Specifications

◆ Unit

Items	Applications
Model names	Dual (electromagnetic / eddy current) SWT-7000III, SWT-7100III
Display method	Graphic LCD (data · message), Backlight
Ranges	Depending on optional probes
Calibrations (CAL)	2 points calibration type Zeroing : for substrate Calibration point : substrate and standard thicknesses
Additional functions	① Switching measuring modes (hold / non interrupt) ② Auto Power Off (3 min.), releasing and reactivating ③ ON/OFF of backlight ④ Switching display resolutions ⑤ Setting exclusive mode corresponding to substrate (only connecting with FN-325 probe). ⑥ USB connections (SWT-7100III only)
Keys	 、  、  、  、 
Power	3V DC (LR6 × 2) 、 SWT-7000III, SWT-7100III, Continuous operation hours about 50 hours (SWT-7100III : with exclusive AC adaptor)
Operating Temperature	0 ~ 40 °C (Non-condensing)
Accessories	Dry battery, Carrying case, 7100:III AC adaptor , USB cable, USB driver (CD)
Optional	For ferrous substrate probe (Fe), for nonferrous substrate probe (NFe), for either ferrous or non-ferrous substrates probe (FN-325)
Dimensions	72(W) × 32(H) × 156(D)mm
weight	200g

◆ Probe (option)

Models	FN-325
Methods	Dual electromagnetic/eddy current (Auto-selection substrate)
Ranges	Ferrous: 0~3.00mm, Nonferrous: 0~2.50mm
Display Solutions	Both ferrous/nonferrous 1 μ m: 0~999 μ m by switching Both ferrous/nonferrous 0.1 μ m: 0~400 μ m、 Both ferrous/nonferrous 0.5 μ m: 400~500 μ m Ferrous substrate 0.01mm:1.00~3.00mm Nonferrous substrate 0.01mm: 1.00~2.50mm
Accuracies (on flat face)	Both ferrous/nonferrous 0~100 μ m: $\pm 1 \mu$ m or within $\pm 2\%$ the reading value Ferrous substrate 101 μ m~3.00mm: within $\pm 2\%$ Nonferrous substrate 1.00~2.50mm: within $\pm 2\%$
Probes	One point contact constant pressure type, with v-cut shape, $\phi 13 \times 52$ mm
Options	V type probe adaptors※
Accessories	Standard thickness foils. Zero plate for testing (for ferrous/nonferrous)
Measuring objects	Ferrous substrate: Coating, lining, thermal spray film, plating (except electrolyte nickel plating), etc. on magnetic metal substrates like ferrous, steel, etc. Nonferrous substrate: Insulated films etc. on non-magnetic metal substrates like aluminum, copper, etc for comparatively general measuring objects.

※ V type probe adaptor has 3 different sizes, (for $\phi 5$ or less, $\phi 5 \sim 10$, $\phi 10 \sim 20$).

◆ Probe (option)

Models	Fe-2.5※ /Fe-2.5L	Fe-2.5LwA	Fe-10	Fe-20
Methods	Magnetic inducing type			
Ranges	0~2.50mm		0~10mm	0~20mm
Display resolutions	1 μm: 0~999 μm Switching to 0.1 μm: 0~400 μm, 0.5 μm: 400~500 μm 0.01mm: 1.00~2.50mm		1 μm: 0~999 μm 0.01mm: 1~10mm	1 μm: 0~999 μm 0.01mm: 1~5mm 0.1mm: 5~20mm
Accuracies (on flat face)	0~100 μm: ±1 μm or within ±2% the reading value 101 μm~2.50mm: within ±2%		0~3mm: ±(5 μm+ 3% the reading value) 3.01mm or over: within ±3% the reading value	
Probes	One point contact constant type, V cut 2.5: φ13 × 48mm 2.5L: 18 × 23 × 67mm	One point contact constant type, Measuring part: 20 × 57mm Full length: 550~1.550mm (flexible)	One point contact constant type, V cut φ18 × 47mm	One point contact constant type, V cut φ39 × 59mm
Option	V type probe adaptor※2 /—	—	—	—
Accessories	Standard thickness foils Zero plate (ferrous)	Standard thickness foils, Zero plate (ferrous) Carrying case	Standard thickness foils, Zero plate (ferrous)	
Measuring objects	Coating, lining, thermal spray film, plating (except electrolyte nickel plating), etc. on magnetic metal substrates like ferrous, steel, etc.	Coating, lining On high/hard t-to-reach/remote place on magnetic metal substrate like iron, steel.	On magnetic metal substrates like iron/steel For relatively thick objects	For thick objects

※Probes are heat-resistant (about 200 °C). (Fe-2.5)

※2: V type probe adaptor has 3 different sizes, (for φ5 or less, φ5~10, φ10~20).

◆For details please contact us for other various types of probes.

◆ Probe (option)

Models	Fe-0.6Pen	NFe-2.0※ /NFe-2.0L	NFe-0.6	NFe-8
Methods	Magnetic inducing type	Eddy current type		
Ramnges	0~600 μm	0~2.00mm	0~600 μm	0~8.00mm
Display solutions	1 μm:0~600 μm Switching to 0.1 μm:0~400 μm、 0.5 μm:400~500 μm	1 μm:0~999 μm Switching to 0.1 μm:0~400 μm、 0.5 μm:400~500 μm 0.01mm:1.00~2.00mm	1 μm:0~600 μm Switching to 0.1 μm:0~400 μm、 0.5 μm:400~500 μm	1 μm:0~999 μm 0.01mm:1~8mm
Accuracies (on flat face)	0~100 μm: ±1 μm or within ±2% the reading value 101 μm~600 μm: Within ±2%	0~100 μm: ±1 μm Or within ±2% the reading value 101 μm~:2.00mm Within ±2%	0~100 μm: ±1 μm Or within ±2% the reading value 101 μm~600 μm: Within ±2%	0~3mm: ±(5 μm+ 3% the reading value) 3.01mm or over: within ±3% the reading value
Probes	One point contact constant type, V cut φ5.6×94mm	One point contact constant type, V cut 2.0: φ13×47mm 2.0L: 18×23×67mm	One point contact constant type, V cut φ11×48mm	One point contact constant type, V cut φ35×61mm
Options	—	V type probe adaptor※2 /—	—	—
Accessories	Standard thickness foils, Zero plate for testing (ferrous)	Standard thickness foils, Zero plate for testing(nonferrous)		
Measuring objects	Coating, lining, thermal spray film, plating (except electrolyte nickel plating), etc. on magnetic metal substrates like ferrous, steel, etc.	Insulated films etc. on non-magnetic metal substrates like aluminum, copper For relatively general measuring objects	For high stability like narrow bars, tubes, minute piece, etc.	For elatively thick oobjects

※Probes are heat-resistant (about 200°C). (NFe-2.0)

※2: V type probe adaptor has 3 differnet sizes, (for φ5 or less, φ5~10, φ10~20).

◆For details please contact us for other various types of probes.

Reference (Principle of measurements)

● Electro-Magnetic type

When metals approach to AC- magnetic fields emitted from probe, the metal and the magnet pull each other.

It makes the pulling force stronger as they come closer.

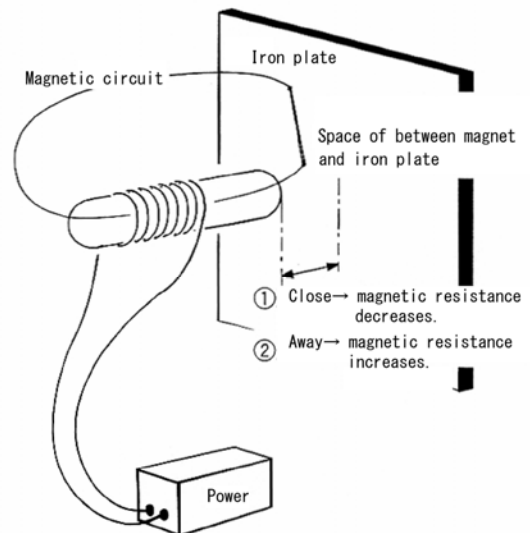
In other words, it makes the magnetic density higher as they come closer. On the contrary, it weakens the magnetic density as they move away from each other.

This symptom means that magnetism emitted from probe has Higher Transferability when they come closer, and lower Transferability when they move away from each other.

These levels of transferability of the magnetism co-relate with thicknesses of films coated on substrates.

By analyzing correlations of transferability/less transferability (Reluctance), and thicknesses of the films on the substrates, the correlated values can be converted to the thickness, actually by measuring the Reluctance to be processed.

Because it is difficult to observe and measure magnetic volumes, it is necessary that the Reluctance volumes be converted to electric volumes using coils and methods of the Principle of Electromagnetic Induction so that the measured values can be processed and converted to the thickness values.



● Eddy Current Type

The eddy current is induced on the surface of metals when metals approach to alternating current fields emitted from probe.

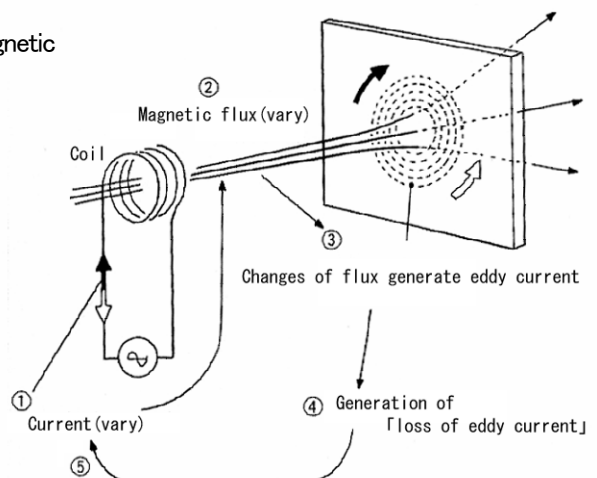
As the metal comes closer to the probe, the eddy current increases and the magnetic field density becomes high.

On the contrary, as the metal move away from the probe, the eddy current decreases and the magnetic density becomes low: Correlations of between density of magnetic field and film thicknesses on the substrate are analyzed beforehand.

It measure the thicknesses by converting to the thickness value from the magnetic density measured through the above correlations.

Because it is difficult to observe and measure the density of a magnetic field, it is necessary that a coil be put in magnetic fields

and converted to electric volumes for measurements using the Principle of Electromagnetic Induction so that the measured value can be processed and converted to the thickness value. Generally in the eddy current type, it varies in measurement range on non-magnetic substrate by dividing substrates by a high-wave transferable like Alumi and Copper and non-transferable like irons to optimize the measurement methods.



Products sold:

Sales of Coating thickness meter, Pinhole detector,
Condensator, Viscosity cup, Moisture meter,
Needle detector, Iron piece detector

Manufacturer:

Sanko Electronic Laboratory Co., Ltd.

Tokyo branch : Shibata Bldg., 2-6-4, Uchikanda, Chiyoda-ku, Tokyo 101-0047, Japan

Tel 81-3-3254-5031 Fax 81-3-3254-5038

Osaka branch : Konishi Bldg., 2-3, Sugawara-cho, Kita-ku, Osaka 530-0046, Japan

Tel 81-6-6362-7805 Fax 81-6-6365-7381

Sendai Branch : Bonuer Est, 72-2 Teppo-cho, Miyagino-ku, Sendai 983-0861 Japan

Tel: 81-22-292-7030 Fax: 81-22-292-7033

Nagoya branch : Meihoku Bldg., 3-11-27, Kinjo, Kita-ku, Nagoya 462-0847, Japan

Tel 81-52-915-2650 Fax 81-52-915-7238

Fukuoka branch : 11-11 Naraya-cho, Hakata-ku, Fukuoka 812-0023, Japan

Tel 81-92-282-6801 Fax 81-92-282-6803

Head office : 1677 Hisasue, Takatsu-ku, Kawasaki 213-0026, Japan

Tel 81-44-751-7121 Fax 81-44-755-3212

URL <http://www.sanko-denshi.co.jp> E-mail info@sanko-denshi.co.jp