



SANKO Coating Thickness Meter SWT—7000IV Instruction Manual



Caution

- Read the manual thoroughly and use the meter correctly.
- Keep the manual with care and refer to it when necessary.

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Attention for safety (to use safely and correctly)

To prevent you and your properties from damaging please take some time to read thoroughly this “Attention for Safety” and use this main unit correctly.

And keep these instructions attentive to read when necessary.



-  ● Do not dump nor wet the main unit in water, otherwise it may cause malfunctions.
Prohibition Please contact our distributor or sales office should submerged water into the main unit.
-  ● Do not insert metals or foreign substances into the main unit, otherwise it may cause malfunctions.
Prohibition Please contact our distributor or sales office should put any metals or foreign substances in the main unit.
-  ● Do not insert a screwdriver into the connector, otherwise that it may cause malfunctions.
Prohibition
-  ● Do not throw, smash, drop the main unit, otherwise it may cause injuries, damages, malfunctions.
Prohibition
-  ● Never dismantle or modify the main unit by yourself, otherwise it may cause errors reactions or damages.
Prohibition
-  ● Do not use AC adaptors other than an exclusive adaptor for this main unit.
Prohibition ✘ And do not use volatage other than the specified voltage, otherwise it may cause damages, electric shocks, fires.
-  ● Keep the terminal of AC adaptor from conductive substances or dirt, otherwise it may cause short circuits, electric shocks, ignitions and 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 damages, breaking wires, short circuits, electric shocks, fires.
Prohibition

Attention for safety (to use safely and correctly)




Warning


- ! ● Never fail to remove batteries from the main unit when not in use for a long time.
Must Leakages occurred from deterioration of batteries may cause erroneous reactions or damages.
- ! ● Be sure to read this book on the item of 「How to fit batteries」 to replace batteries.
Must
- ! ● Store batteries in a place where pets and children are incapable of handling them.
Must Please call a doctor like in a case that a battery is swallowed.
- ! ● Do not put batteries into fire or water. Store them in a cool, dry and dark place avoiding flames, high
Must temperature and moisture.
- ! ● 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 specified, new batterie (watch: battery life).
Must Some special dry batteries (nickel batteries) may not work properly.
- ! ● 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 cloths to replace batteries.
Must And do not touch the leaked liquid and wash skins or clothes in case they are contaminated.
- ! ● Comply to regulations and laws in your neighbors when disposing of them.
Must
- ! ● Insert a plug of the AC adaptor to the full end.
Must And do not use faulty or loose receptacles, otherwise it may cause electric shocks and fires.
- ! ● Switch to OFF and unplug the AC adaptor from the receptacle to avoid electric shocks and
Must injuries when inspecting or cleaning the main unit.


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, otherwise it may cause malfunctions or injuries.

Prohibition
-  ● Keep the meter away off rubber-made articles or vinyl articles. A lengthy contact between the meter and them may cause stickiness and it may be difficult to get rid of them.

Prohibition

Notes

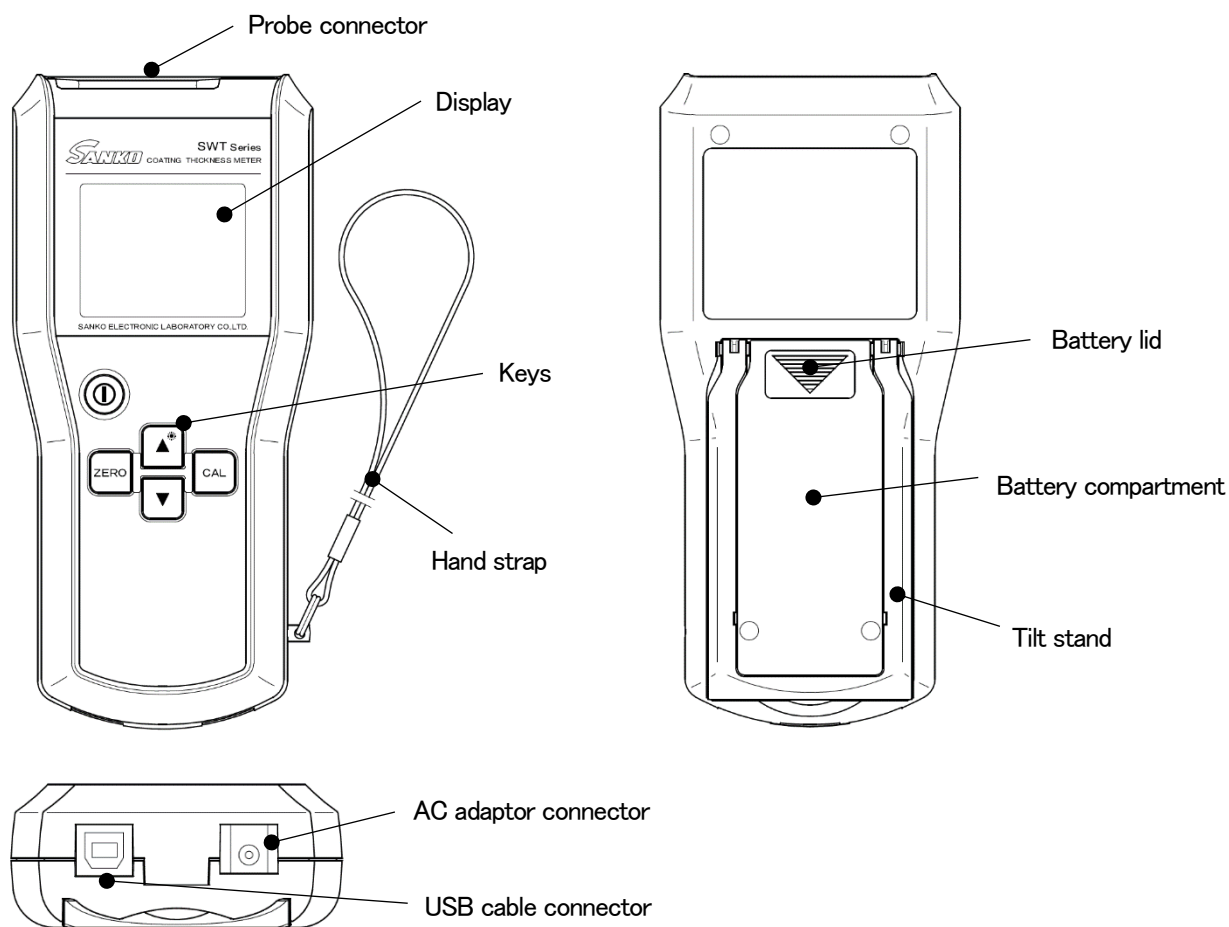
- Please read this manual thoroughly for correct operations before getting started.
- This meter is a precision gauge. Please handle with care.
- Do not tug, bend, fold or curl up forcefully the cables of probes.
- Do not knock or scratch objects with the tip of a probe.
- Keep the tip of a probe clean. 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 us for a periodical inspection.
- Keep the meter away off electric noises, shocks or magnetic fields when in a use, otherwise it may cause malfunctions.

Get started

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

- Main unit
SWT-7000IV
- Dry batteries LR6 (2 pieces)
- SWT/SAMAC series CD
 - ◆ SWT-7000IV Instruction Manual (this manual)
 - ◆ USB driver
 - ◆ Installation of USB transfer driver
- Inspection certificate (warranty)-cum-user registration sheet
(This warranty is valid only in Japan)
- Hand strap cord (attach directly to main unit)
- Carrying case for main unit

◆ Names of part



● Probe connector





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

- (1) To measure a film thickness of coated, plated, lining layer on substrates made of ferrous material please use a probe of 「SFe」 series for the connection.
- (2) To measure a film thickness of coated, lining layer on substrates made of non-ferrous materials such as Aluminum, etc. please use a probe of 「SNFe」 series for the connection.
- (3) To measure a film thickness on a coated metal substrate made of either ferrous or non-ferrous please use a Dual type probe 「SFN-325」.

● Display

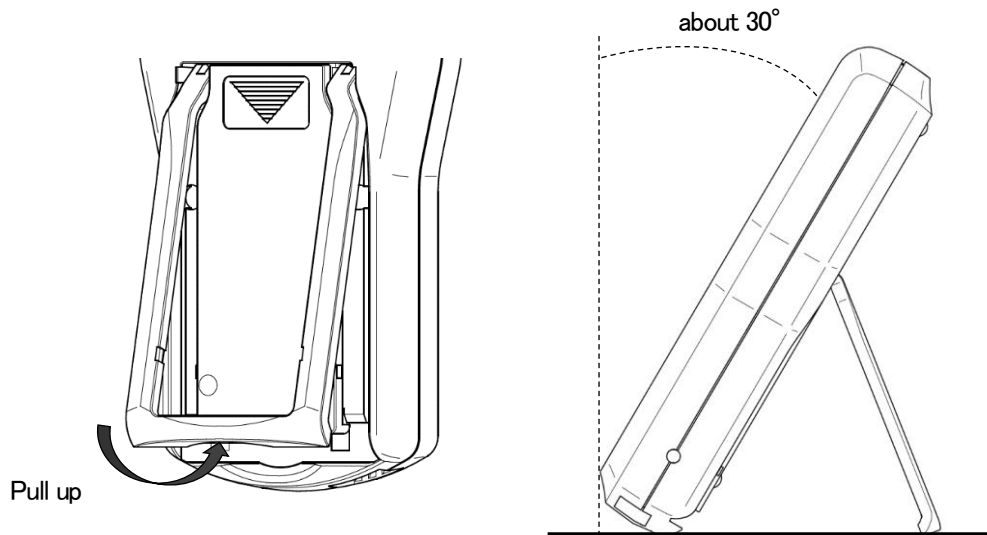
It indicates measurement results, operation guides, or malfunction status. With a backlight.

● Keys

- (1) 「」 (Power source) key
It switches ON or OFF.
- (2) 「ZERO」 key
To set a ZERO point of substrate before measuring.
- (3) 「」 key, 「」 key
They are a Backlight key / an adjusting key to set a neumericall value for standard adjustments.
- (4) 「CAL」 key
This is to start up and finish the Calibration standard, and delete an abnormal value taken during adjustment process.
(activates only when 「Zeroing」, 「Calibration standard」 is processed with combination with 「」 key)

※ Power source key /operation keys activate setting of various kinds of functions in combination with other keys.

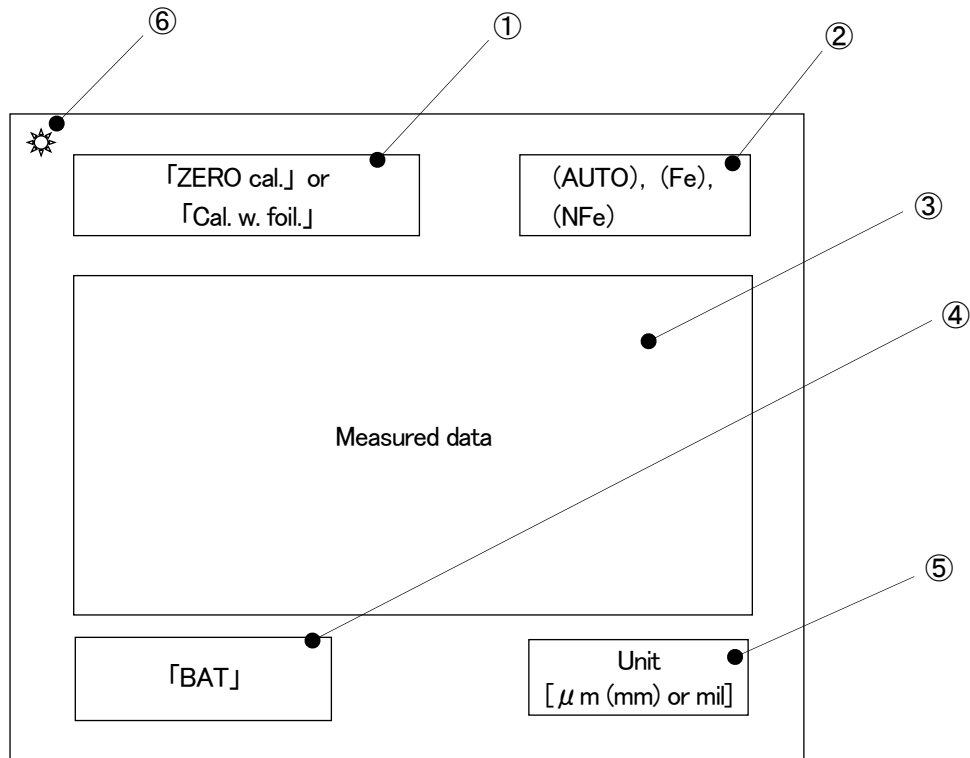
- Hand strap
Hang the meter through a strap over your wrist never to drop it.
- AC adaptor connector
A connector to connect the AC adaptor (option).
- USB cable connector
A connector to connect the USB cable (option) for data transfer.
- Battery compartment
It contains 2 pieces of dry battery (LR6).
- Tilt stand
Set up the tilt stand to use this meter in a raised position.



Caution

- The tilt stand does not come off. Do not remove it forcibly.
- The tilt stand cannot be used when AC adaptor or USB cable are connected.

◆ Items displayed on LCD



- ① Indicates 「ZERO cal.」 (Zeroing) or 「Cal. w. foil.」 (Calibration Standard), 「2-foil's cal.」 when in process. It never appears on the reading except when in process of these adjustments.
- ② At Auto Selection mode, one of the three (AUTO), (Fe), and (NFe) is displayed. At Corresponding mode to substrate, **Fe** is displayed when being setting for exclusively Ferrous substrate, **NFe** for exclusively Non-ferrous substrate.
- ③ Measured data is displayed.
- ④ **BAT** mark is displayed with 2 steps when battery has run out for replacement.
- ⑤ Setted unit is displayed. "μ m" display automatically switches to "mm" display when it exceeds 999 μ m.
- ⑥ Backlight: The light goes on when Backlight is set to ON.

◆ How to fit batteries

- ① Raise the tilt stand.
 - ② Open the battery lid on the rear of the main unit.
Press 「▽」 mark on the top of the lid and slide it down.
 - ③ Insert batteries.
Ensure correct battery polarity ⊕, ⊖ for placement.
 - ④ Close the battery lid and put the tilt stand back.
- ※ When changing batteries and inadvertently switching ON, but that is not defective at all.



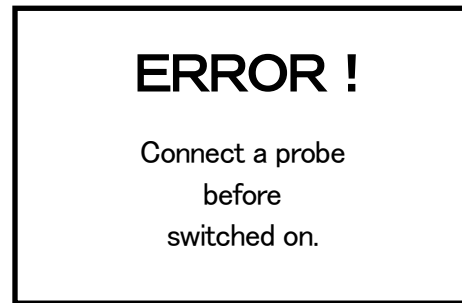
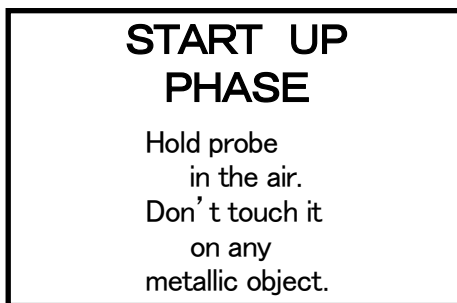
Caution

- Use specified 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 different types of batteries.
- Take out batteries to store when not in use for a long absence, or that may cause leakages to breakdown.
- Keep batteries away from pets and children.
- Comply to the regulations and laws in your Local Authorities when disposing of batteries.

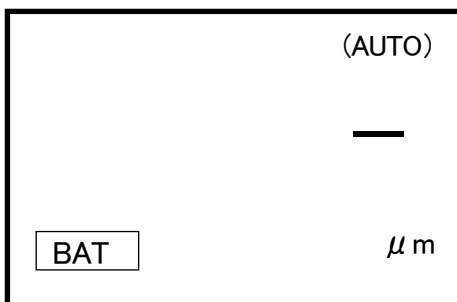
◎ About reading display



- When placing batteries in the main unit, the messages and warning below on the screen may be displayed. And these are not breakdowns, wait until the reading disappears with a beeping sound.
- ※ When connecting or disconnecting probe please switch Power source to OFF.



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



← **【In case of SFN-325 probe connected】**

After Power source switched to ON at Auto mode, (AUTO) is displayed on the screen and when setting exclusively for Fe substrate, or NFe substrate, Fe for a ferrous substrate, NFe for a non-ferrous substrate is displayed.

Also, displayed (Fe) when SFe-probe is connected, and (NFe) when SNFe-probe is connected.

◆ How to connect, disconnect probes

◆ Connect an optional, exclusive SWT probe to the main unit

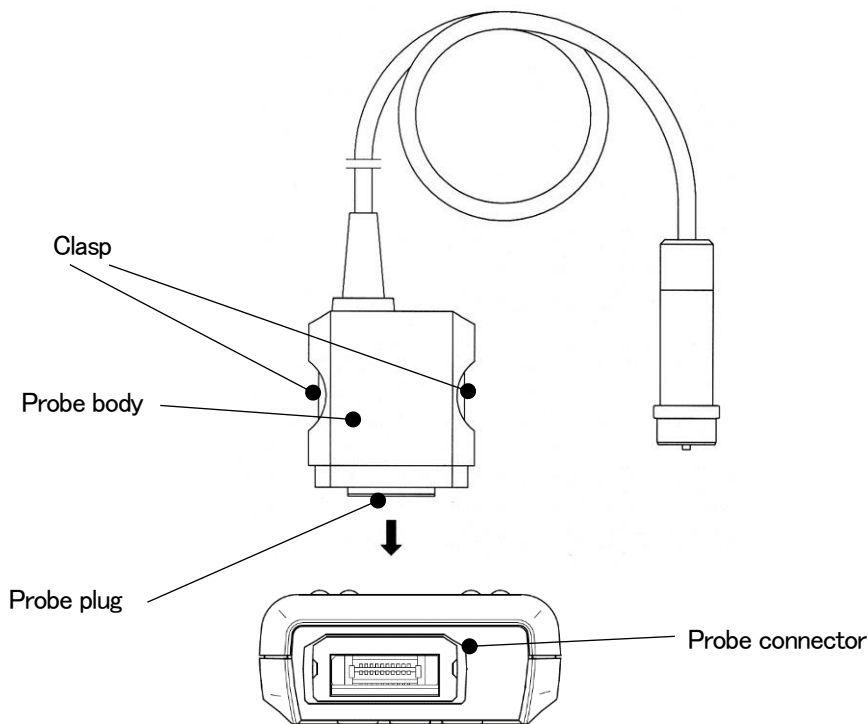
Select one of the probes suited for your application.

- ◇ If the substrates made of ferrous material, please use a probe of 「SFe」 series or a Dual type probe 「SFN-325」.
- ◇ If the substrates made of non-ferrous materials such as Aluminum, please use a probe of 「SNFe」 series or a Dual type probe 「SFN-325」.

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

Make sure of aligning the keyway, push the connector into place until the clasps are locked.

※ If the direction is reversed, it will not enter.



◆ Remove the exclusive probe from the main unit.

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

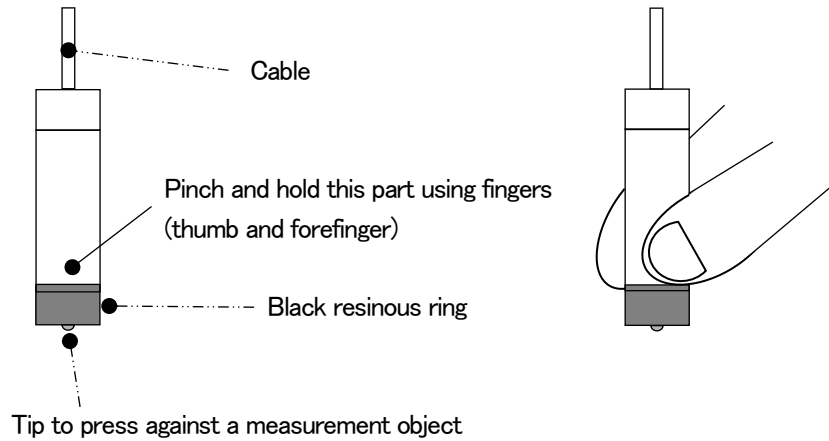
※ Do not pull off by force or it may cause damages.

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

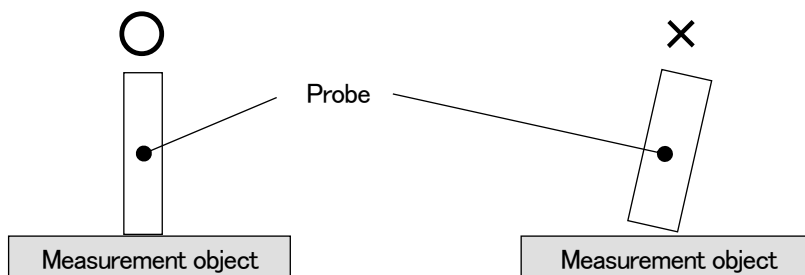


Quickly and calmly press perpendicular against the object by grabbing the probe as illustrated. It beeps and the reading screen shows the measuring result.

When it does not beep, lift it 5~7 cm above the object and try again to take measurements.

◆ 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 perpendicular 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.



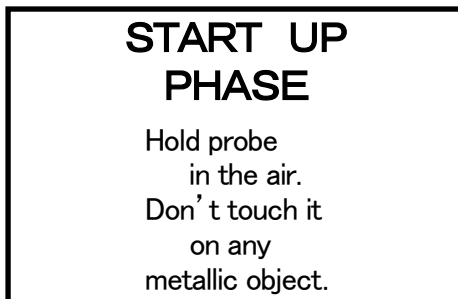
Caution

- 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  key.



The buzzer beeps.

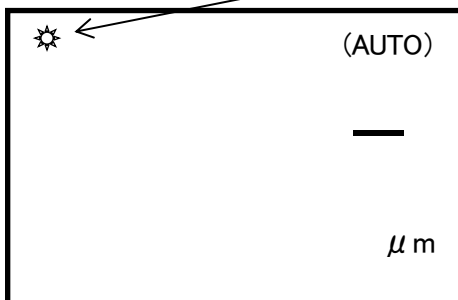
This message lasts for about 3 seconds.





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 Backlight mark is displayed when ON.



【In case of SFN-325 probe connected】

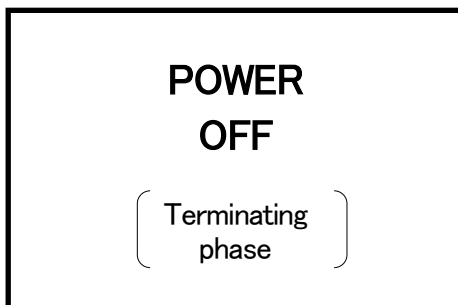
After Power source switched to ON at Auto mode, (AUTO) is displayed on the screen and when setting exclusively for Fe substrate, or NFe substrate,  for a ferrous substrate,  for a non-ferrous substrate is displayed.

Also, displayed (Fe) when SFe-probe is connected, and (NFe) when SNFe-probe is connected.

(2) How to switch off

Press  key.

The buzzer beeps.



The message lasts for about 2 seconds.



Caution

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

The buzzer beeps and this main unit is switched to OFF.

(3) Zeroing

After switching ON, it is capable of getting started on measurements and adjustments when the reading 「START UP PHASE...」 disappeared.

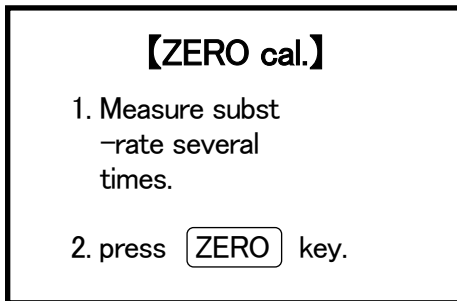
※ Generally, the meter makes errors depending on material formation and shapes to be measured.
To minimize measurement errors and obtain as accurate results as possible please be sure of carrying out 2 kinds of adjustments of 【Zeroing】 and 【Calibration standard】 before measuring process.

※ Prepare the identical material and shape to a measuring object.
(This is designated as a 「Zero plate」.)

Press **ZERO** key.

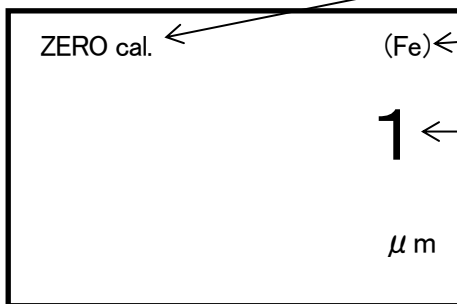
The buzzer beeps.

CAL key changes to one data “deletion” function.



Press the probe to the Zero plate.

The buzzer beeps.



Zeroing is in process.

The measuring object is set for ferrous metal substrate.

Measured a mean value

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

Remove the probe from 「Zero plate」.



After pressing certain times or 20 times,
press **ZERO** key.



● Repeat a measuring processes, 1~20 times by pressing the probe to the 「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 new entry is no more accepted.

The buzzer beeps.

It stops the “deletion” function of **CAL** key.



The reading **[ZERO cal.]** in the upper left disappears.
Zeroing completed and the main unit becomes possible to take measuring and adjusting operations.

- Press the probe to the 「Zero plate」 several times and make sure the measuring result indicates in the neighborhood of “0”.
When the measured value results in largely off “0”, please try again zeroing from the beginning.
There is a case when calibration is not correctly made.
- “LLLL” displayed on the screen during a time of zeroing means that the calibration point heavily deviates from the standard.
Please make sure that the metal substrate is not processed with other materials such as plating and repeat the zeroing until a stable in the neighborhood of “0” is obtained.
- ※ After performing Zeroing, the previous 「Zeroing value」 is deleted, and the last entry of 「Zeroing value」 is stored.

(4) Calibration standard (CAL)

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

The buzzer beeps.



【Cal. w. foil】

1. Measure thick-ness of foil several times.
2. With **▼** or **▲**. Adjust just to thickness of foil
3. press **CAL** key.

CAL key changes to one data “deletion” function.

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

Press the probe to the Thickness standard on the Zero plate.
It beeps whenever pressing.



cal. w. foil (Fe)

102

μm

Calibration standard is in process.

The measuring object is set for ferrous metal substrate.

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

- Repeat a measuring processes, 1~20 times by pressing the probe to the 「Thickness standard」 on the 「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 new entry is no more accepted.

Adjust the reading value to the Thickness standard (in this case, 100 μm) by pressing

▲ or **▼** key.



cal. w. foil (Fe)

100

μm

Pressing **▲** or **▼** key interrupt the “deletion” function of **CAL** key.

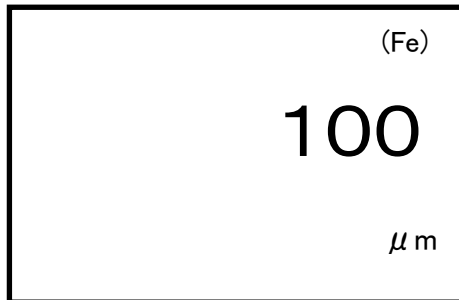
Pressing **▲** key increases the reading value.

Pressing **▼** key decreases the reading value.
(Press and holding key turns to fast forwarding.)

Adjust the reading value to the Thickness standard.

After adjusting the reading value to the Thickness standard,
press **CAL** key.

The buzzer beeps, **[cal. w. foil]** on the upper left disappears
and it returns to a measuring mode.

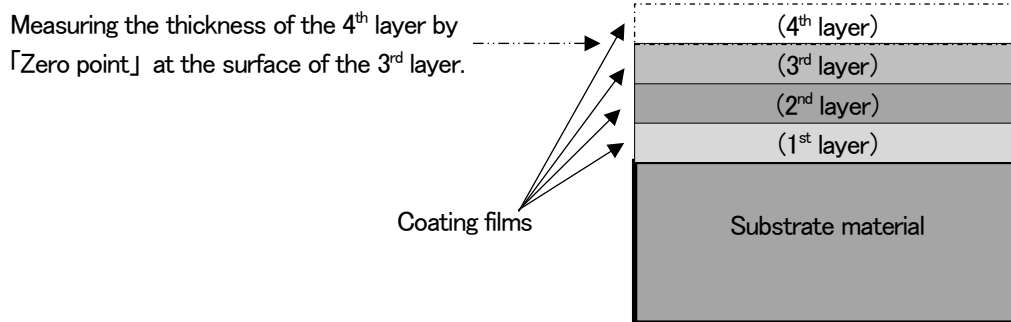


This is a measuring mode.

- It is correct that numerical values measured by pressing the probe a few times to the 「Thickness standard」 on the 「Zero plate」 indicates the thickness in the neighborhood of the 「Thickness standard」.
- When the measured value results in largely off the 「Thickness standard」 please try again 「Calibration standard」 from the beginning.
- ※ After performing Calibration standard , the previous 「Calibration standard value」 is deleted, and the last entry of 「Calibration standard value」 is stored.

(5) Zeroing — in special cases —

- ◎ 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 point」 at the surface of the 3rd layer stacked on the substrate and take 「Zeroing」, 「Calibration standard」 as the aforementioned (3), (4).



◆ 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 and shape to a measuring object.
(This is designated as a 「Zero plate」.)

Press **ZERO** key.

The buzzer beeps.

CAL key changes to one data “deletion” function.



【ZERO Cal.】

1. Measure subst
-rate several
times.

2. press **ZERO** key.

Press the probe to the Zero plate.

The buzzer beeps, beeps, beeps 3 times.



OFFSET.

To continue,
press **ZREO** twice.

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



Press **ZERO** key again.
The buzzer beeps.



【ZERO Cal.】

1. Measure subst
-rate several
times.
2. press **ZERO** key.

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



ZERO cal. (Fe)

1

μm

Zeroing is in process.

The measuring object is set for ferrous metal substrate.

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

Remove the probe from 「Zero plate」.



After pressing certain times or 20 times,
press **ZERO** key.



- Repeat a measuring processes, 1~20 times by pressing the probe to the 「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 new entry is no more accepted.

The buzzer beeps.



It stops the “deletion” function of **CAL** key.

The reading **【ZERO cal.】** in the upper left disappears.
Zeroing completed and the main unit becomes possible to take measuring and adjusting operations.

- Press the probe to the 「Zero plate」 several times and make sure the measuring result indicates in the neighborhood of “0”.
When the measured value results in largely off “0”, please try again zeroing from the beginning.
There is a case when calibration is not correctly made.
- “LLLL” displayed on the screen during a time of zeroing means that the calibration point heavily deviates from the standard.
Please make sure that the metal substrate is not processed with other materials such as plating and repeat the zeroing until a stable in the neighborhood of “0” is obtained.
- ※ After performing Zeroing, the previous 「Zeroing value」 is deleted, and the last entry of 「Zeroing value」 is stored.

(6) 2-point calibration in case it is difficult to perform 「Zeroing」

When it is difficult to adjust 「Zeroing」 in a usual method on a rough surface such as the Blast steel plate, it is effective also to adjust by using 「two pieces of different thickness of the Thicknesses standard」.



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 and two pieces of different thicknesses of the 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
1.0~2.5 mm	0.5 mm or over

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

The buzzer beeps.



CAL key changes to one data “deletion” function.

【2-foil's cal】

Measure thinner foil on metal several times.

Afterward, press **ZERO** key.

Stack the thinner 「Thickness standard」 on the substrate and press the probe on it.

The buzzer beeps whenever pressing the probe.



【 2-f. c. 】 (Fe)

27

μm

2-foil calibration in process.

The measuring object is set for ferrous metal substrate.

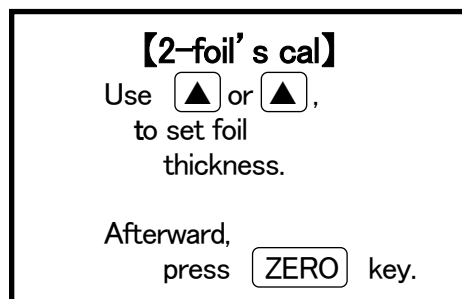
Measured a mean value

When the measuring value results in largely off the “Thickness standard”, press **CAL** + **▼** key to delete the latest data out of measured values.

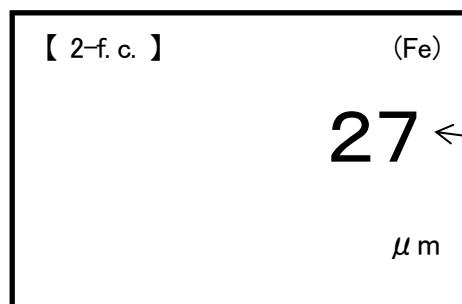
It indicates “—” to delete all data.

After pressing certain times or 20 times,
press **ZERO** key.

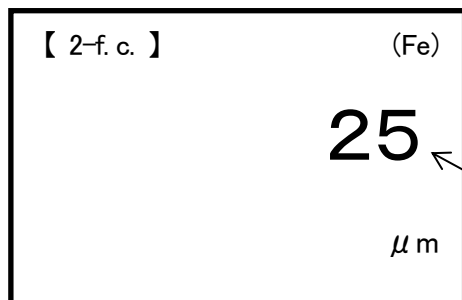
The buzzer beeps, beeps 2 times.



A press of **▲** or **▼** key makes the buzzer beep and
a mean value to the last measurement appears on the reading.



Adjust the reading value to the Thickness standard (in this case, $25\mu\text{m}$)
by pressing **▲** or **▼** key.



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

Pressing **▼** key decreases the reading value.
(Press and holding key turns to fast forwarding.)

After adjusting the reading value to the Thickness standard,
press **ZERO** key.
The buzzer beeps.



- Repeat a measuring processes, 1~20 times by pressing the probe to the thinner 「Thickness standard」.
(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 new entry is no more accepted.

【2-foil' s cal】
 Measure thicker foil on metal several times.
 Afterward, press **ZERO** key.

Stack the thicker 「Thickness standard」 on the substrate and press the probe on it.

The buzzer beeps whenever pressing the probe.



【 2-f. c. 】 (Fe)
 198
 μ m

Measured a mean value

When the measuring value results in largely off the "Thickness standard", press **CAL** + **▼** key to delete the latest data out of measured values. It indicates "—" to delete all data.

After pressing certain times or 20 times, press **ZERO** key.

The buzzer beeps, beeps 2 times.

- Repeat a measuring processes, 1~20 times by pressing the probe to the thicker 「Thickness standard」. (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 new entry is no more accepted.





【2-foil' s cal】
 Use **▲** or **▲**, to set foil thickness.
 Then, ready for measure.

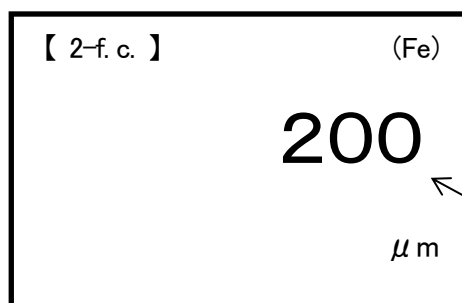
A press of **▲** or **▼** key makes the buzzer beep and a mean value to the last measurement appears on the reading.




【 2-f. c. 】 (Fe)
 198
 μ m

Mean value


Adjust the reading value to the Thickness standard (in this case, 200 μm)
by pressing  or  key.

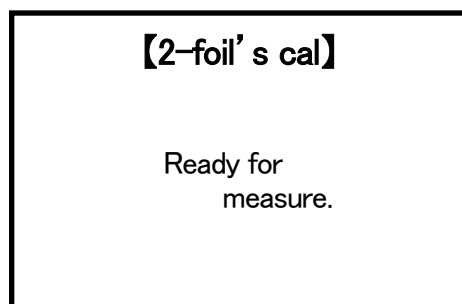


Pressing  key increases the reading value.

Pressing  key decreases the reading value.
(Press and holding key turns to fast forwarding.)

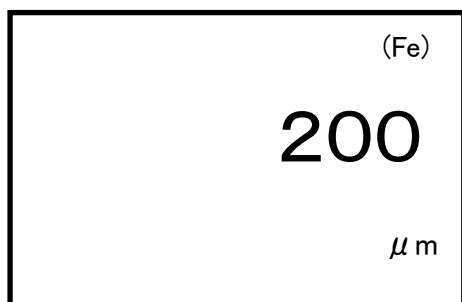
Adjust the reading value to the Thickness standard.

After adjusting the reading value to the Thickness standard,
press  key.
Then the buzzer beeps, beeps, beeps 3 times.



This is on display for about 0.5 seconds.

The buzzer beeps.




This is a measuring mode.

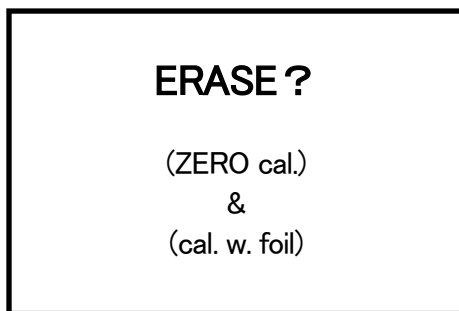
- It is correct that numerical values measured by pressing the probe a few times to the 「Thickness standard」 on the 「Zero plate」 indicates the thickness in the neighborhood of the 「Thickness standard」. Take the procedure with each 2 sheets of the「Thickness standard」.
- When the measured value results in largely off the 「Thickness standard」 please try again 「2-foils calibration」 from the beginning.
- ※ After performing 2-foils calibration, the previous 「Calibration value」 is deleted, and the last entry of 「2-foils calibration value」 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).

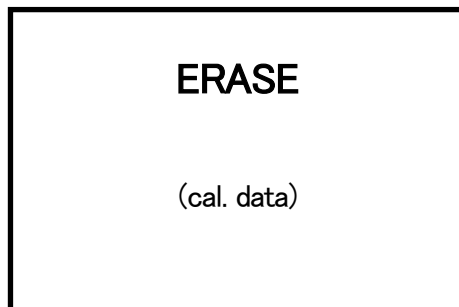
※ This operation procedures are taken when SWT is faulty. Usually, take adjustments with the old adjusted data stored. Automatically the old data is deleted and the new data is stored.

Hold **ZERO** key and press  key.
The buzzer beeps, beeps 2 times.

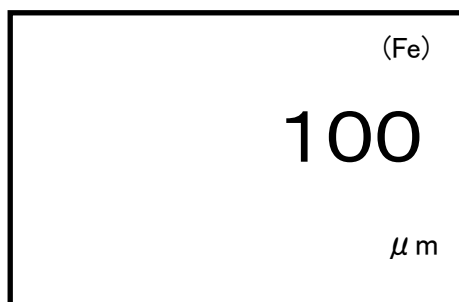


※ Switch Power to OFF when interrupting the deletion of calibration.

Press  key.
The buzzer beeps, beeps 2 times.



Deletion of calibration data is over and the buzzer beeps, beeps 2 times.



The last measured substrate and value are displayed.

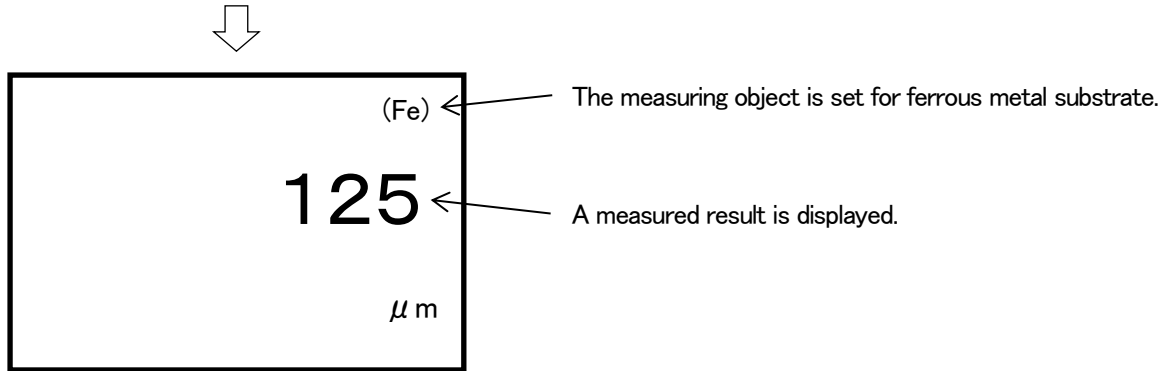
It becomes possible to take measurements and adjustment procedures of this main unit.

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

Measuring

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

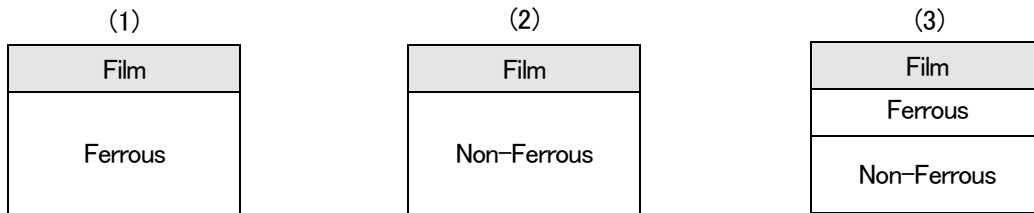
When pressing the probe against the object with Power ON, the buzzer beeps.



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

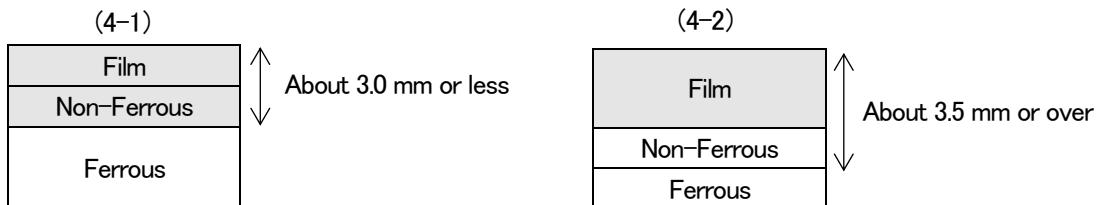
◆ Measuring of Auto-selection by 「SFN-325」

- (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 Film, 3.0 mm or less* measure thickness of layered Non-Ferrous and Film in Fe mode.
- (4-2) Layered thickness Non-Ferrous and Film, 3.5 mm or over* measure Film thickness in NFe mode.



Note:

- "HHHH" is displayed in a between area of 2 different layers and when special metals unidentified by Auto-selection.
- In case of adjusting by 「Calibration standard」 on Fe-substrate, 「Calibration standard」foils made of Non-Ferrous metals such as BeCu can be used.
- In case substrates are not identified by Auto-selection mode, change to exclusive mode by 「corresponding mode to a metal substrate」.

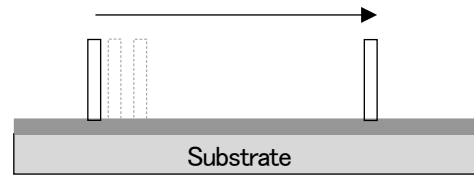
In case of an example of (4-1), thickness of Film only can be measured at 「Non-Ferrous」 exclusive mode.

* They may vary in compositions, characteristics, thicknesses of materials.

Function setting

(1) Setting of Non-Interrupt Measurement mode

As illustrated on the right figure, this mode is used when taking non-interrupt measurements for painting surfaces etc. Film thickness values are taken/displayed while press/holding probe on the object.



A measuring value is held (displayed) when pressing a probe at standard mode, but in Non-Interrupt Measurement mode measuring values are taken/displayed about every 0.5 seconds interval while pressing a probe.

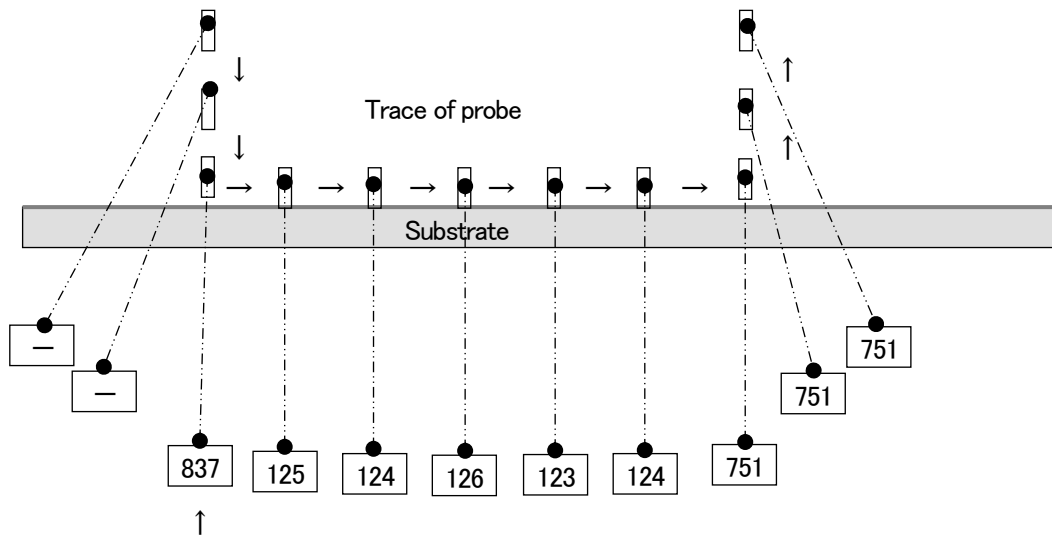
Hold **ZERO** key and press **▲** key.

The buzzer beeps, beeps 2 times.



This main unit has turned into 「Non-Interrupt Measurement mode」.

Data can be successively measured about 0.5 second intervals and the data is displayed with a beeping sound.



Reaching to a measurable distance, the probe indicates the distance/thickness at the spot.

Display of measured values (displayed successively each 0.5 second interval).

※ The Non-Interrupt function is stored when switching Power to OFF.

To return to the beginning, take the procedure of “Returning to the beginning” listed on the following page.



Caution

The moving measuring method at “Non-Interrupt Measuring Mode” may damage the measuring surface or the probe tip because of frictions made by sliding the probe on the surface.
Please try fewer to take this method to minimize the frictions.

《Returning to the beginning》

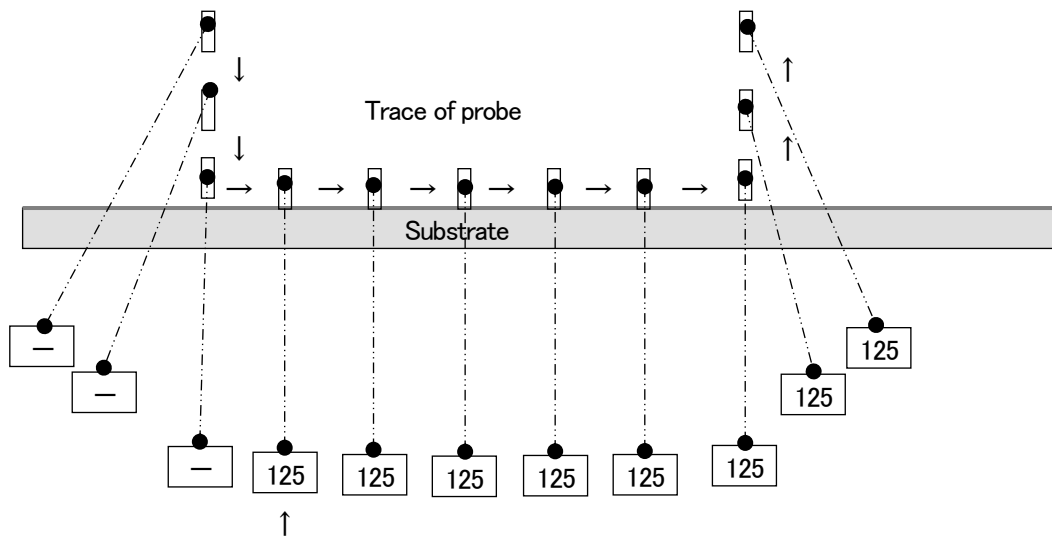
To return 「Non-Interrupt Measurement mode」 to the beginning take the same procedures as at the initial setting.

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

The buzzer beeps, beeps 2 times.



「Non-Interrupt Measurement mode」 has been released and returned to the beginning.



(2) Setting of resolutions

The reading values up to 500 μm can be switched in resolutions as below.

It is possible to read resolution measurement results by the 0.1 μm unit in the thickness of (0~400 μm), and by the 0.5 μm unit in the thickness of (400~500 μm).

- Switch Power to OFF when Power is ON.

Hold **CAL** key and press **Ⓜ** key for 3 seconds or over.
The buzzer beeps, beeps 2 times.



Displayed :
0~400 μm by the 0.1 μm unit,
400~500 μm by the 0.5 μm unit.

- ※ This function is not released even if the Power source is switched to OFF.
When returning, take the operation procedures of “Returning to the beginning” as below.

《Returning to the beginning》

To return 「0.1 μm , 0.5 μm 」 displayed resolutions to the beginning, take the same procedures as the above.

- Switch Power to OFF when Power is ON.


Hold **CAL** key and press **Ⓜ** key for 3 seconds or over.
The buzzer beeps, beeps 2 times.

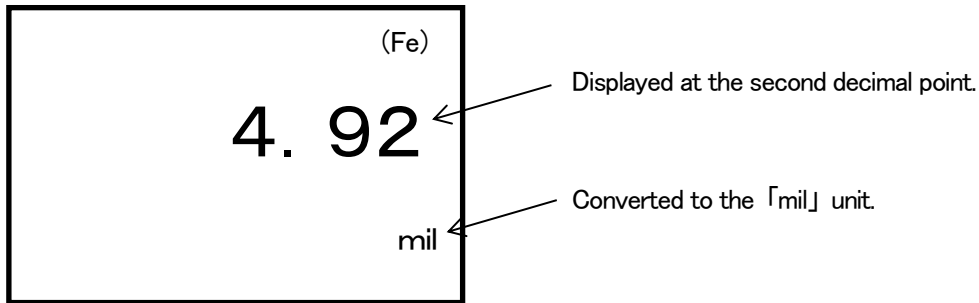


No display under a decimal place.
(The data is rounded off to nearest whole digit.)

(3) Setting of units

This main unit is equipped with a function converting the unit to 「mil」.


- Switch Power to OFF when Power is ON.
- Press and hold  key for 10 seconds or over until the buzzer beeps, beeps 2 times.

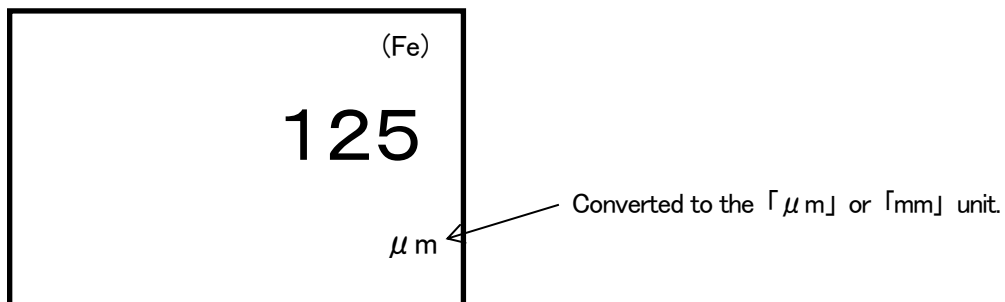


- ※ This function is not released even if the Power source is switched to OFF.
When returning, take the operation procedures of “Returning to the beginning” as below.

《Returning to the beginning》

To return 「mil」 unit to the beginning, take the same procedures as the above.

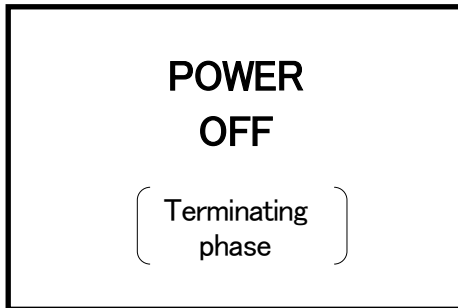
- Switch Power to OFF when Power is ON.
- Press and hold  key for 10 seconds or over until the buzzer beeps, beeps 2 times.



(4) Setting of Auto-Power-OFF function

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

No entry for 3 minutes lasts, and then the buzzer beeps.



The message is displayed for about 5 seconds.

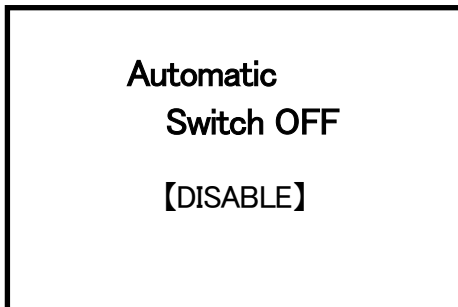
The buzzer beeps, and the main unit is switched to OFF.

《To Disable Auto-Power-OFF function》

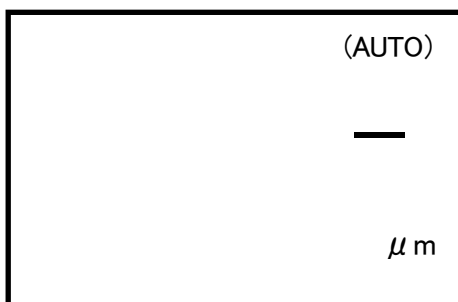
- Switch Power to OFF when Power is ON.

Hold key and press key for 5 seconds or over.

The buzzer beeps, beeps 2 times.



It indicates 5 seconds.



It returns to a measurable mode.

Power switches to OFF when key is pressed.

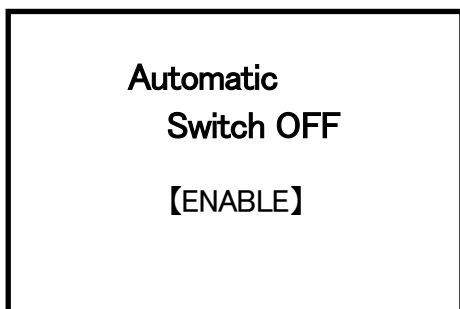
※ This function is not released even if the Power source is switched to OFF.

To enable it, take the operation procedures of “To Enable Auto-Power-OFF function”.

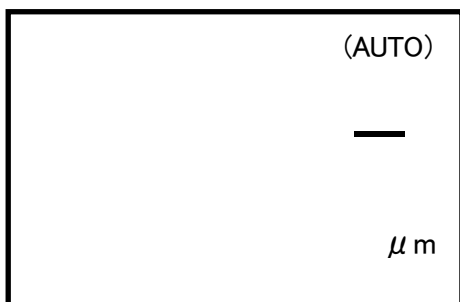
《To Enable Auto-Power-OFF function》

- Switch Power to OFF when Power is ON.

Hold  key and press  key for 5 seconds or over.
The buzzer beeps., beeps 2 times.



It indicates 5 seconds.



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

When no entry of key operations and measuring procedures lasts about for 3 minutes,
the buzzer beeps and the power is switched to OFF.

- ※ This function is not released even if the Power source is switched to OFF.
To disable it, take the operation procedures of “To Disable Auto-Power-OFF function”.

(5) Setting of corresponding mode to substrate with SFN-325 probe

When the SFN-325 probe is connected, the main unit automatically select a substrate for measuring objects, but in addition to the Auto-selection mode 『Fe substrate exclusive mode』, 『NFe substrate exclusive mode』 are ready to use.

In case it is not possible to identify the substrate by Auto-selection mode, change the mode on the following steps to take measurements with procedure as shown below.

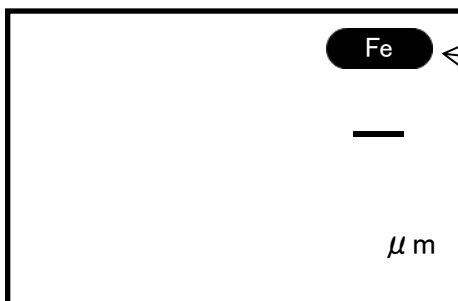
- ※ When on Ex-factory, the unit is set to 「AUTO mode」.
- ※ This function is effective only when 「SFN-325」 probe is connected.
- ※ This function is kept live even if the Power is switched to OFF.

【EX-factory setting】



Displays of Ferrous/Nonferrous Auto-selection mode are displayed by one of (AUTO), (Fe), (NFe) respectively.

Press and hold **CAL** key for 3 seconds or over.
The buzzer beeps, beeps 2 times.



When moving to a Fe substrate exclusive mode, **Fe** is displayed.

Press and hold **CAL** key for 3 seconds or over.
The buzzer beeps, beeps 2 times.



When moving to a NFe substrate exclusive mode, **NFe** is displayed.


By press and holding **CAL** key for 3 seconds or over,
it switches: AUTO → Fe → NFe → AUTO → Fe

(6) Setting of Backlight

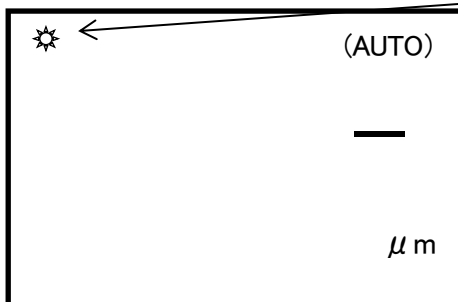
The LCD of this unit has a backlight function.

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 or over.

The buzzer beeps, beeps 2 times
and the backlight goes on.



It is shown when the backlight is ON.

《Lighting out the Backlight》

Press and hold  key for 3 seconds or over.

The buzzer beeps, beeps 2 times
and the backlight goes off.



The mark and the backlight go off.

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

Transferring data — Real time transfer —

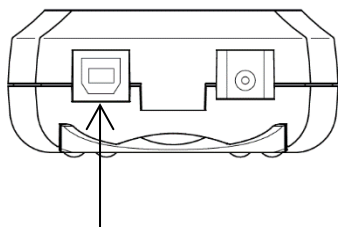
Transfer data to a PC (personal computer) by using a USB cable.

Download the USB transfer driver from our website.

- ※ Data is not transferred when the main unit is set to 「Non-Interrupt Measuring mode」.
Make sure beforehand that this main unit is set to 「is set to Normal (hold) Measuring mode」.
- ※ Even when the unit of this instrument is set to the 「mil」, the data transferred to the Transfer software is displayed with the 「 μm 」 unit.

Outright transferring measured data

- Prepare for a PC side.
- Connect a USB cable (option) to a PC.



This is a USB cable connector.

Hook up a USB cable (option) to USB cable connector and the other side to PC.



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

Note to improve measuring accuracy

① Zero plate

Prepare the same material, thick and shape plate as the measuring object for Zeroing and Calibration standard (CAL). Different materials may not bring about correct measuring results.

※ As accessories to probe (option), “Zero plates” are **for testing purpose only**.

Select a most optimal zero plate to meet actually measuring objects. (Please refer to page 12)

② Thickness standard (foils)

Take Calibration standard (CAL) using a Thickness standard which is thicker or as thick as the measuring films.

※ Use of a Thickness 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 μm), contact a local sales office.

③ Quality of films to be measured

Magnetic metal contained in the films can correctly not be measured. In case of measuring elastic films, place a Thickness standard of 30~50 μm 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.

15~20mm 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.





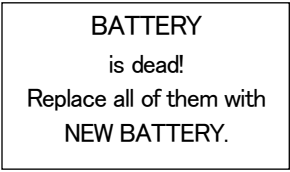





Especially, large temperature differences between a main unit and a probe causes measuring error.

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 「  」 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 main unit.	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 ones.
	Out of batteries.	Replace them with new ones.
	Possibly pressing probe to object too soon after pressing 「  」 key.	Hold probe in air, keeping it away off measuring objects, metals during a time of “START UP ...” on screen.
	Press 「  」 key without connecting probe.	Press 「  」 key after being sure of connecting probe.






Symptoms	Points to check	Measures to be taken
<p>TROUBLE ! The probe may have trouble. Change it to the other one.</p> <p>《Power OFF》</p>	Something wrong with probe.	Contact us for repair.
<p>TROUBLE ! The probe and the main unit may have trouble. Repairing needed.</p> <p>《Power OFF》</p>	Something wrong with probe/ main unit.	Contact us for repair.
Unable to transfer data.	<p>① Is USB cable connected correctly ?</p> <p>② Is PC side ready to operate ?</p>	<p>① Connect USB cable correctly.</p> <p>② (1) Install driver by our home page correctly. (2) Set Comport No.correctly.</p>
Sudden interruption of data transfer.	<p>① Does PC operate normally?</p> <p>② PC side is not faulty. → Something wrong with main unit.</p>	<p>① Check if something wrong with PC side.</p> <p>② Contact us for repair.</p>

Disclaimer

We are not liable for any damage to customers caused by the use or inability to use of this product (including built-in software and data).

Specifications

◆ Main unit

Items	Applications
Model name	Dual (Electromagnetic/Eddy current) type coating thickness meter SWT-7000IV
Display method	Graphic LCD (data/message), Backlight
Ranges	Depending on optional probes
Calibrations (CAL)	2-point calibration Zero: metal substrate calibration Calibration standard: metal substrate and thickness standard calibration
Additional functions	<ul style="list-style-type: none"> ① Switching measuring modes (hold/non-interrupt) ② Switching display resolutions (depending on a connecting probe) ③ Switching of units ④ Auto Power Off (about 3 min.), releasing and reactivating ⑤ Setting for exclusive substrate mode (only when SFN-325 probe is connected) ⑥ Backlight ⑦ Data output to PC (USB terminals)
Keys	 ,  ,  ,  , 
Power	3V DC Dry Battery (LR6 × 2), Continuous operation hours about 50 hours [※] AC adaptor ※ Maximum (may vary depending on usage conditions)
Operating Temperature	0 ~ 40°C (Non-condensing)
Accessories	Dry battery, Carrying case, Hand strap cord, Inspection certificate, CD (Instruction manual, USB driver, etc.)
Option	For ferrous substrate probe (SFe), For nonferrous substrate probe (SNFe), Dual ferrous/nonferrous substrate probe (SFN-325), AC adaptor, USB cable
Dimensions	72(W) × 32(H) × 156(D)mm
Weight	About 200g

◆ Probe (option)

Model	SFN-325	SFe-0.6Pen	SFe-0.6L
Measuring method	Dual (Electromagnetic/Eddy current) type (auto-selection for Fe/NFe)	Electromagnetic type	
Measuring range	Fe: 0~3.00mm, NFe: 0~2.50mm	0~600 μm	
Resolutions	1 μm: 0~999 μm 0.01mm: 1.00~3.00mm (Fe) : 1.00~2.50mm (NFe) by switching 0.1 μm: 0~400 μm 0.5 μm: 400~500 μm	1 μm: 0~600 μm by switching 0.1 μm: 0~400 μm 0.5 μm: 400~500 μm	
Accuracies (to flat, smooth face)	0~100 μm: ±1 μm or ±2% of reading 101 μm~3.00mm: ±2% (Fe) 101 μm~2.50mm: ±2% (NFe)	0~100 μm: ±1 μm or ±2% of reading 101~600 μm: ±2%	
Probes	One point contact constant pressure typ V-cut about φ15×51mm	One point contact constant pressure typ V-cut about φ5.5×92.5mm	One point contact constant pressure typ about 8×13.5×119mm (Minimum measuring Diameter φ16)
Options	V type probe adaptors [※]	—	
Accessories	Thickness standards, Zero plates for testing(Fe/NFe)	Thickness standards, Zero plates for testing(Fe)	
Measuring objects	Fe: coating, lining, thermal spray film, plating (except electrolyte nickel plating), etc. on magnetic metal substrate like iron, steel. NFe: relatively general use objects like insulated films on non-magnetic metal substrate like aluminum, copper, etc.	Coating, lining, thermal spray film, plating (except electrolyte nickel plating), etc. on magnetic metal substrate like iron, steel. Small parts, narrow places, and so on.	Inside of a small diameter tubes, narrow places, and so on.

※ 3 kinds of V type probe adaptors (less φ5、φ5~10、φ10~20)

◆ Probe (option)

Model	SFe-2. 5 ^{※1} /SFe-2. 5L	SFe-2. 5LwA	SFe-10	SFe-20
Measuring method	Electromagnetic type			
Measuring range	0~2. 50mm		0~10mm	0~20mm
Resolutions	1 μm: 0~999 μm 0. 01mm: 1. 00~2. 50mm by switching 0. 1 μm: 0~400 μm 0. 5 μm: 400~500 μm		1 μm: 0~999 μm 0. 01mm: 1~10mm	1 μm: 0~999 μm 0. 01mm: 1~5mm 0. 1mm: 5~20mm
Accuracies (to flat, smooth face)	0~100 μm: ±1 μm or ±2% of reading 101 μm~2. 50mm: ±2%		0~3mm: ±(5 μm+3% of reading) 3. 01mm or over: ±3%	
Probes	One point contact constant pressure type V-cut SFe-2. 5: about φ 15 × 47mm SFe-2. 5L: about 18 × 22 × 67mm	One point contact constant pressure type Measuring part: about 24 × 27 × 56mm Full length (flexible): about 546~1530mm	One point contact constant pressure type V-cut about φ 21 × 47mm	One point contact constant pressure type V-cut about φ 35 × 55mm
Options	V type probe adaptors ^{※2} /—	—	—	—
Accessories	Thickness standards, Zero plates for testing (Fe)	Thickness standards, Zero plates for testing (Fe), Carring case	Thickness standards, Zero plates for testing(Fe)	
Measuring objects	Coating, lining, thermal spray film, plating (except electrolyte nickel plating), etc. on magnetic metal substrate like iron, steel.	For coating thickness on remote, unreachable place of coating, lining on magnetic metal substrate like iron, steel.	On magnetic metal substrate like iron, steel For relatively thicker objects	For thick objects

※1: Heat-resistant (about 200°C) for probe Fe-2.5

※2: 3 kinds of V type probe adaptors (less φ 5、φ 5~10、φ 10~20)

◆ Probe (option)

Model	SNFe-2. 0/SNFe-2. 0L	SNFe-0. 6	SNFe-5	SNFe-8
Measuring method	Eddy current type			
Measuring range	0~2. 00mm	0~600 μ m	0~5. 00mm	0~8. 00mm
Resolutions	1 μ m: 0~999 μ m 0. 01mm: 1. 00~2. 00mm by switching 0. 1 μ m: 0~400 μ m 0. 5 μ m: 400~500 μ m	1 μ m: 0~600 μ m by switching 0. 1 μ m: 0~400 μ m 0. 5 μ m: 400~500 μ m	1 μ m: 0~999 μ m 0. 01mm: 1~5mm	1 μ m: 0~999 μ m 0. 01mm: 1~8mm
Accuracies (to flat, smooth face)	0~100 μ m: $\pm 1 \mu$ m or $\pm 2\%$ of reading 101 μ m~2. 00mm: $\pm 2\%$	0~100 μ m: $\pm 1 \mu$ m or $\pm 2\%$ of reading 101~600 μ m: $\pm 2\%$	0~3mm: $\pm (5 \mu$ m+3% of reading) 3. 01mm or over: $\pm 3\%$	
Probes	One point contact constant pressure type V-cut SNFe-2. 0: about $\phi 15 \times 47$ mm SNFe-2. 0L: about $18 \times 22 \times 67$ mm	One point contact constant pressure type V-cut about $\phi 13 \times 45.5$ mm	One point contact constant pressure type V-cut about $\phi 20.5 \times 47$ mm	One point contact constant pressure type V-cut about $\phi 35 \times 59$ mm
Options	V type probe adaptors [※] /—	—	—	—
Accessaries	Thickness standards, Zero plate for testing (NFe)			
Measuring objects	Insulated films on non-magnetic substrate metal like aluminum, copper, etc.			
	Relatively general use objects	For high stability with narrow bars, small tubes, minute pieces	For relatively thicker objects	

※ 3 kinds of V type probe adaptors (less $\phi 5$ 、 $\phi 5 \sim 10$ 、 $\phi 10 \sim 20$)

Reference (measurement principles)

● Electromagnetic 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.

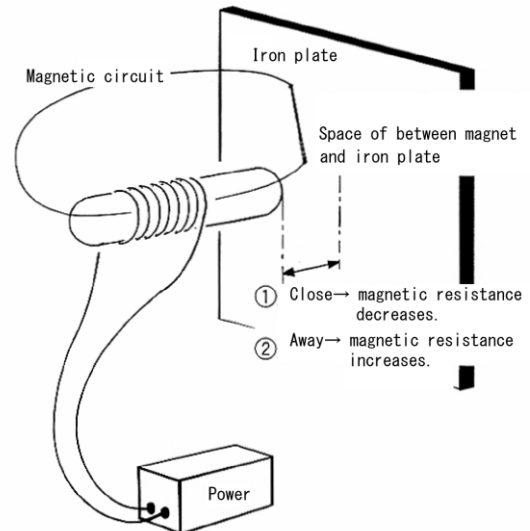
In other words, it makes the magnetic density higher as they come closer. On the contrary, it weakens the magnetic density as they move away from each other.

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

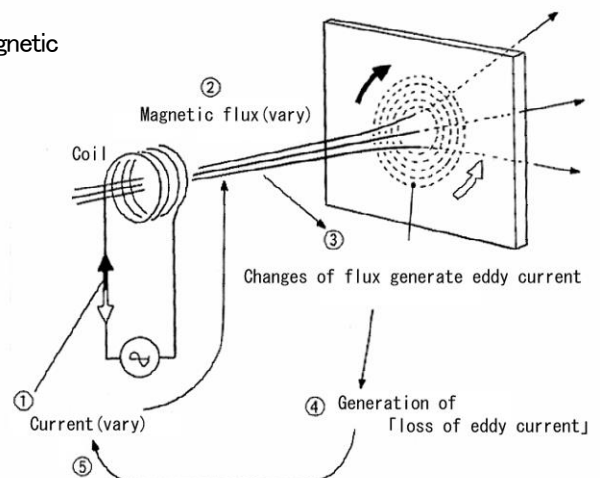
The eddy current is induced on the surface of metals when metals approach to alternating current fields emitted from probe.

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 ◆

Coating thickness meter, Pinhole detector,
Moisture meter, Concrete covermeter, Condensator,
Needle detector, Iron piece detector, Viscosity cup



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