SANKO Coating Thickness Meter

ＳＷＴ－７０００／７１００

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・Nagoya・Fukuoka・Kawasaki

Contents Pages

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

Keep off water ● Do not dump nor wet the gauge unit in water, otherwise it may cause damages.
Please contact our distributor or sales office should submerged water into the unit.

Prohibition ● Keep metals or foreign substances from the unit, otherwise it may cause damages.
Please contact our distributor or sales office should put any materials or foreign substances in the unit.

Prohibition ● 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.

Dismantling prohibited ● Never dismantle or modify the gauge unit by yourself, otherwise it may cause errors or damages.

Prohibition ● Do not use AC adaptors other than an exclusive adaptor for this unit, (SWT-7100 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.

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

Prohibition ● 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.

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

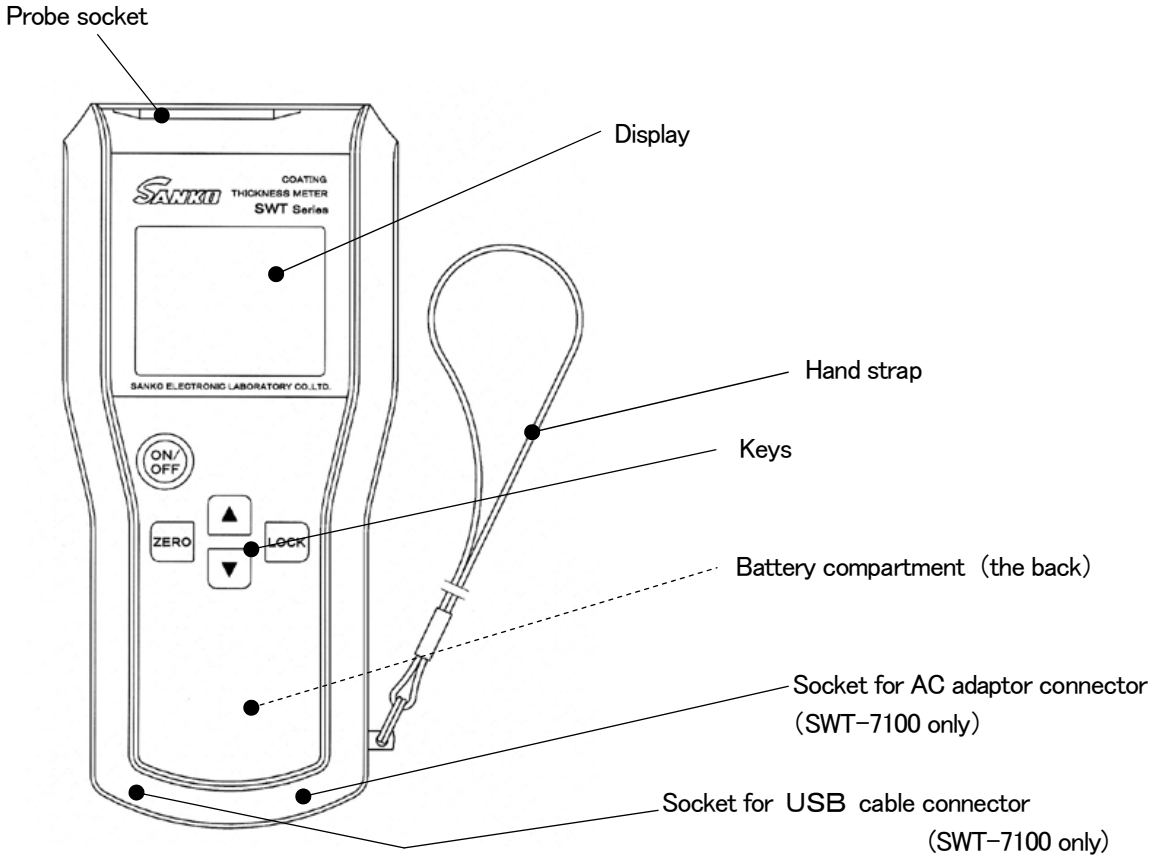
◆ Contents in a package

- Main unit
  SWT－7000, or SWT－7100
- Dry batteries R6P/AA（2 pieces）
- Carrying case
- Instruction manual（this manual）
- Warranty／User resistor sheet （Available only in Japan）
- AC adaptor （SWT－7100 only）
- USB cable（2. 0m）（SWT－7100 only）
- USB driver（CD）（SWT－7100 only）

● In case of an optional probe

- Probe
  For ferrous（Fe）, or non-ferrous（NFe）
- Zero boards for testing（for Fe：ferrous substrates／for NFe：non-ferrous substrates）
- Thickness standards（films ：2 sheets、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

● Display

It indicates measurement results, operation guides, or malfunction status.

● Keys

（1） Power On/Off key

It switches On or Off.

（2）「ZERO」key、「▲」key、「▼」key

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

（3）「LOCK」key

It is a key to avoid erroneous operations caused by an inadvertent key entry.

● Battery compartment

It contains 2 pieces of dry battery (R06, AA).

● Hand strap

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

● Socket for AC adaptor (SWT-7100 only)

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

● Socket for USB cable (SWT-7100 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.

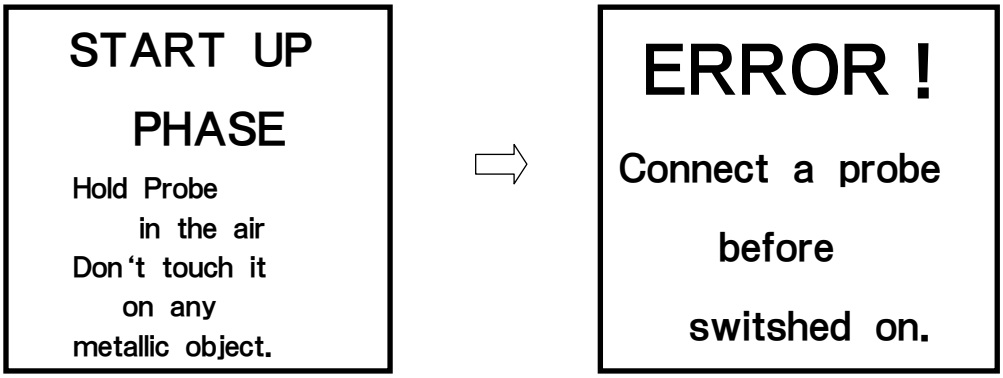
② Insert batteries.
Ensure correct battery polarity ⊕、 ⊖ for placement.

③ Close the lid.

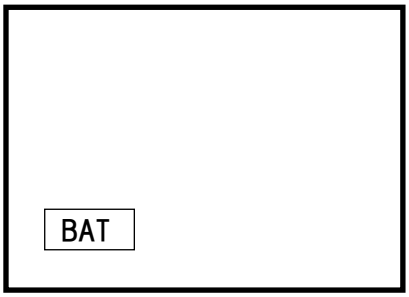
Caution

- Use designated and new (unused) 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.

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.



◆ How connect, disconnect probes

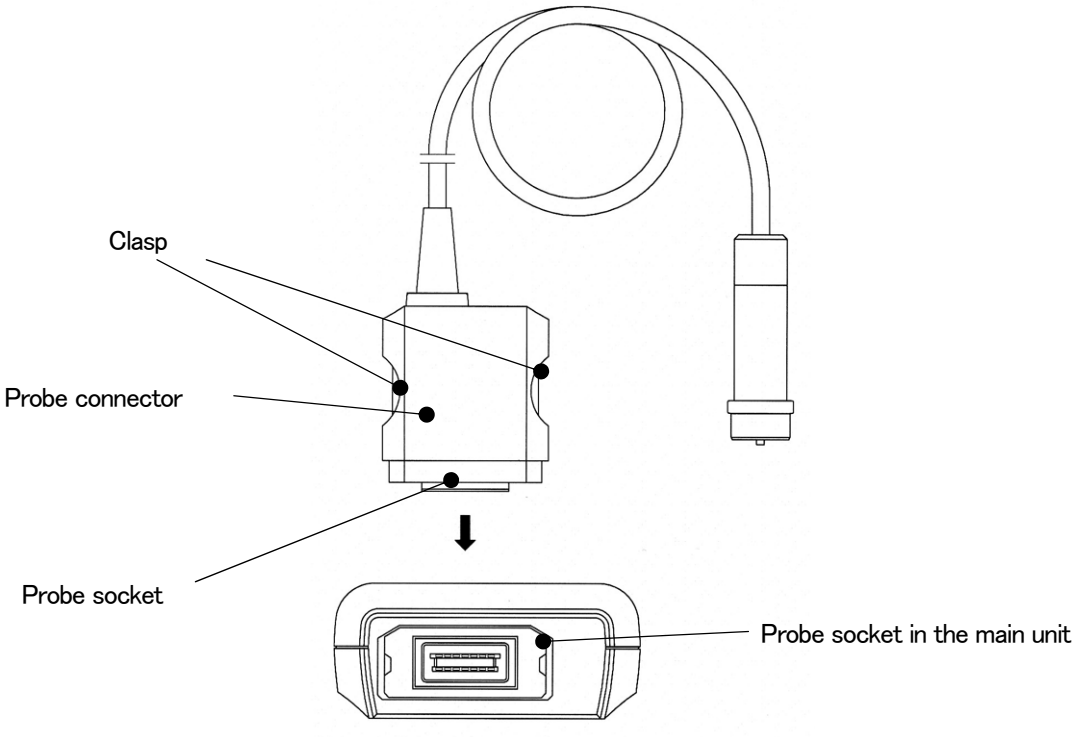
◎ Connect an optional, exclusive SWT probe to the main unit

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 it to the extent that 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.

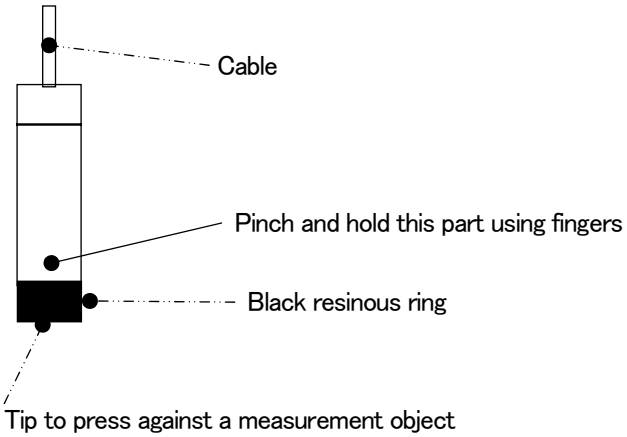
Do not pull off by force or it may cause damages.

⚠ Caution

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

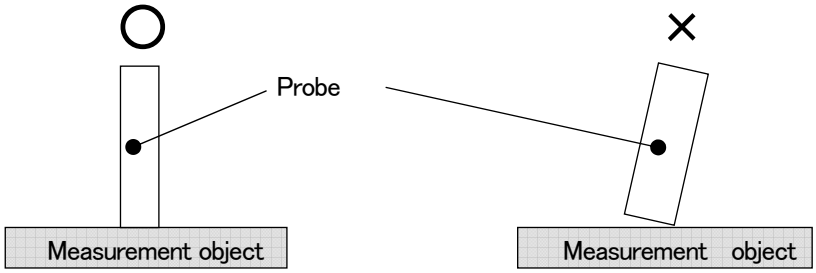
Or else, it may cause damages to connect or disconnect while Power is on.

◆ 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.

Caution

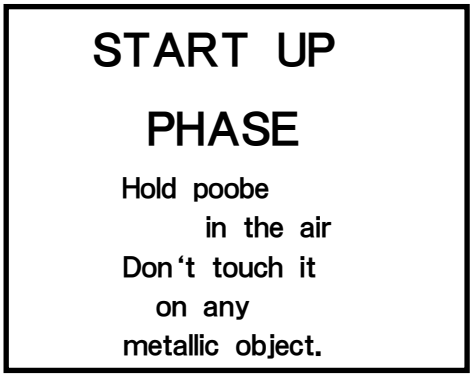
◆ Do not smash or hit the probe against objects, or it may cause damages to probes and to objects

◆ 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 5 seconds.

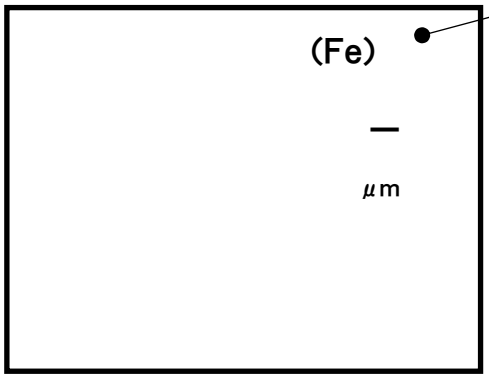
Caution

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.

⇩



「Fe」shows that a SWT exclusive probe in Fe series is connected
「NFe」shows that a SWT exclusive probe in NFe series is connected

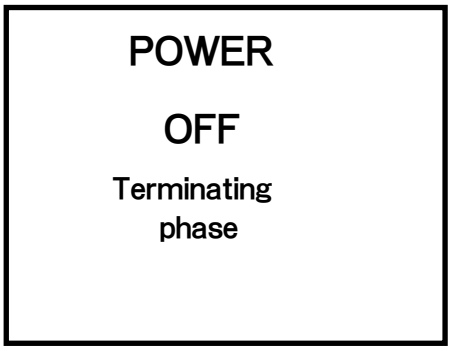
The display shows that it becomes possible to take measuring and adjusting procedures of this unit.

(2) How to switch off

Press [ON／OFF] key.

The buzzer beeps, beeps. (twice)

⇩



The message lasts for about 5 seconds.

Caution

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

⇩

This unit switched off.

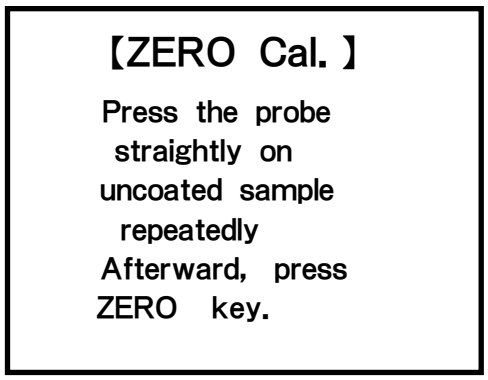
(3) Zeroing

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.

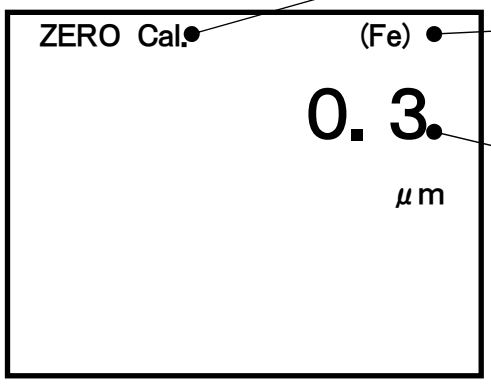


Press the probe on the above「Zero Plate」when the message is indicated on display (about 10 second).

⇩

The buzzer beeps.

⇩



Zeroing is in process.

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

Measured numerical value

⇩

Remove the probe from「Zero plate」

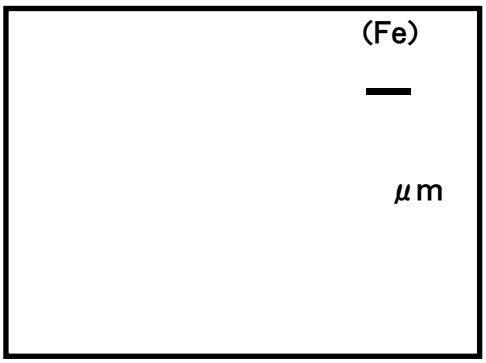
● Repeat measuring processes, 2～10 times by pressing the probe to「Zero plate」. (A measurement value is displayed whenever a probe is pressed)

◆ When a measuring process reaches the 10th time, the buzzer beeps and zeroing automatically finishes without pressing [ZERO] key.

⇩

Press [ZERO] key.
The buzzer beeps.

⇩



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

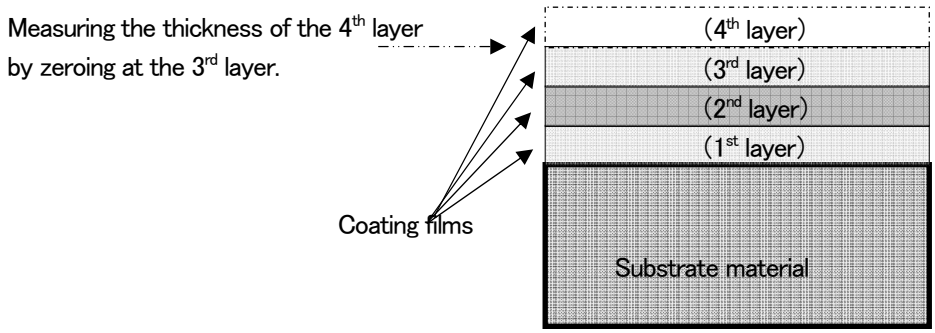
- It is correct that numerical values measured by pressing the probe to the「Zero Plate」indicates「0」or in the neighborhood of「0」.
  When the measured value results in largely off「0」μm, please try again zeroing from the beginning.

- ［LLL］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.

Caution

The message of「ZERO cal.」described on the previous page is indicated on display for about 10 seconds. Without pressing the probe to the「Zero Plate」during the period of the reading on display, it automatically returns to the beginning. Try again zeroing procedures from the beginning if necessary.

(4) 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 μm, please zero the meter on the following procedures.
If the thickness of 3 combined layers is bellow 50 μm, 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.

⇩

【ZERO Cal.】
Press the probe straightly on uncoated sample repeatedly Afterward, press ZERO key.

Press the probe on the above「Zero Plate」while the message is indicated on display. (for about 10 seconds)

⇩

The buzzer beeps, beeps, beeps.

⇩

ZERO position is

OFFSET.

To continue ZERO adjustment, press ZERO key twice successively.

Press ZERO key twice while this message on the reading

⚠ Caution

This message is indicated on display for about 10 seconds. If no ZERO key is pressed when the reading is on display,「Zeroing」is automatically interrupted and returns to the beginning of the process Try again zeroing from the beginning if necessary.

⇩

Press ZERO key. —— ①
The buzzer beeps.

⇩

Press ZERO key. —— ②
The buzzer beeps.

⇩

【ZERO Cal.】

Press the probe straightly on uncoated sample repeatedly Afterward, press ZERO key.

Press the probe to「Zero Plate」when on the reading for 10 seconds.

⇩

The buzzer beeps.

⇩

ZERO Cal. (Fe)

0. 3.

μm

The reading shows that it is process of zeroing adjustments

Measured numerical value

⇩

● Repeat measuring processes, 2～10 times by pressing the probe to「Zero plate」.
(A measurement value is displayed whenever a probe is pressed)

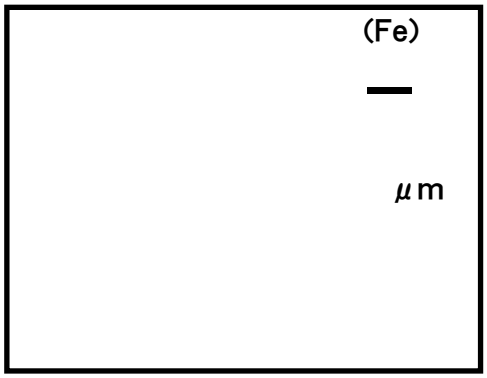
◆ When a measuring process reaches the 10th time, the buzzer beeps and zeroing automatically finishes without pressing ZERO key.

Remove the probe from「Zero Plate」.

⇩

Press [ZERO] key.
The buzzer beeps.

⇩



「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.

- [LLL] 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.

> ⚠ Caution
>
> The message of zeroing on page 13 is indicated on display for about 10 seconds.
> Without pressing the probe to Zero plate during the period of the reading, it automatically returns to the beginning. Try again zeroing procedures from the beginning if necessary.

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

(5) Calibration standard (CAL)

- Prepare 「Zero Plate」 used in 「Zeroing」.
- Prepare 「Thickness Standard」 which thicknesses is thicker or as thick as a measuring film.
- Place 「Thickness Standard」 on 「Zero Plate」.
- Press △ key or ▽ key.

The buzzer emits a beeping sound.

⇩

【Cal. w. foil】

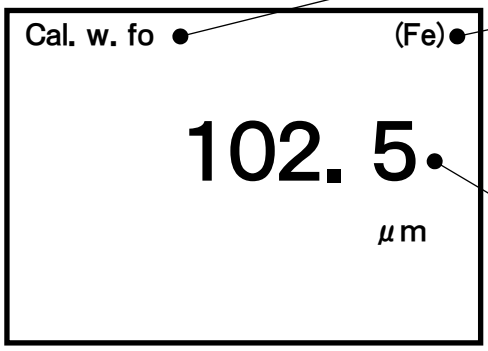
Press the probe straightly on the foil placed on uncoated sam −ple repeatedly.

Press the probe on the 「Thickness Standard」stacked on the 「Zero Plate」when this message is displayed on the reading. (for about 10 seconds)

⇩

The buzzer beeps whenever the probe is pressed.

⇩



The reading shows that it is in process of Calibration standard.

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

Measured numerical value

⇩

Remove the probe from 「Thickness standard」.

⇩

In about 5 seconds the buzzer beeps, beeps.

⇩

- ● Repeat measuring operations, 2～10 times by pressing probe to 「Thickness standard」 on the「Zero plate」. (The measured value is indicated whenever the probe is pressed.)
- ◆ When the measuring process reaches the 10th time, the buzzer beeps to take the next page screen.
- ● Wait for while (about 5 seconds) after the following procedures completed.

⚠ Caution

The message of 「Cal. w. foil」 is indicated on the reading for about 10 seconds.
Without pressing the probe during the period of the reading, it automatically returns to the beginning. Try again Calibration standard procedures from the beginning if necessary.

【Cal. w. foil】

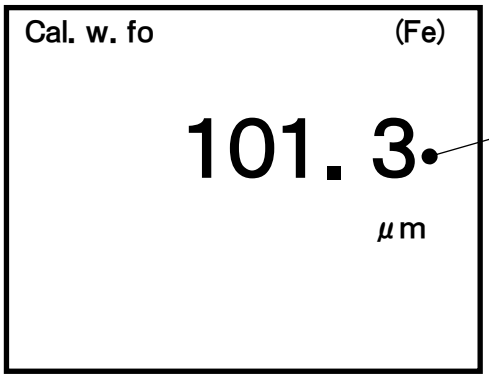
Use ▲ ▼ key, adjust displayed value to the thickness of foil.

When the reading message is indicated on display (about 5 seconds), press ▲ key or ▼ key to equate a thickness value with 「Thickness Standard」 value.

Caution

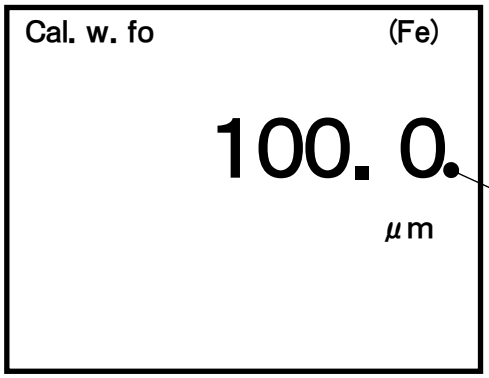
The message is indicated on the reading for about 5 seconds.
If no ▲ key or ▼ pressed during this time, the unit automatically interrupts 「Calibration Standard」 and returns to beginning.
Try again 「Calibration Standard」from the beginning if necessary.

A press of ▲ key or ▼ key beeps the buzzer and indicates the latest value pressed by probe.



Numerical value by the latest press of a probe.

As example, equate a value on the reading with the thickness of Thickness standard by pressing ▼ key (tentatively 100 μm)



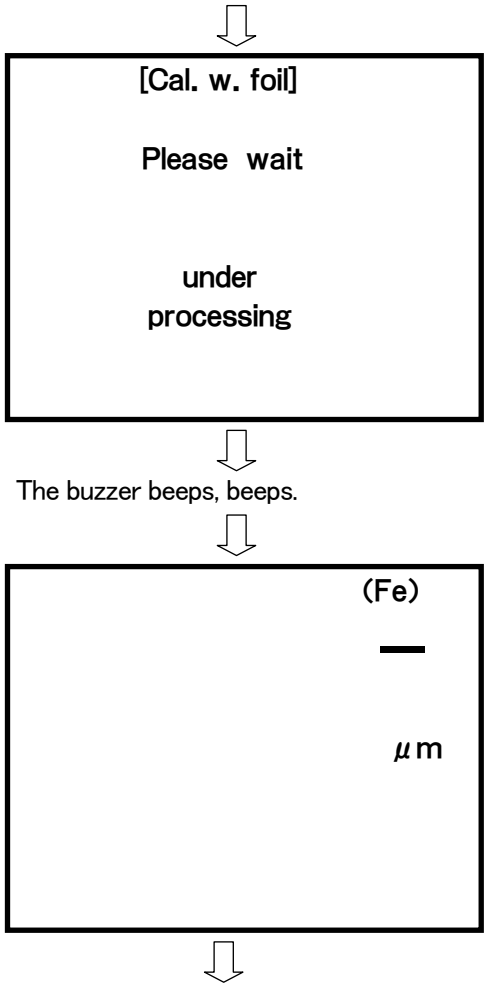
A press of ▲ key increases the displayed value.

A press of ▼ key decreases the displayed value.

Equate value with the Thickness Standard value.

Waite for about 5 seconds after the numerical value equated with the Thickness Standard.

The buzzer beeps, beeps.



It becomes possible to take measurement and adjusting operations.

- It is correct that numerical values measured by pressing the probe to the「Thickness Standard」on the「Zero Plate」indicates the neighborhood of「Thickness standard」.

- When the measured value results in largely off the thickness of「Thickness Standard」 please try again calibration standard from the beginning.

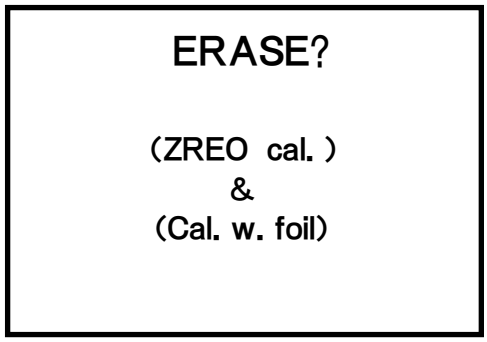
Note:

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

(6) How to delete calibration

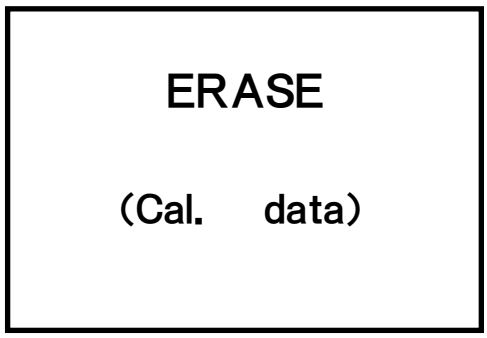
Take the following procedures to delete calibration when the reading on the screen is locked or after batteries replaced or when it becomes impossible to process 「Zeroing」、「Calibration Standard」(CAL).

When holding [ZERO] key , press [▼] key.
The buzzer beeps, beeps.

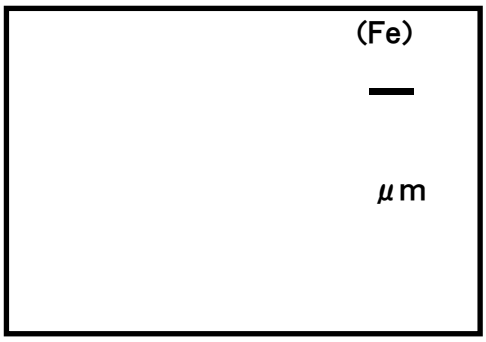


When this message is indicated on the reading, press [▼] key. (for about 5 seconds)

The buzzer beeps, beeps.



The buzzer beeps, beeps.



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

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

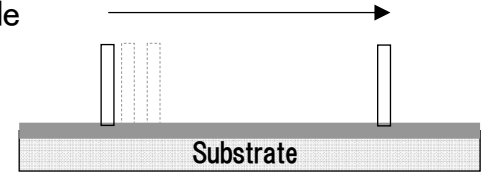
Caution

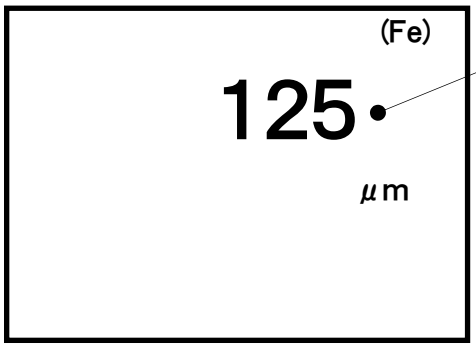
This message is indicated for about 5 seconds. If no [▼] key is pressed during the time of 5 seconds, the unit interrupts deleting and returns to the beginning. Try again from the beginning if deleting is necessary.

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.





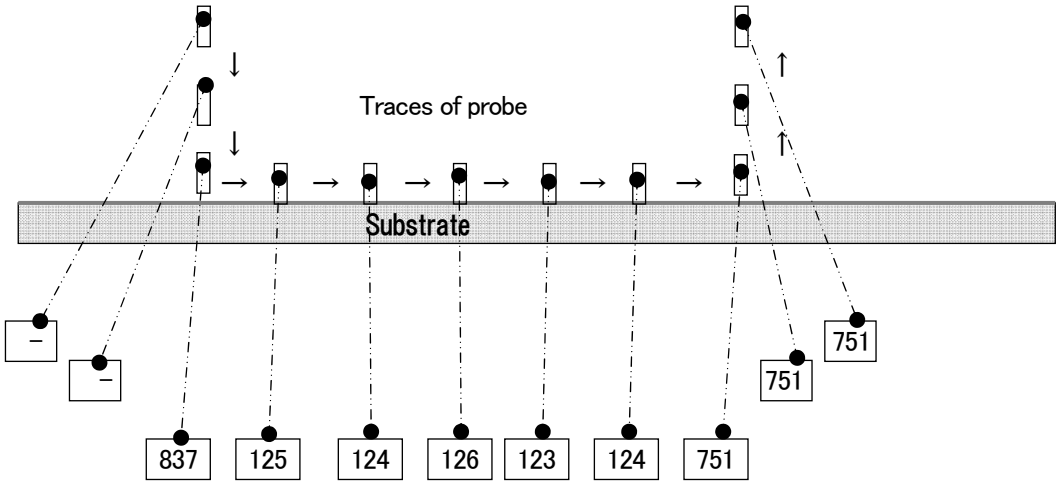
A measuring value is indicated and stored each time a probe is pressed in a normal state.

Hold [ZERO] key and press [▲] key.

The buzzer beeps, beeps.

⇩

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



Measuring values on display (indicated successively each 0.5 seconds 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》

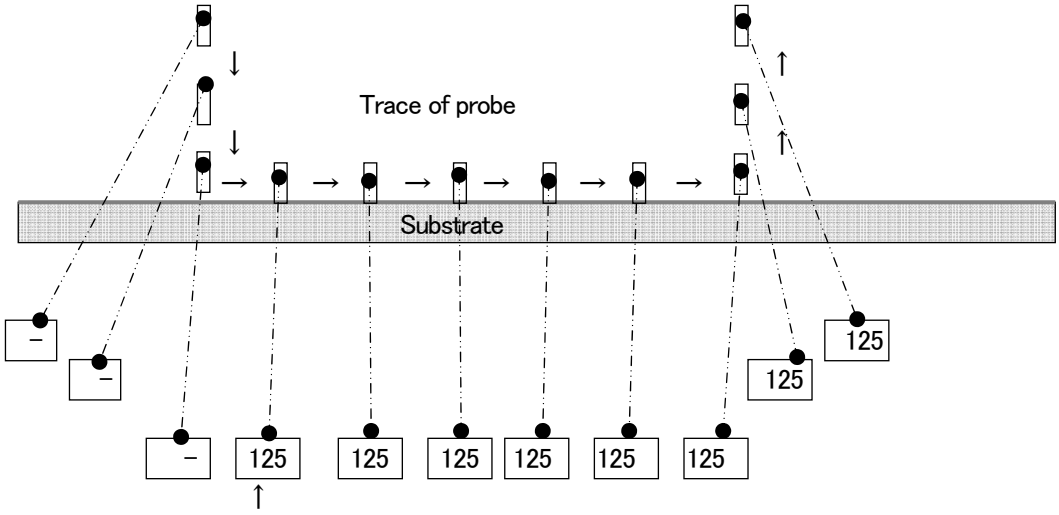
To return 「non-interrupt measurement mode」 to the beginning take the same procedures as at the initial setting.

Hold [ZERO] key and press [▲] key.

The buzzer beeps, beeps.

⇩

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



Measured values are stored until a next measurement is taken.

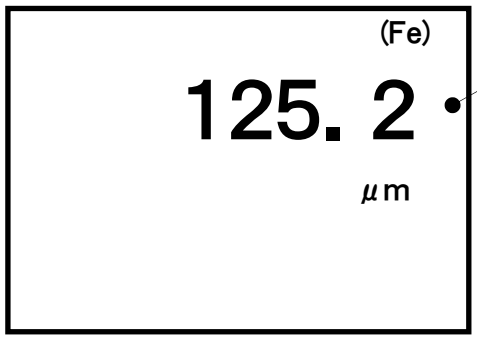
(2) Switching to Resolution

To inspect precisely a thickness up to 500μm it is possible to take solution measurements by switching to a 0.1μm(0～400μm) unit , to a 0.5μm(400～500μm) unit.
In this case it changes resolution units by taking the following procedures.

- Switch Power to Off.
- Hold [LOCK] key and press [ON/OFF] key until the buzzer beeps in the following.

The buzzer beeps, beeps.

⇩



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

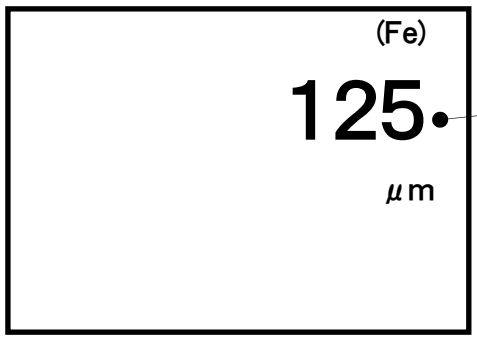
《Returning to the beginning》

To return「0.1μm」display resolution to the beginning take the same procedures as the above.

- Switch power to OFF.
- Hold [LOCK] key and press [ON/OFF] key until the buzzer beeps in the following.

The buzzer beeps, beeps.

⇩

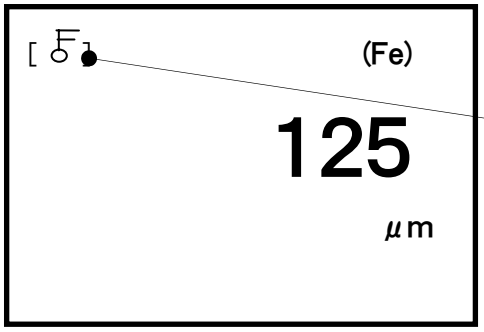


No indication under a decimal point

（3） Switching to Key Lock Mode

This is to prevent this unit from making errors by inadvertently fingering a key in taking measures.

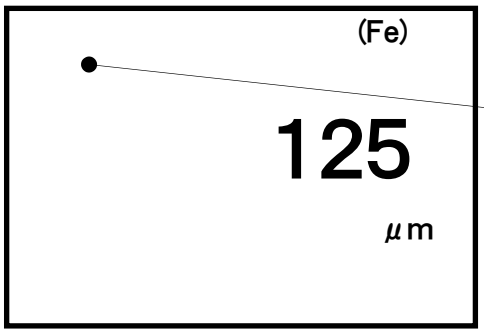
- Press [LOCK] key when Power is On.
  The buzzer beeps.



Any presses of keys except [ON/OFF] key locks the operation to be non-operational to avoid errors.

《Releasing lock》

- Press [ON/OFF] key and switch Power off.
- Press [ON/OFF] key and switch Power on.
  The lock has been released and all keys can be activated.

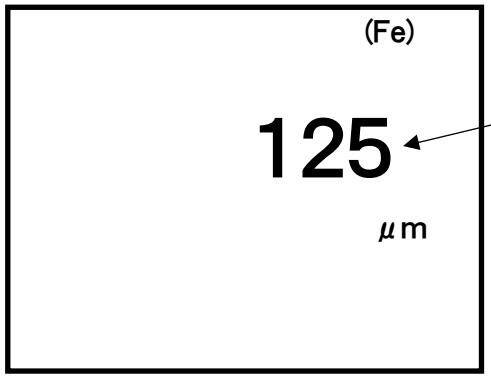


Measuring

● According to explanations on page 8 hold a probe and quickly press it to a measuring object.

The buzzer beeps.

⇩



A measured result is indicated.

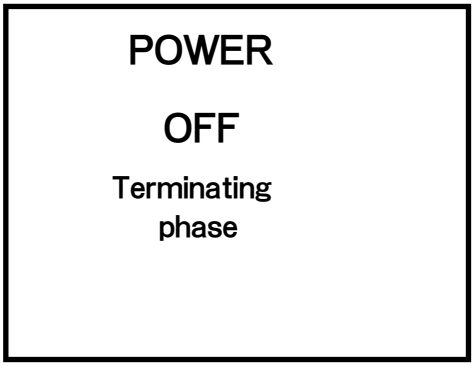
Each time a probe is pressed to an object the buzzer beeps and the measuring result is indicated.

《Auto-Power-OFF》

Power will automatically be switched off 3 minutes after the last entry to save batteries.

The buzzer beeps.

⇩



The message lasts for about 5 seconds.

⇩

The buzzer beeps.
This unit switches Power off.

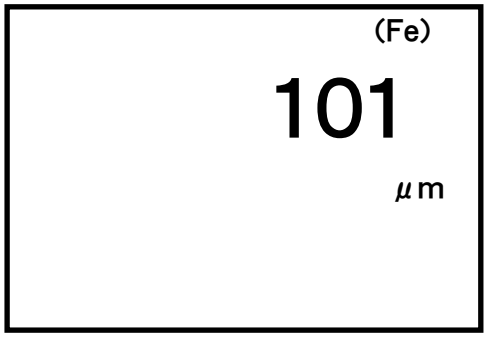
※ SWT－7100 equip AC-adaptor as one of accessories. and Auto-Power-Off functions also works with AC-adaptor connected.

Transferring data （SWT-7100）

Transfer data to a PC (personal computer) by using a USB cable
Refer to separately attached information "Installment of a driver for USB transfer of SWT series" to install a driver into a PC.

Outright transferring measured data

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



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

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.

＊ Accessories like "zero plates for zeroing" 「for electromagnetic: SUS-430」(ferrite stainless), 「for eddy current: AL1050(aluminum)」are for testing purpose only.
Select a substrate to meet actually measuring objects.

② Thickness standard (plates)

Take a calibration standard measurement using a Thickness standard which is thicker or as thick as the measuring films.

＊ Use of a calibration standard with a deviate thickness may cause errors.
Replace worn-out or bent plates with new ones. In case non-accessorized plates are necessary (over 15 μm), contact a local sales office.

③ Quality of films to be measured

Metal contained films can not correctly be measured. In case of measuring elastic films, place a standard plate 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

Electric 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

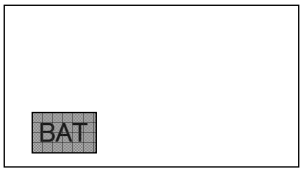
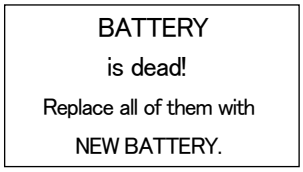
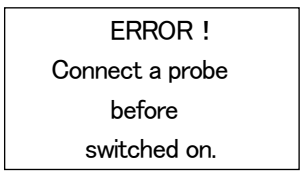
Operating temperature range is 0～40 ℃. Especially difference between a main unit and a probe causes measuring errors.

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
 《Power OFF》	Out of batteries	Replace new batteries
 《Power OFF》	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. .
 《Power OFF》	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
TROUBLE ! The probe may have trouble. Change it to the other one. 《Power OFF》	Something wrong with probe	Contact us for repairs

Specifications

◆ Unit

Items	Applications
Model names	Dual electromagnetic／eddy current（SWT－7000、SWT－7100）
Display method	Graphic LCD（data ・ message）
Ranges	Depending on optional probes
Calibrations （CAL）	2 points calibration type　Zeroing ： for substrate Calibration standard:　for substrate and standard thicknesses
Additional functions	① Key Lock ② Auto Power Off（3 min.） ③ switching modes（hold／non interrupt） ④ switching display resolutions ⑤ USB connections（SWT-7100 only）
Keys	ON/OFF 、ZERO 、▲ 、▼ 、LOCK 、
Power	3V DC （AA、R6P×2）、(exclusive AC adaptor : SWT-7100)
Operating Temperature	0～40℃ (Non-condensing)
Accessories	Dry battery、Carrying case、 (7100) : AC adaptor、USB cable、USB driver（CD）
Optional	For ferrous substrate probe(Fe)、 for nonferrous substrate probe (NFe)
Dimensions	72(W) × 30(H) × 156(D)mm
Weight	200g

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◆ Probes（Optional）

Models	Fe－2. 5	NFe－0. 6	NFe－2. 0
Methods	Magnetic inducing type	Eddy current type	
Ranges	0～2. 50mm	0～600μm	0～2. 00mm
Display resolutions	1μm:0～999μm switching to 0. 1μm:0～400μm、 0. 5μm:400～500μm 0. 01mm:1. 00～2. 50mm	1μm:0～600μm switching to 0. 1μm:0～400μm、 0. 5μm:400～500μm	1μm:0～999μm switching to 0. 1μm:0～400μm、 0. 5μm:400～500μm 0. 01mm:1. 00～2. 00mm
Accuracies （on flat face）	0～100μm:±1μm Or ±2% the designated value 101μm～2. 50mm: ±2%	0～100μm:±1μm Or ±2% the designated value 101μm～600μm: ±2%	0～100μm:±1μm Or ±2% the designated value 101μm～2. 00mm: ±2%
Probes	One point contact constant pressure type, V cut φ13×48mm	One point contact constant pressure type, V cut φ11×48mm	One point contact constant pressure type, V cut φ13×47mm
	Option : V type probe adaptor（3 kinds: forφ5 less、φ5～10、φ10～20）		
Accessories	Standard thickness, Zero plate fro testing（Fe）	Standard thickness, Zero plate for testing（NFe）	
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 substrates like aluminum, copper, etc.	

Reference (Principle of measurements)

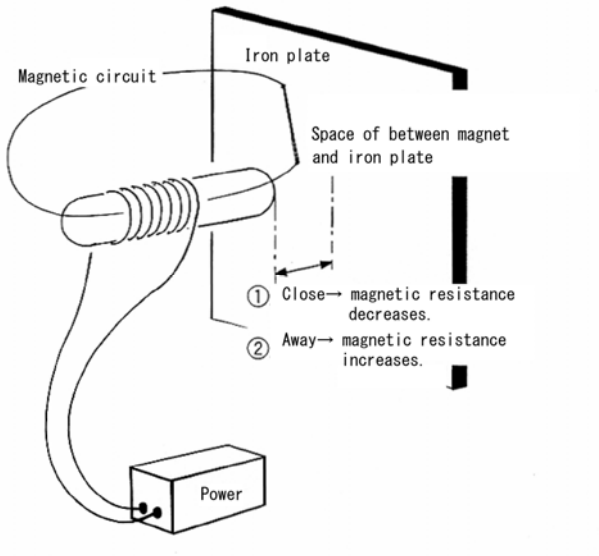
● Electro-Magnetic type

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.