1 Caution

- To avoid leakage of the battery and instrument damage. Please take out the battery from the instrument,when not using it for a long time.
- Do not make the measuring head of the instrument close to or touch magnetic objects (such as magnets, iron plates with magnetic force, etc.) to prevent the measuring head from being magnetized and affecting the measurement results.
- Do not rotate the measuring head 360° to avoid breaking the electronic connecting wire inside the measuring head and causing damage.The way of the measuring head placing effects the measurement. In the measurement, the head should be kept perpendicular to the surface of the specimen.
- Please take care of the instrument and keep the measuring head clean and free of stains on the surface of the probe.

2.Overview

This device is a portable meter. It is capable of measuring coating thickness quickly, precisely and without injury, both for the laboratory and engineering environment. It is currently widely used in manufacturing, metal processing industry, chemical industry, commodity inspection and testing fields; and is essential for material protection major.This device meets the following criteria:

GB/T 4956 — 1985 non-magnetic coating thickness measurement on magnetic metal substrate, Magnetic Method

GB/T 4957 — 1985 non-conductive coating thickness measurement on non-magnetic metal substrate, Eddy Current Method

JB/T 8393-1996 Magnetic&Eddy Current coating thickness measurement Features

- Thickness measurement using both Magnetic Method to measure the non-magnetic coating on a magnetic metal substrate and Eddy Current Method to

measure the non-conductive coating on a non-magnetic metal substrate.

- Single-point,three-point and four-point calibration method could be used to correct probe system deviation, in order to ensure the accuracy of the device in the process of measuring.
- Automatic identify ferrous and non-ferrous substrate quickly.
- Power voltage indicator.
- Speaker beep while operating.
- Power-off automatically when idle; manually power-off available.
- Negative display function to ensure the accuracy of zero point calibration.
- Showing average, max, min value[*]

2.1 Principle

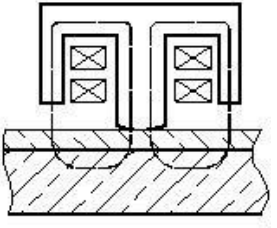
The device uses magnetic thickness measurement method, which non-destructively measures thickness of non-magnetic coating (such as: aluminum, chromium, copper, enamel, rubber, paint, etc.) on magnetic metal substrates (such as steel, iron, alloy and hard magnetic steel, etc.).

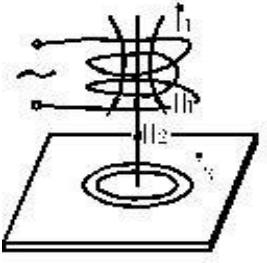
Magnetic Method (F-type probe)

When the probe contacts the cover layer, the probe and magnetic substrate forms a closed magnetic circuit; Due to the presence of non-magnetic coating, magnetic resistance changes. The thickness of the cover layer can be derived by measuring the change.

Eddy Current Method (NF-type probe)

When the probe contacts the cover layer, the probe and non-magnetic substrate forms Eddy Current and gives feedback to the coil inside the probe. The thickness of the cover layer can be derived by measuring the feedback.





Magnetic Method Eddy Current Method

2.2 Item Checklist

Name	Quantity
Meter device	1
Standard films	5
Base substrate	2
7 dry cell	2
Packing box	1
User Manual	1

2.3 Technical Data

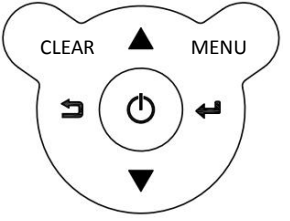
- Measuring range: 0-1250um[*] 0-1500um[**]
- Power supply: 2 * AA batteries

- Measurement deviation: zero calibration ± (1 + 3% H);

  two-point calibration ± [(1% ~ 3% H)] H + 1.5
- Ambient temperature: 0-40 ℃
- Relative humidity: ≤85%
- Minimum substrate: 10 * 10mm
- Minimum curvature: 5mm convex; 5mm concave
- Thinnest substrate:0.4mm
- Weight: 99g (with battery)
- Size: 102mm * 66mm * 24mm

[*]Single-base, double-base basic version

3.Display Description



- CLEAR Display measurement data clear button
- MENU: press this button to enter the menu operation
- Back Confirm
- UP DOWN
- Off button. When the instrument is turned on,

press this button to turn off the machine; when the instrument is turned off, press this button to turn it on.

- µm/mil: units of measurement
- CAL: calibration indicator
- Fe:Magnetic measuring state;NFe:Non-Magnetic measuring state
- 8.8.8.8: Thickness display area
- T010 means 10 times measurements, AVG means average value of 10 times measurements, MAX means max value of 10 times measurements, MIN means min value of 10 times measurement.
- : supply voltage low indicator.

4.Instructions

4.1 ON/OFF

Put 2 No. 5 dry batteries into the instrument (note the positive and negative terminals of the battery and make sure the battery is fully charged)

a) Power on:When the instrument is off, press and hold the “ ⏻ ” power button for 2 seconds.

b) Shutdown:When the instrument is powered on, press and hold the “ ⏻ ” power button for 2 seconds.

4.2 Calibration

There are four calibration methods for this instrument: zero calibration, single-point calibration, three-point calibration, and four-point calibration. For more accurate measurements, it is recommended that the instrument be calibrated each time used.

Note: When the measurement result of the instrument is not accurate, the zero point calibration can be performed first. After the zero calibration, if the data is still not correct, do another three-point calibration. If the data is still not accurate after three-point calibration, try four-point calibration or single-point calibration.

4.2.1 Zero Calibration

Zero calibration is one of the most basic calibrations. To improve the accuracy of the instrument during the measurement process, it is recommended to perform a zero calibration before each use of the instrument. The specific steps are as follows:

First measure the substrate (Fe or NFe) in the package, and the measured result will be displayed on the instrument display (for example: “-3.7 μm”), keep the measuring head of the instrument in contact with the substrate, and then press Hold the “ ▼ ” button until the instrument display prompts “Let the instrument away from the Fe/NFe substrate” and then release the “ ▼ ” button to raise the instrument to ensure that the instrument's measuring

head is away from the substrate until the instrument display shows “Success”. At this point, the zero calibration is complete.

4.2.2 Single-point Calibration

Single point calibration is suitable for high precision measurement and small workpieces, hardened steel, alloy steel. The specific operations are as follows:

a) Zero calibration first(As 4.2.1)

b) Press “MENU” to enter the “Main Menu” interface, press “▲”, “▼” to select “Calibration” item, press “↵” to enter “Calibration” interface, then select “Single Point Calibration” item, press “↵” to enter "Single point calibration" interface, the instrument display will prompt "Measure the thickness of the standard sheet first! Please measure..."

c) A measurement is made on a standard sheet having a thickness approximately equal to the expected thickness of the coating to be tested, and the screen displays <×××m>. Press the “▲” and “▼” keys to correct the reading to the standard value.(For example, if the thickness

of a standard sheet measuring 250 μm is "240 μm", press "▲" to adjust "240 μm" to "250 μm". Then press the "↵" key to save the correction value. At this point, the single point calibration is complete.)

Note: Pressing the "▲" and "▼" keys a single time will jump a number, long press and not release, will continuously jump the value to be corrected.

4.2.3 Three-point Calibration

When the environment of the instrument changes greatly (such as temperature, humidity, etc.), or the substrate (Fe or NFe) of the instrument changes or the performance changes, the measurement results of the instrument may be affected. At this time, we can The instrument performs the <Three Point Calibration> operation. The specific steps are as follows:

a) Press "MENU" to enter the "Main Menu" interface, press "▲", "▼" to select "Calibration" item, press "↵" to enter "Calibration" interface, then select "Three-point calibration" item, press "↵" Enter the "three-point calibration" interface, and the text on

the instrument display will prompt you to perform the first calibration.

b) Press the measuring head of the instrument vertically on the substrate according to the prompt on the instrument display (Fe or NFe), then press the “ ↵ ” button to start the first calibration. After the buzzer “ Beep... ” is heard, A point calibration is complete and the instrument's measuring head can be moved away from the substrate.

c) Place the standard piece of 500 μ m standard in the product package on the substrate (Fe or NFe) according to the instructions on the instrument display. Then press the measuring head of the instrument vertically and place it on the base with a standard piece of about 500 μ m. Press the “ ↵ ” button to start the second calibration. After the buzzer “Beep...” is heard, the second calibration is completed. At this point, the measuring head of the instrument can be moved away from the base.

d) Follow the prompts on the instrument display to raise the instrument away from the substrate (Fe or NFe), then press the “ ↵ ” button to start the third calibration. After the buzzer “Beep...” is heard, the third calibration is completed. At this point, the three-point calibration is

complete.

Note: If the measurement result of the instrument is still inaccurate after three-point calibration, a three-point calibration operation can be performed again. If it is still not possible, try a four-point calibration or a single-point calibration.

4.2.4 Four-point Calibration

When the probe of the instrument is worn, oxidized, magnetized, etc., the performance of the probe will change, and the measurement result of the instrument will be affected. At this time, we can perform the <four-point calibration> operation on the instrument. The specific steps are as follows:

a) Press "MENU" to enter the "Main Menu" interface, press "▲", "▼" to select "Calibration" item, press "↵" to enter "Calibration" interface, then select "four-point calibration" item, press "↵" to enter " Four-point calibration interface, there will be text prompts on the instrument display for the first calibration.

b) Press the measuring head of the instrument vertically on the substrate according to the prompt on the instrument display (Fe or NFe), then press the “ ↵ ” button to start the first calibration. After the buzzer “ Beep... ” is heard, A point calibration is complete and the instrument's measuring head can be moved away from the substrate.

c) Place the standard piece of 100 μ m standard in the product package on the substrate (Fe or NFe) according to the instructions on the instrument display. Then press the measuring head of the instrument vertically and place it on the base with a standard piece of about 100 μ m. Press the “ ↵ ” button to start the second calibration. After the buzzer “Beep...” is heard, the second calibration is completed. At this point, the measuring head of the instrument can be moved away from the base.

d) Replace the standard piece of about 100 μ m in the c step with the standard piece of about 500 μ m as standard in the product package, and then press the measuring head of the instrument vertically on the substrate with the standard piece of about 500 μ m, press “ ↵ ” The key starts the second calibration. After the buzzer “Beep...” is heard, the third point calibration is completed,

and the measuring head of the instrument can be moved away from the base.

e) Follow the prompts on the instrument display to raise the instrument away from the substrate (Fe or NFe), then press the “ ” button to start the third calibration. After the buzzer “Beep...” is heard, the fourth calibration is completed. At this point, the four-point calibration is complete.

Note: If the measurement result of the instrument is not accurate after four-point calibration, a four-point calibration operation can be performed again.

4.3 Instrument settings

The instrument can set the illumination time of the display, the automatic shutdown time of the instrument, the alarm of the measured coating exceeding the threshold value, the system language of the instrument and the unit of the thickness value obtained by the measurement.

4.3.1 Backlight time setting

The screen backlight time can be set to 5-999 seconds. In the standby state, press the "MENU" button to enter the main menu interface, press the "▲" or "▼" button to select the "Settings" item, press the "↵" button to enter the setting interface, and then select the "Backlight time item", press the "↵" button to enter the screen backlight time setting interface.

In the screen backlight time setting interface, press the "▲", "▼" key to adjust the size of the selected digital value, press the "↵" key to cycle through the numbers. When the backlight time is set, press "↩", the instrument display will prompt "Save the changes?", press "▲", "▼" to select "Yes", then press "↵" to save the changes.

4.3.2 Automatic shutdown time setting

The automatic shutdown time can be set to 2-99 minutes. In the standby state, press the "MENU" button to enter the main menu interface, press the "▲" and "▼" keys to select the "Settings" item, press the "↵" button to enter the setting interface, and then select

“Power off time” press "↵" button to enter the automatic shutdown time setting interface.

In the power off time setting interface, press the “▲”, “▼” key to adjust the size of the selected digital value, press the “↵” key to cycle through the numbers. When the auto power off time is set, press “⮌”, the instrument display will prompt “Save the changes?”, press “▲”, “▼” to select “Yes”, then press “↵” to save changes.

4.3.3 Alarm Threshold Setting

Press “MENU” in the standby mode to enter the main menu interface, press “▲”, “▼” to select “Settings” item, press “↵” to enter the setting interface, then select “Alarm setting” item, press “↵” button You can enter the alarm threshold setting interface.

In the alarm threshold setting interface, press the “▲”, “▼” key to adjust the content of the selected item, press the “↵” key to cycle through the setting items. When the alarm threshold is set, press “⮌”, the instrument display will prompt “Save the changes?”, press “▲”, “▼” to select “Yes”, then press “↵” to save the changes.

When the alarm threshold switch is turned on, if the coating thickness value of the measured object are more or less than the upper or lowest limit value of the alarm threshold , the instrument will issue "Di Di Di" three times when the measurement is completed.

4.3.4 Language Setting

This instrument supports both Simplified Chinese and English.

Press “MENU” in the standby mode to enter the main menu interface, press “▲”, “▼” to select “Settings” item, press “↵” to enter the setting interface, then select “Language” item, press “↵” button Enter the system language setting interface. Press the "▲", "▼" button in the system language setting interface to switch between "Simplified Chinese" and "English". Press “⮌” after the setting is completed, “Save the changes?” will be displayed on the instrument display, press “▲”, “▼” to select “Yes”, then press “↵” to save the changes.

4.3.5 Measurement unit setting

For different application requirements, the instrument is available in metric (μ m) and imperial (mil) measurement units.

Press the "MENU" button in the standby mode to enter the main menu interface, press the "▲", "▼" button to select the "Settings" item, press the "↵" button to enter the setting interface, then select the " Unit setting" item, press the "↵" button Enter the measurement unit setting interface. Press the "▲" or "▼" key in the measurement unit setting interface to switch between "μm" and "mil". Press "⮌" after the setting is completed, "Save the changes?" will be displayed on the instrument display, press "▲", "▼" to select "Yes", then press "↵" to save the changes.

4.3.6 Restore factory settings

Restoring the factory settings will restore all settings of the instrument to the factory state, and the calibration value of the instrument will be restored to the initial state. (When the thickness

of the coating measured after various calibrations of the instrument is still not in time, you can first restore the factory settings, and then do the calibration operation of the instrument.)

Press the “MENU” button in the standby mode to enter the main menu interface, press the “▲”, “▼” button to select the “Settings” item, press the “↵” button to enter the setting interface, then select the “Factory reset” item, press the “↵” button, the instrument The display will prompt “Factory reset?”, press “▲”, “▼” to select “Yes”, then press “↵” to complete the factory reset.

5.Accuracy Effecting Factors

a)Magnetic properties of the substrate metal

Base metal magnetic changes will affect the magnetic method accuracy. (In practical use, the magnetic change of low carbon steel can be considered mild.) To avoid the influence of heat and cold treatment, standard films with the same magnetic properties as specimen should be used to

calibrate the device; specimen without coating could also be used.

b)Electrical properties of the substrate metal

Conductivity of the base metal affects the measurement, which depends on its material composition and heat treatment method. Standard films with the same electrical properties as specimen should be used to calibrate the device.

c)Thickness of substrate metal

Each device has a critical thickness of substrate metal. Beyond the limitation, the base metal thickness does not affect the measurement. Please refer to Table 1.

d)Edge effect

This device is sensitive to shape transition so such measurement is not reliable.

e)Curvature

Specimen curvature affects the measurement. This effect increases clearly with the curved radius reduction.Measurement on bending specimens is not reliable.

f)Deformation of the specimen

Probe makes soft coating deformation, so measurement on these is not reliable.

g)Surface roughness

The roughness of substrate and coating effect measurement. Influence increases with roughness. Rough surface will cause system deviation and accidental deviation, so several measurements should be done for single point. If the substrate metal is rough, zero calibration should be done on un-coating surface.

h)Magnetic field

Strong magnetic fields generated by electrical equipment around would seriously interfere magnetic thickness measurement method to work.

i)Attached material

Material attached to the probe affect the accuracy. Thus, attached material must be removed to ensure that the probe contacts with the specimen directly.

j)Probe pressure

Pressure on the probe will affect the reading. Please keep the pressure stable.

k)Probe pressure

During operation, probe should be kept vertical to specimen surface.