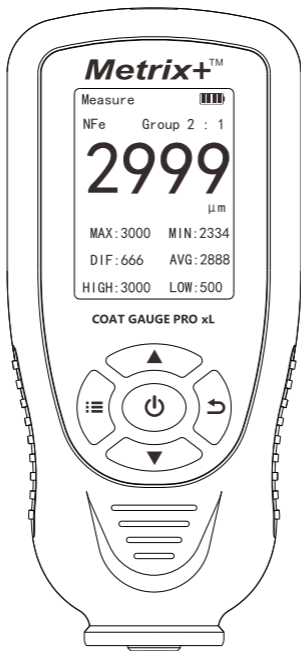


# Coating Thickness Gauge

## User's Manual



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## 1. Foreword

Dear user, thank you for purchasing this coating thickness gauge. In order to gain a more comprehensive understanding of this instrument and a better experience, please read this User's manual carefully before using the product.

### 1.1 Product Introduction

This instrument is a portable handheld thickness gauge that can measure the thickness of electroplated coatings or coatings on metal surfaces. Specifically, it can measure the thickness of non magnetic coatings (such as chromium, paint, ceramics, etc.), on magnetic materials (such as steel and iron) as well as the coating thickness (such as copper and aluminum ) on non magnetic materials (such as paint, etc.). The instrument is equipped with a precision probe that automatically detects substrate properties and detects coating thickness through electromagnetic induction and eddy current effects.

### 1.2 Application Scenario

This instrument can measure the thickness of coatings without damage quickly and accurately. Widely used in the manufacturing industry, metal processing industry, chemical industry, commodity inspection and other testing fields, it is a necessary instrument for material surface treatment engineering. Can work stably in laboratories, workshop sites, and outdoors.

### 1.3 Measuring principle

This instrument utilizes two principles: electromagnetic induction and eddy current effect. Non magnetic coating thickness (such as paint, plastic, copper, chromium, zinc, etc.) on magnetic metal substrates (such as steel, iron, and their alloys) can be measured non-destructive; The thickness of non conductive coatings (such as oxide film, plastic, paint, etc.) on non magnetic metal substrates (such as copper, aluminum, zinc, tin, etc.).

**Fe Probe:** Using the principle of electromagnetic induction, When the probe is contact with a coated magnetic substrate, the probe and the magnetic substrate form a closed magnetic circuit. The coating thickness corresponds to the magnetic resistance of the magnetic circuit, and the coating thickness is measured by detecting changes in magnetic resistance.

**NFe Probe:** Using the principle of eddy current effect, when the probe is contact with a coated non magnetic substrate, the probe generates eddy currents on the substrate. The feedback effect of eddy currents on the probe is proportional to the coating thickness. By detecting this feedback quantity, the purpose of measuring the coating thickness is achieved.

**Fe+ZnProbe:** Automatically identify whether there is a Zn layer above magnetic materials.

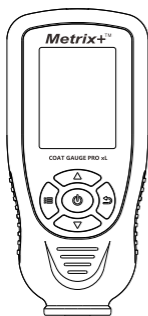
## 1.4 New features

In order to meet the higher needs of users, this coating thickness gauge has the following upgrades from its predecessor.

- ◆ Upgrade the color LCD dot matrix screen for richer display content.
- ◆ Add metal putty detection.
- ◆ Add non-metallic or over range prompts.
- ◆ Add group function, each group stores 8 measurement data, and can store up to 10 groups according to the first in first out principle. For the 8 measurement data in each group, there are the following calculation results: MAX, MIN, DIF, AVG which are displayed at the bottom of the screen.
- ◆ Added custom alarm threshold function, allowing users to customize the upper and lower limits of alarm values. After enabling this function, the measured values that exceed the high and lower limits are displayed in red.
- ◆ Add calibration animations to make the instrument simple and easy to use.

## 2. Accessories list

Dear user, the instrument you purchased includes the following accessories. For the convenience of future use, please do not discard it at will.



Instrument\*1



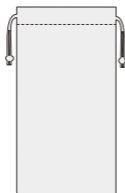
Iron based sheet\*1



Aluminum based sheet\*1



Calibration diaphragm\*7



Cloth bag\*1

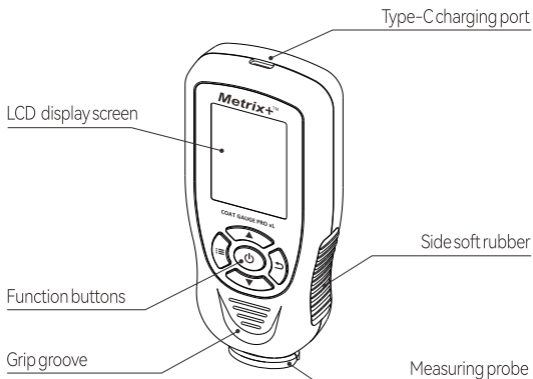


Charging Line\*1

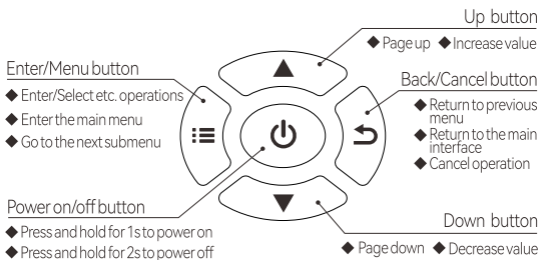
**Note:** The specific attachments are subject to the actual products from the factory. Any changes in the future are subject to no notice!

## 3. Product information

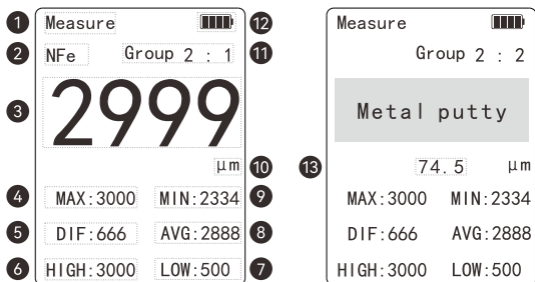
### 3.1 Description of components



### 3.2 Description of function buttons



## 3.3 Description of main interface display



Contents		Explain
1	Measure	Interface description.
2	NFe	Base material, the instrument automatically recognize the base material, display "Fe" (magnetic material), "NFe" (non magnetic material), or "Fe+Zn" (magnetic metal material with zinc coating).
3	2999	Measurement value. When the tested substrate is non-metallic material or over range, it displays "non-metallic or over range".
4	MAX : 3000	The MAX value of all measurement data in the current group.
5	DIF : 666	The difference between the MAX and MIN values in the current group.
6	HIGH : 3000	Upper limit alarm value which set by user.
7	LOW : 500	Lower limit alarm value which set by user.
8	AVG : 2888	The average of all measurement data in the current group.
9	MIN : 2334	The MIN value of all measurement data in the current group.
10	$\mu\text{m}$	Unit " $\mu\text{m}$ ", which can be switched to "mils" in settings.
11	Group 2 : 1	Group, representing the 1th measurement data of the 2 group.
12		Battery level icon.
13	74.5	Measurement value of metal putty.

## 3.4 Technical Parameter

Usage scenario	Non magnetic or insulation coatings on magnetic substrates; insulation coatings on non magnetic but conductive substrates
Measuring range	0~3000 $\mu$ m or 0~118mil
Resolution	0.1 $\mu$ m(0~99.9 $\mu$ m), 1 $\mu$ m(100~3000 $\mu$ m) or 0.01mil(0~9.99mil), 0.1mil(10~99.9mil), 1mil( $\geq$ 100mil)
Min measurement area	6X6mm
Thinnest substrate thickness	0.4mm
Min surface diameter	Concave surface:5mm; convex surface:5mm
Usage environment	Temperature:-20~40°C(-4~104°F); humidity:20%~90%RH, No strong magnetic field environment
Measurement accuracy	0~1000 $\mu$ m: $\pm$ (3%+1 $\mu$ m) or $\pm$ (3%+0.04mil); $\geq$ 1000 $\mu$ m: $\pm$ (5%+1 $\mu$ m) or $\pm$ (5%+0.04mil)
Unit	$\mu$ m, mil
Calibration method	Zero calibration; Point calibration; Reset calibration
Automatic power off time	Default 5 minutes, can be set to other times in the menu
Size	4.72*2.17*0.91 inch (120*55*23mm )
Weight	6.17oz(175g)

## 4. Interference factors affecting measurement accuracy and stability

### a. The base metal Properties

- ◆ For the magnetic method: The thickness measurement using the magnetic method is influenced by the magnetic changes in the base metal (in practical applications, the magnetic changes in low-carbon steel can be considered minor). To avoid the influence of heat treatment and cold working factors, the instrument should be calibrated using a standard plate with the same properties as the base metal of the test piece, or the tested piece can also be used for calibration.
- ◆ For eddy current method: The conductivity of the base metal has an impact on the measurement, and the conductivity of the base metal is related to its material composition and heat treatment method. Use a standard piece with the same properties of the base metal to calibrate the instrument.

### b. The base metal thickness

Check if the thickness of the base metal exceeds the minimum thickness (0.4mm), If not, it can be measured after calibration.

**c. Deformation of the test-piece**

The measuring probe will deform the soft cover layer of the test-piece, so reliable data cannot be measured on these test-piece.

**d. Number of readings**

Usually, due to the fact that each reading is not exactly the same, it is necessary to take several readings within each measurement area. The local differences in the thickness of the covering layer also require multiple measurements to be made within any given area, especially during surface roughening.

**e. Surface cleanliness of probe and test-piece**

Before measurement, any attached substances such as dust, grease, and corrosion products should be removed from the surface of the probe and test piece, but do not remove any covering material.

**f. Magnetic field**

The magnetic field generated by various electrical equipment around it can seriously interfere with magnetic thickness measurement work, making it unsuitable for use in such environments, such as magnets, horns/motors containing magnets, high-power electrical appliances in operation, etc.

**g. The probe is perpendicular to the test-piece**

The placement of the probe has an impact on the measurement, and it should be kept perpendicular to the workpiece during measurement.

**h. Environmental temperature and humidity**

Avoid measuring in environments with significant changes in temperature and humidity.


**i. Battery level**

When the battery is low, serious errors may occur in the data. Please ensure to use it when the battery is sufficient.

## 5. Use the instrument

Dear users, when using this instrument for the first time, please carefully read the above description and suggestions of interference factors affecting measurement accuracy and stability. The instrument has been initially set before delivery, and can be used directly after unpacking. The use method is as follows:

### 5.1 Measurement steps

- 1 Prepare the test-piece;
- 2 Place the instrument in an open space, at least 5cm away from any metal, then long press the on/off button "  " for about 1 second to start the instrument. After starting, pay attention to whether the power is insufficient in the upper right corner of the screen, if the power is insufficient, the data may have serious errors, please charge it before use;

- 3 Select the desired unit in the settings menu;
- 4 Quickly and smoothly place the probe in vertical contact and gently pressed against the test piece. The buzzer will "beep" and the screen will display the measured value. Before proceeding with the next measurement, the probe must be at least 5 centimeters away from the test piece. The operating method is shown in the following figure;
- 5 After the measurement is completed, long press the power on/off button "⏻" for about 2 seconds to turn off the instrument; The system has the automatic power off function. By default, the system automatically power off after 5 minutes without operation.



The probe should be at least 5cm away from the test-piece, then quickly and smoothly vertically contacted and gently pressed against the test-piece

After the buzzer "beep", the screen displays the measured thickness value

**Note:** Please avoid the following incorrect measurement methods:



**Error cause:**

Probe is not perpendicular to the surface to be measured



**Error cause:**

Probe is not compressed to the surface to be measured

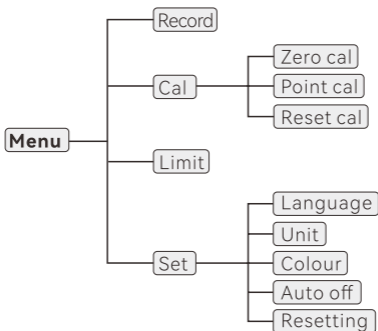


**Error cause:**

No probe was used for measurement

## 5.2 Function menu

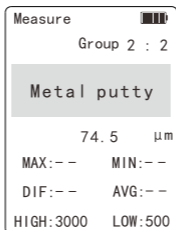
After power on, press the menu button " " in the main interface to enter the function menu page. And then you can follow the prompts to access more functions and Settings of the instrument. The menu structure is as follows:



## 5.3 Auxiliary Display

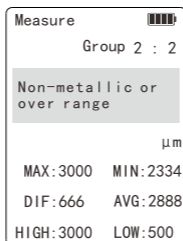
### 1. Metal putty

When there is metal putty inside the paint surface, traditional thickness gauges will judge the metal putty as the substrate and only measure the thickness of the paint surface, misleading testers to consider it as the original factory paint surface, making illegal vendors profitable. red dragon Instrument has developed a metal putty detection function for this purpose. When the instrument detects a metal putty layer inside the paint surface, it will display as follows:



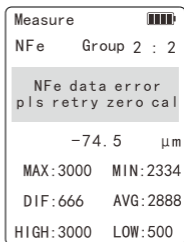
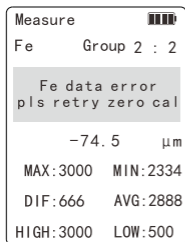
## 2. Non-metallic or over range

When the test piece is a non-metallic substrate or the coating thickness exceeds the range, the instrument will display the following:



## 3. Calibration error



When there is an error in calibration and the measured value is negative, the value will be displayed in red and the following display interface will appear:



## 3. The measured value exceeds the high and low limits

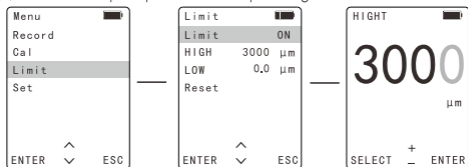
If the user sets the upper and lower alarm thresholds, when the measured value exceeds the upper and lower limits, the measured value will display in red.

## 5.4 Record

Under the main interface, press the back button " " or enter the history page in the menu. According to the "first in first out" principle, up to 10 groups (8 data in each group) can be saved. The data in each group has multiple calculation results displayed at the bottom. On the record page, press the menu button " " to delete the record as prompted.

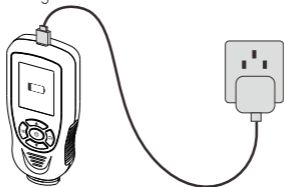
## 5.5 Alarm threshold setting

Many times, users have an expected value for the coating thickness to be measured, and values within the range can be judged as qualified. This instrument has added an alarm threshold function. The specific operation is as follows: Press the menu button "☰" on the main interface to enter the menu page — press the up button "▲" and down button "▼" on the menu page to select the limit option and enter the next level sub page — open the alarm threshold function on the limit page, and follow the prompts to set the required high and low limit values.



## 5.6 charge

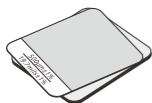
When the battery is low, serious errors may occur in the measurement data. This instrument has a built-in rechargeable lithium battery. When the battery icon in the upper right corner of the display screen shows low power "🔋", please use a Type-C charging line to charge the instrument.



## 6. Calibration

### 6.1 The purpose and determination method of instrument calibration

Calibration is mainly used for fine-tuning the measurement accuracy of instruments. When the instrument probe has slight wear, storage time is too long, environmental temperature and humidity are relatively poor, or the material to be tested is special, there may be slight deviations in the measurement values. At this time, users need to perform simple calibration of the instrument themselves. Users can determine whether the instrument needs to be calibrated by measuring calibration diaphragms of different thicknesses based on the iron and aluminum sheets, as shown in the following figure:



1. Prepare iron or aluminum sheets and place the calibration diaphragm above them.



2. Measure the thickness of the diaphragm with the probe vertically pressed against it to obtain a reading.

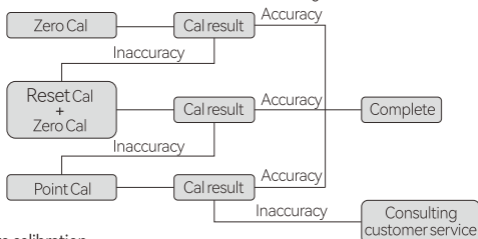


3. Compare the reading with the thickness of the diaphragm, if there is a big difference, calibration is required.

**Note:** Whether the reading differs too much from the actual thickness of the diaphragm can be judged according to the measurement accuracy of the instrument in the technical parameters.

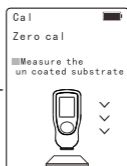
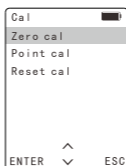
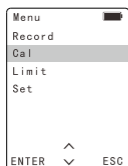
## 6.2 Calibration method

The instrument is set up in three calibration modes: zero calibration, point calibration and reset calibration. The recommended calibration logic is as follows:




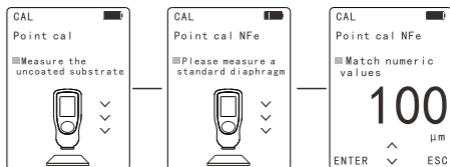
### 1. Zero calibration

Zero calibration steps: Menu button "☰" — Cal — Zero cal — as prompted.




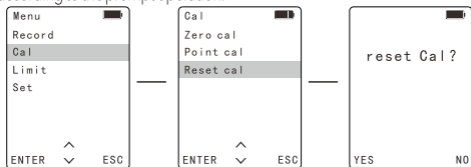
## 2. Point calibration

Point calibration steps: Menu button " " — Cal — Point cal — After operating according to the prompts, confirm whether the instrument reading is consistent with the thickness of the calibration diaphragm. If not, press the arrow button to switch to the value consistent with the calibration diaphragm.



## 3. Reset calibration

The instrument will try to automatically solve calibration faults caused by calibration errors or data confusion, but when occasionally the instrument cannot be calibrated normally or the reading is confused due to some wrong operation, you can use the reset calibration, the operation procedure: menu button " " — Cal — Point cal — according to the prompt operation.



### 6.3 Points for attention in calibration

- ◆ In most cases, it is not necessary to complete all calibration steps.
- ◆ After zero calibration or point calibration, it is recommended to use a 100 $\mu$ m diaphragm to verify the calibration effect, if accurate, no further steps are required.
- ◆ The Fe and NFe modes need to be calibrated separately. If the Fe mode is inaccurate, it is necessary to use the iron based sheet to calibrate; If the NFe mode is inaccurate, it is necessary to use the aluminum based sheet to calibrate; If both modes are inaccurate, it is necessary to perform calibration separately according to the above steps.
- ◆ After performing reset calibration, the calibration data is cleared. In order to comply with the current usage environment, it is recommended to perform a subsequent "zero calibration".

## 7. Maintenance and repair

Users should avoid using this instrument under excessively harsh conditions such as collision, heavy dust, high temperature, humidity, and strong magnetic field, otherwise it will damage the instrument; If there is a significant deviation in the measured values during the use of the instrument, please first check if the battery is low and try restarting. If it still does not work, please try restoring the factory settings. If the above methods still cannot solve the problem, please contact the dealer in a timely manner. Do not disassemble or disassemble the machine on your own, as this will affect warranty services.

## 8. Waste disposal

Always dispose of packaging materials, batteries, and discarded electronic devices in an environmentally friendly manner and in accordance with local regulations.



This icon is taken from Directive 2012/19/EU. It states that this device must not be disposed of with the household waste at the end of its life. You will find collection points for free return of waste electrical and electronic equipment in your vicinity. In the European Union, batteries and accumulators must not be treated as domestic waste, but must be disposed of professionally in accordance with Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators. Please dispose of batteries and accumulators according to the relevant legal requirements.