

CM10 series
Coating Thickness Gauge
Operating Manual

YUSHI INSTRUMENTS

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1 General Information

CM10 Series is a kind of compact and handy pocket gauge which was designed for non-destructive, fast and precise coating thickness measurement. Fit for both experiments and project sites.

This gauge complies with the following standards:

GB/T 4956-2003 Non-magnetic coatings on magnetic substrates,

Measurement of coating thickness, magnetic method.

GB/T 4957-2003 Non-conductive coatings on Non-magnetic substrates,

Measurement of coating thickness, Eddy Current method.

JB/T8393-1996 Magnetic and Eddy Current Measuring instrument for coating thickness.

JJG818-2005 Magnetic and Eddy Current Measuring instrument for coating thickness.

Features:

- CM10F and CM10FH adopt magnetic measuring method to measure the thickness of non-magnetic coatings on magnetic metal substrates.
- CM10N adopt eddy current measuring method to measure the thickness of non-conductive coatings on non-magnetic metal substrates.
- CM10FN could adopt both magnetic measuring method and eddy current measuring method.
- CM10F can measure the max thickness to 3mm, CM10FH can measure the max thickness to 10mm.
CM10N can measure the max thickness to 2mm, CM10FN can measure the max thickness to 1.5mm.
- Optional High and Low resolution.
- Five statistics: Number of measurement (N), Maximum value (MAX), Minimum value (MIN), Mean value (MEAN) and Standard deviation (STD.DEV).

- The gauge can be calibrated by zero calibration, one-point calibration and two-point calibration methods.
- Power low-voltage prompt function.
- Bleep prompts during the operation.

1.1 Configurations

1.1.1 Standard Configuration

Standard Configuration				
Model	CM10F	CM10N	CM10FN	CM10FH
Main unit	1 set			
Probe	Inseparable with the Main unit			
Zero plate	Fe×1	Al×1	Fe×1+Al×1	Fe×1
Calibration foils	1 set			
Battery	2 pieces			
USB Cable	1 piece			
Communication CD	1 piece			
Operating Manual	1 copy			
Sealed Carrying Case	1 piece			

1.1.2 Optional Configuration

- Calibration Foils
- Fe Zero Plate
- Al Zero Plate

1.2 Construction of the Gauge

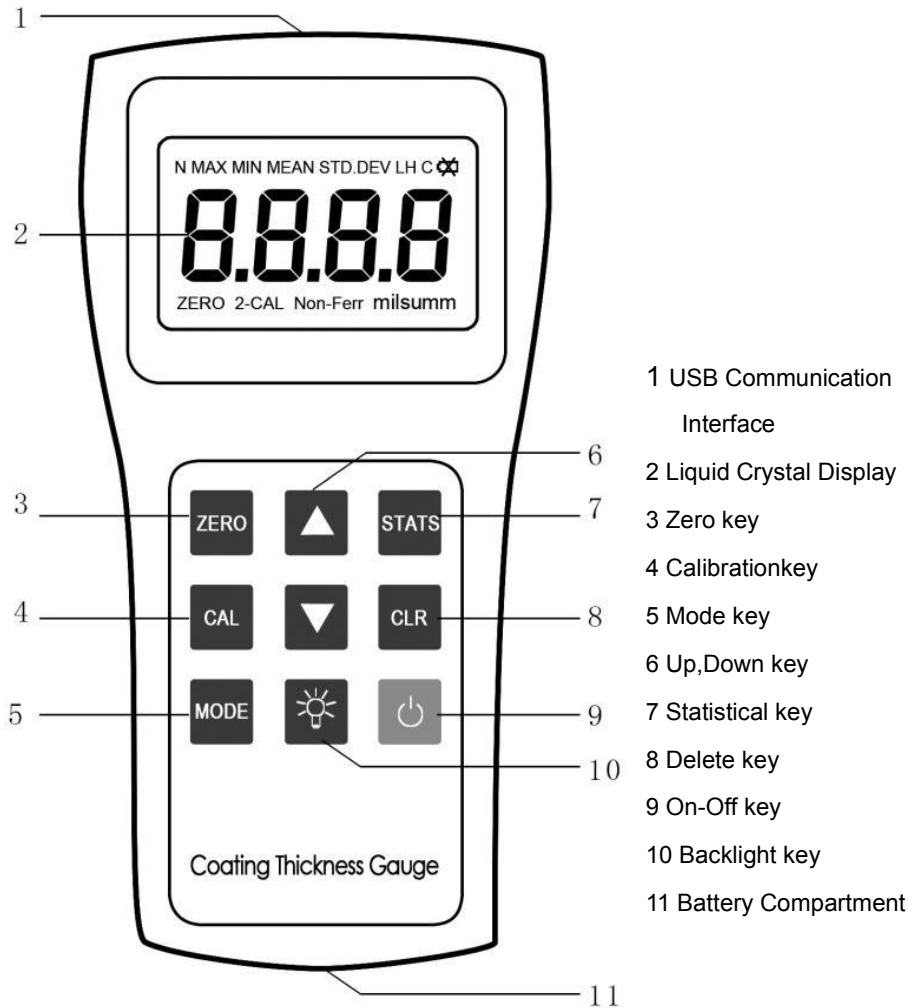


Figure 1.1 Main Unit (suitable for CM10F/CM10N/CM10FH)

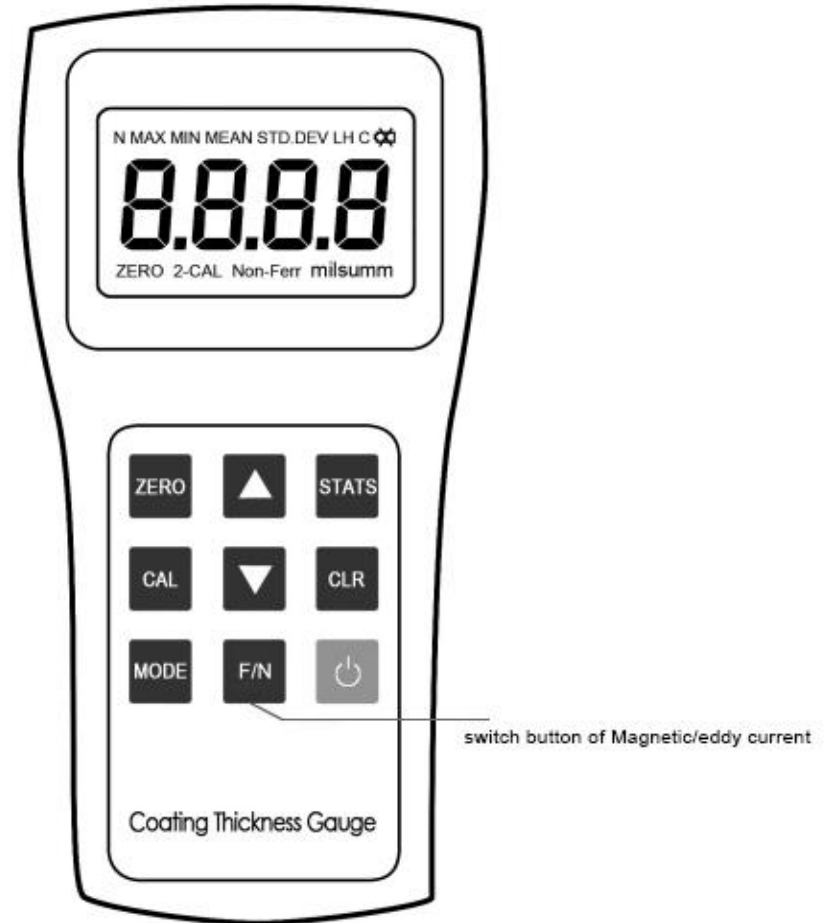


Figure 1.2 Main Unit (CM10FN)



Figure 1.3 Screen

- 1 Statistical symbol
- 2 Resolution symbol
- 3 Low voltage symbol
- 4 USB cable connected
- 5 Data display area
- 6 Zero symbol
- 7 Calibration symbol
- 8 Probe type symbol
- 9 Metric unit symbol
- 10 Imperial unit symbol

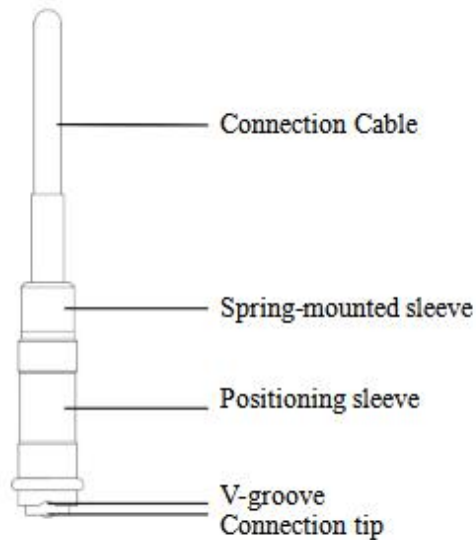


Figure 1.4 Probe

1.3 Specifications

1.3.1 Measurement Range and Measurement Error

Model	CM10F	CM10N	CM10FH	CM10FN	
Measuring Principle	Magnetic	Eddy Current	Magnetic	Magnetic/Eddy Current	
Measuring Range(μm)	0-3000	0-2000	0-10000	0-1500	
Low Range Sensitivity(μm)	0.1	0.1	0.1	0.1	
Tolerance(μm)	$\pm(2\%H+2)$	$\pm(2\%H+2)$	$\pm(2\%H+10)$	$\pm(2\%H+2)$	
Testing Condition (mm)	Min. Curvature Radius(μm)	5	5	10	5
	Min. Measuring Surface	$\Phi 20$	$\Phi 20$	$\Phi 40$	$\Phi 20$
	Substrate Thickness	0.5	0.5	2	0.5

Table1.1 Instrument Specification

1.3.2 Operating Environment

Temperature: $-10^{\circ}\text{C} \sim +50^{\circ}\text{C}$
 No strong magnetic field environment

1.3.3 Power

Two 1.5 Volts Alkaline Batteries

1.3.4 Size and Weight

Size: $149\text{mm} \times 73\text{mm} \times 32\text{mm}$
 Weight (no batteries): 250g

2 Instrument Usage

2.1 Preparing before Using

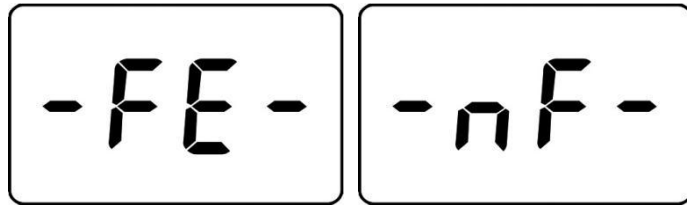

1. Prepare the testing object.
2. Make the probe away from the testing object.
3. Press “

Figure 2.1 Switch the gauge on

After a short stay, the screen interface is switched to initialization.

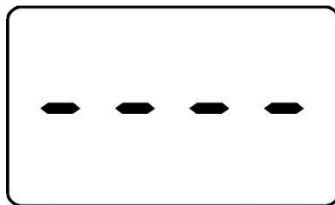



Figure 2.2

4. After the instrument beeps again and completes the power-on self-check, the measurement can be started.

2.2 Checking Power Supply


Batteries are sufficiently charged if “

Note: 1 Low-battery voltage won't lead to incorrect readings.

2 Data in memory won't loss when replacing batteries.

3 The batteries should be removed if the gauge is not used for a long time.

2.3 Device Initialization

To turn the gauge off, press and hold “CLR”, then press “

2.4 Basic Setting

Press MODE to enter the measuring unit setting, press MODE again to enter the high and low resolution setting, and press MODE for the third time to quit the basic setting.

Note: For CM10FN, the third time to press MODE to enter backlight setting, include light off and light on. Press MODE again to quit basic setting.

2.4.1 Measuring Unit Setting

After enter the measuring unit setting, press the arrow keys “↑”“↓” to adjust the measuring unit to your requested option 0 or 1. The metric measuring mode (0) is shown in um and um icon lights up; the imperial measuring mode (1) is shown in mils and mils icon lights up; CM10 series gauge will switch the unit between um and mm automatically according to the measured thickness.



Figure 2.3

2.4.2 Resolution Setting

After entering the resolution setting, press “↑”“↓” to adjust the resolution to your requested option 0 or 1. The screen displays “H” in the high resolution mode (0) and displays “L” in the low resolution mode (1).

Note: For CM10FN, (0) for low resolution mode, (1) for high resolution mode. Subsequent program upgrades may operate uniformly, specific to the actual situation.

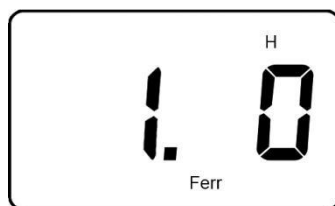


Figure 2.4

Resolution	0~999(um)			≥1mm
	0~99.9	100~999		0.01mm
High Resolution	0.1	1		
Low Resolution	0~200	200~500	500~999	
	1	2	5	

Table 2.1

2.5 Statistics Value Querying and Deleting


The statistics of CM10 series include Number of measurement (N), Maximum value (MAX), Minimum value (MIN), Mean value (MEAN) and Standard deviation (STD.DEV).

Every time press “STATS”, the statistical values can be query, and exit the statistics program after query. Press the Delete key to delete all statistics and exit the statistical value query system.

2.6 Delete the Current Measured Value

Press “CLR” to delete the current measured value during the measurement, and the previous measurement result won't be impact.

2.7 Backlight Control

CM10 series(except CM10FN) gauge has backlight function, in order to read the measured values in the dark. Press “” button in any mode to toggle backlight settings (short/long/off).

Adjust the gauge to backlight power saving mode (short light up mode), the backlight will light up only in the process of measuring, and automatically turns off after 5 seconds.


2.8 Probe switch (CM10FN)

Press "F/N " button to select probe type.

2.9 Communication Function

Connect the gauge to the computer using the USB cable. When successfully connected, the device will beep and display the “C” (connect) mark.

2.10 Switch the Gauge OFF

CM10 offers two different modes to power off: automatic turn off after about 3 minutes with no operation, or long press “” button to turn it off.

3 Instrument Calibration

3.1 Zero Calibration

3.1.1 Calibration Condition

For correct calibration, the test object should have no coating.

3.1.2 Calibration Steps

1. Press “ZERO” button to enter zero calibration procedure, the “MEAN” mark displays on the screen, and “ZERO” mark flicking;
2. Every time the probe smoothly falls on the zero adjustment of the measured work-piece, the value appears on the instrument screen, zero adjustment for one time .If the number of zero adjustment is less than 10 times, press the "Zero" button to exit the zero adjustment mode. If the calibration times is more than 10 times, the instrument automatically exits the zero adjustment mode.
3. After exiting the zero adjustment, the "MEAN" icon is off. If there is zeroing data inside the instrument, the "ZERO" icon is on; otherwise, the "ZERO" icon is off.

3.2 One-Point Calibration

3.2.1 Calibration Condition

The thickness of the calibration foil should close to the testing object.

3.2.2 Calibration Steps

1. Press “CAL” button to enter the calibration mode, the “MEAN” mark displays on the screen, and “CAL” flicking;

2. Put the calibration foil on the zero position of the testing material, The probe falls on the calibration foil as one time calibration .The maximum number of calibration times is 10,Press “↑” or “↓” to make the reading on the screen to a standard value,Press the "CAL" button again to exit the calibration mode.

3. After exiting the calibration mode, the "MEAN" icon is off, if there are calibration values inside the gauge, The "CAL" icon is on, otherwise the "CAL" icon is off.

3.3 Two-Point Calibration

3.3.1 Calibration Condition

The thickness difference between the two calibration foils is at least three times, and the thickness of the coating to be tested is between the two calibration foils.

3.3.2 Calibration Steps

1.Complete the one-point calibration operation with one foil first, then “CAL” mark will display on the screen.

2.Complete the one-point calibration operation again with another foil, then “2-CAL” mark will display on the screen.

3.4 Remove the Calibration Data

After entering the calibration mode, if there are no calibration measurements, press “CLR” will remove all the calibration values and exit the calibration mode; if there already are calibration measurements, pressing “CLR” will not save the current calibration value and exit the calibration mode, use the previous calibration data .

4. Factors Affecting Measuring Accuracy

4.1 The Related Table

Measuring Method Influencing Factors	Magnetic Method	Eddy Current Method
The magnetic permeability of the metal substrate	√	—
The conductivity of the metal substrate	—	√
Thickness of the Metal Substrates	√	√
Edge Effects	√	√
Curvature	√	√
Deformation of the Specimen	√	√
Surface Roughness	√	√
Magnetic Field	√	—
Attached Material	√	√
Probe Pressure	√	√
Probe Orientation	√	√

Table 4.1 Related Table

√: Means Influential


5. Care and Maintenance

5.1 General Cautions

Strictly avoid collision, heavy dust, humidity, strong magnetic field and oil pollution, etc.

5.2 Replace Batteries

Please replace the batteries promptly when the battery power is low, the steps are as follow:

1. Press “

Attention: we do not recommend removing batteries out directly in the state of power on.

5.3 Instrument Maintenance

Contact with the maintaining department of our company with the following problems:

1. Components damage and the gauge cannot measure;
2. The display of the screen is disordered;
3. The measuring error is abnormally big in normal usage;
4. Keyboard operating is disordered or keyboard does not work.

As the coating thickness is high-tech product, the maintaining work should be made by professional operator and please avoid self-acting operations.