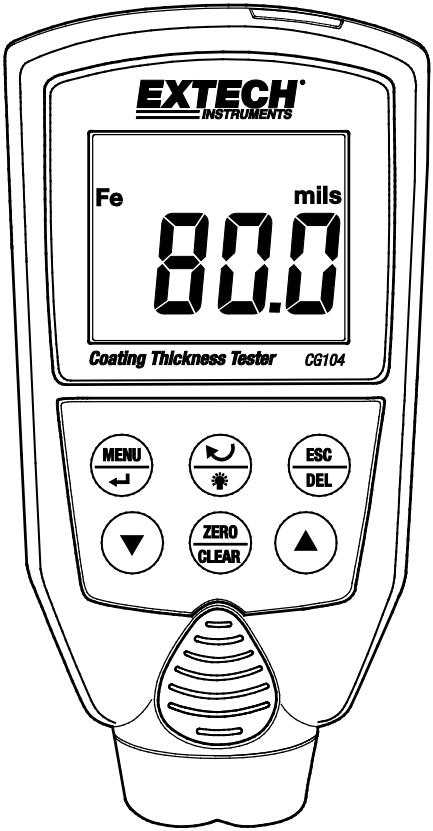
EXTECH INSTRUMENTS

User Manual

Coating Thickness Tester

Model CG104



Additional User Manual Translations available at www.extech.com

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Introduction

Thank you for selecting the Extech Instruments CG104 Coating Thickness Tester. The CG104 is a portable meter designed for non-invasive coating thickness measurements with automatic recognition of the material under test.

The meter uses two measurement methods: magnetic induction (for ferrous metal substrates) and eddy current (for non-ferrous metal substrates).

This device is shipped fully tested and calibrated and, with proper use, will provide years of reliable service. Please visit our website (www.extech.com) to check for the latest version of this User Guide, Product Updates, Product Registration, and Customer Support.

Features

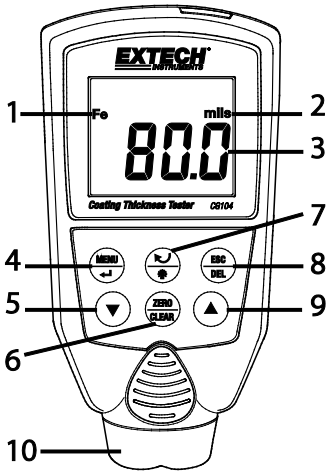
- LED backlighting
- Reversible LCD orientation
- Auto Power OFF
- Low-Battery Indication
- Zero Function and Two-Point Calibration
- Datalogging function
- High-Low Alarm Alerts
- Selectable Measurement Units
- Supplied Zero and Standard Coating Substrates

Description

Meter Description

1. Ferrous/non-ferrous or auto (AT) indicator
2. Unit of measure
3. Measurement reading
4. MENU / Return button
5. Down arrow button
6. ZERO / CLEAR button
7. Backlight and Reverse Display arrow button
8. Escape / Delete button
9. Up Arrow button
10. Sensor

Note: Battery compartment on rear of meter



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Function Keys

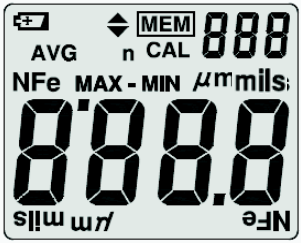
MENU	Access the Menu / Enter for confirming an edit
	Reverse the display orientation/ press > 2 seconds for Backlight
ESC DEL	Revert to previous mode / Delete an entry
▼ ▲	Selecting functions, scrolling and setting values
ZERO CLEAR	Substrate Zero CAL (short press) / Calibration point clear (press > 2 secs.)

Function Key Notes:

ESC and Arrow keys are disabled in the Measurement mode

Backlight and ZERO buttons are disabled in the 'Options' menu

Display Icon Description



Fe, nFe	Ferrous and Non-ferrous substrates
AT	Auto metal sensing mode
▲▼	High-Low Alarm indicators
MEM	MIN-MAX-AVG Recording is active
CAL	Calibration is active
µm	Micrometer unit of measure
mils	mils (unit of measure) = millimeters * 2.54/100
MAX-MIN	Maximum minus Minimum reading
MIN, MAX, AVG	Minimum, Maximum, or Average reading
n	Recalled data point storage serial number
	Low battery

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Safety Information

CAUTION

- Do not use the unit near devices that generate strong electromagnetic radiation or near a static electrical charge, as these may cause errors.
- Do not use the unit where it may be exposed to corrosive or explosive gases. The unit may be damaged, or an explosion may occur.
- Do not keep or use this unit in direct sunlight or where condensation is present. The meter's housing could become deformed, its insulation may be damaged, or it may no longer function according to specification.
- Do not place the meter on or around hot objects (70°C/158°F); otherwise damage to the case is likely.
- If the meter is exposed to significant changes in ambient temperature, allow 30 minutes for temperature stabilization, before taking measurements.
- Condensation may form on the sensor when moving from a cold to a hot environment. Wait for 10 minutes for condensation to dissipate before taking measurements.
- This unit is not constructed to be waterproof and dustproof. Do not use it in a wet or extremely dusty environment.
- In order to take accurate measurements, ensure that the sensing tip contacts the coated surface tightly without a tilt angle.
- Please ensure that there are no air bubbles between substrate and coating.
- **Substrate zero calibration must be performed before each use.** The enclosed zeroing plates are suitable for the zeroing calibration as described in this User Guide.
- **To ensure measurement accuracy, the Two-point Calibration, as described in this User Guide, is recommended before each use.**
- Zeroing on a specific material substrate still needs to be done before taking formal measurements, such as for Iron, Steel, Bronze, Copper, Nickel, Zinc, SUS304, etc. This is to avoid measurement errors caused by the differences in individual substrates. End users can expect the best results on a specific metal by performing a Zero calibration and a Two-point calibration as described in this User Guide.

WARNING

This instrument uses a magnetic field method to measure the coating thickness on a ferrous metal base. If this meter is placed in an environment of 20mG (milli Gauss) or above, its accuracy will be affected. The meter should be kept at least 30cm away from the source of interference. The list below can be used as a reference for interference potentials. Electromagnetic field strength is shown in milli Gauss:

Electromagnetic Source:	0cm	30cm
Cellular Phone Charger:	50~ 500	< 1
Notebook Power Supply:	100~ 1000	< 5
LCD Display:	10~ 100	< 1
Fan:	100~ 1000	< 5
Reading Lamp:	400~ 4000	< 10

Note: Any device with an internal coil should be considered as a possible interference source.

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Operation

Meter Power and Auto Power OFF

The meter powers up automatically when the sensor is pressed against a measurement surface. If the display does not switch ON, install or replace the batteries. The Auto Power OFF (APO) feature switches the device OFF after 30 seconds of inactivity. Note that the APO feature is deactivated while programming in the ‘Options’ menu.

Measurements, ZERO function, and Alarms

Practice with the supplied film and zero reference metal substrates to learn how the meter operates before moving on to a professional application. The heavier metal substrate is the ferrous (magnetic) substrate and the lighter metal substrate is the non-ferrous (non-magnetic) substrate (they are labeled).
When in the AUTO MODE (see ‘Options’ menu) the meter automatically senses ferrous and non-ferrous substrates (the display icons inform the user) otherwise the user must select ferrous or non-ferrous in the ‘Options’ menu.

1. Set the meter to ferrous, non-ferrous, or automatic sensing mode in the ‘Options’ menu.
2. Make sure that the tip of the meter is clean of all oil and particles.
3. Press the spring-loaded sensor against the surface of a blank round ferrous or non-ferrous substrate.
4. While maintaining contact with the substrate, momentarily press the ZERO/CLEAR button. The meter will beep once and ‘0’ will appear on the display indicating that the meter has been zeroed.
5. Place a reference film on either the ferrous or non-ferrous substrate.
6. Take a measurement by pressing the spring-loaded sensor against the reference film.
7. The meter will beep once when the measurement is taken. Note the reading on the display. If it is out of specification perform a calibration.
8. If the coating thickness measurement is above the range of the meter, the meter will display "---" and emit a series of beeps.
9. If the measured value exceeds the High or Low Alarm limit the meter will emit a series of beeps and the high alarm (up arrow) or low alarm (down arrow) icon will appear on the top of the display. Program the High/Low Alarms in the ‘Options’ menu.

CAUTION

Keep the meter clear of Electromagnetic radiation sources as explained in the Safety section of this User Guide.

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'Options' Menu

From the Measurement Mode, press MENU to access the 'Options' menu. The CAL icon will blink. Use the ▲▼ buttons to scroll through the following options; detailed instructions follow this list:

CAL	Two-Point Calibration
rEC	Record setting/recall (select Recoding ON/OFF for MIN, MAX, AVG, and MAX minus MIN)
ALr	High-Low Alarm Settings (select ON or OFF and program alarm limits)
Unt	Measurement Units (mils or microns)
FEr	Substrate Material setting (select ferrous, non-ferrous, or auto sensing)

CAL - Two-Point Calibration

Use the uncoated substrate and the 1006 **µm** reference film or use two reference films (one thinner than the other) of known thickness.

Remove the protective plastic coating from the metal reference standards before use.

Note: To clear previously set calibration points, while in the measuring mode, press and hold ZERO/CLEAR for at least 2 seconds. The LCD will display "0000".

The maximum possible calibration value is 1006 µm (39.6 mils)

1. Turn on the meter by pressing the tip.
2. Press MENU to access the Two-point Calibration mode. 'CAL' will be flashing in the upper right corner of the display.
3. Press MENU again and the LCD will display **Lo** in the upper right hand corner.
   Use the up and down arrow buttons to set the value to '**0**' for an uncoated substrate or to the thickness value of the thinner reference film being used for the calibration.
4. Press MENU/ENTER to confirm the value. The display will flash '**PUSH'**.
5. Press the tip of the gauge to the uncoated substrate for '0' or to the substrate with the thinner reference film. The gauge will beep once. The low value calibration point is now set.
6. The LCD will display **Hi** in the upper right hand corner.
   Use the up and down arrow buttons to adjust the display to the value of the thicker reference film. Use the standard coating plate (1006µm/39.6mils) or a known reference film that is thicker than the first calibration film.
7. Press MENU/ENTER to confirm the reading. The display will flash '**PUSH**'.
8. Press the tip of the gauge to the thicker reference film. The gauge will beep once and then return to the measurement mode. The high value calibration point is now set.
9. The meter is now ready to make measurements.
10. To abort at any time without saving the Two-point Calibration, Press ESC/DEL.

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rEC - Record setting/recall (AVG-MIN-MAX-n)

The meter can record up to 255 Average (AVG), Minimum (MIN), Maximum (MAX), and MAX minus MIN readings for later recall.

1. Turn on the meter by pressing the tip.
2. Press MENU, 'CAL" will flash, Use the ▲ or ▼ buttons to select **rEC** to enter the Recording setup.
3. Press MENU, use the ▲ or ▼ button to select Recording ON or OFF.
4. Press MENU/ENTER to confirm the selection.
5. Press MENU/ENTER again to exit the Recording mode. If the Record feature is On, **MEM** will appear at the top of the display. (If MEM is not displayed when ON is already selected, repeat the above steps, first turning this feature OFF and then ON again).
6. When in the Record option, Use the arrows to scroll through the recorded values: MAX, MIN, MAX-MIN, AVG, #n, and saved readings

   #n = the number of saved data points
   saved readings = Readings are displayed in sequence.

Deleting Recorded data

1. While in the **rEC** mode (see paragraph above for Record mode basics), use the arrow keys to select one of the record options: Max, Min, Max-Min, Avg, #n (Saved values) Press and hold the ESC button for 5 seconds.
2. Press the ▲ or ▼ button to select delete NO or YES.
3. To retain your saved readings, Select NO and press MENU/ENTER to revert to the previous setting.
4. To delete all Records, Select YES and press MENU/ENTER. The meter clear the saved values and return to the normal measuring mode.

ALr- Alarm setting

The minimum alarm setting is 0 µm (0 mils). The maximum alarm setting is 2000 µm (78.8 mils).

1. Press MENU, 'CAL" will flash, Use the ▲ or ▼ buttons to select **ALr**
2. Press MENU/ENTER to enter the Alarm setup.
3. Use the ▲ or ▼ button to select High Alarm ON or OFF.
4. Press MENU/ENTER to confirm the selection.
5. Use the arrows ▲ ▼ to set the HI alarm threshold.
6. Press MENU to confirm the high limit value and access the Low Limit mode.
7. Use the ▲ or ▼ button to select Low Alarm ON or OFF.
8. Press MENU/ENTER to confirm the selection.
9. Use the ▲ ▼ buttons to adjust the low alarm threshold.
10. Press MENU/ENTER to confirm the selection and exit to measure mode.

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Unt - Unit setting

1. Press MENU, ‘CAL” will flash, Use the ▲ or ▼ buttons to select **Unt**
2. Press MENU button to enter the Unit selection mode.
3. Use the ▲ ▼ buttons to select µm or mils.
4. Press MENU/ENTER to confirm the selection and to return to the normal measuring mode.

FEr - Substrate material setting

1. Press MENU, ‘CAL” will flash, Use the ▲ or ▼ buttons to select **FEr**
2. Press MENU to access the substrate material setting mode.
3. Use the▲ ▼ buttons to select **Auto** (meter selects material automatically), NON-ferrous (**nonF**), or ferrous (**FErr**) substrate material.
4. Press MENU/ENTER to confirm the selection and to return to the normal measuring mode.

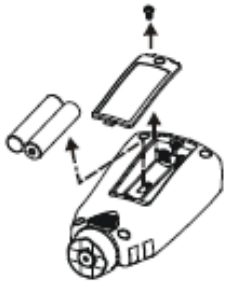
Maintenance

Cleaning and Storage

Periodically wipe the meter housing with a damp cloth and mild detergent; do not use abrasives or solvents. If the meter is not to be used for 60 days or more, remove the batteries and store them separately.

Battery Replacement/Installation

1. Remove the Phillips head screw that secures the rear battery door.
2. Open the battery compartment.
3. Replace/install the two 1.5V ‘AAA’ batteries observing proper polarity.
4. Secure the battery compartment



Never dispose of used batteries or rechargeable batteries in household waste.
As consumers, users are legally required to take used batteries to appropriate collection sites, the retail store where the batteries were purchased, or wherever batteries are sold.

Disposal: Do not dispose of this instrument in household waste. The user is obligated to take end-of-life devices to a designated collection point for the disposal of electrical and electronic equipment.

Battery Safety Reminders

- Please dispose of batteries responsibly; observe local, state, and national regulations.
- Never dispose of batteries in a fire; batteries may explode or leak.
- Never mix battery types; install new batteries of the same type.

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Specifications

Electrical Specifications

	Ferrous	**Non-Ferrous**
Measurement principle	Magnetic induction	Eddy current principle
Response time	One second	One second
Detectable Substrate Materials	Iron, Steel	Copper, Aluminum, Zinc, Bronze, Brass, and others
Measuring range	0~2000µm 0~80.0mils	0~1020µm 0~40.0mils
Accuracy[1] (% of reading)	0~199µm: ±(10 dgts) 200~1000µm: (±3.0% + 10 dgts) 1001~1999µm: (±5.0% + 10 dgts) 0~7.8mils: ±(4dgts) 7.9~39.0mils: ±(3% + 4 dgts) 39.1~80.0mils: (±5% + 4 dgts)	0~199µm: ±(10 dgts) 200 ~1020µm: (±3.0% + 10dgts) 0~7.8mils: ±(4 dgts) 7.9~40.0mils: (±3.0% + 4 dgts)
Resolution	0~100µm: (1µm) 100µm~1000µm: (1µm) 1000µm~2000µm: (1µm) 0~10mils: (0.1mils) 10mils~80mils: (0.1mils)	0~100µm: (1µm) 100µm ~1020µm: (1µm) 0~10mils: (0.1mils) 10mils~40.0mils: (0.1mils)
Basic critical thickness	0 to 80mils (0 to 2000um)	0 to 40mils (0 to 1020um)
Industrial standards	Conforms to GB/T 4956-1985, GB/T 4957-1985, JB/T 8393-1996, JJG 889-95, and JJG 818-93	
Temperature Coefficient	0.1 times the applicable accuracy specification per °C from 18°C to 28°C (64°F to 82°F)	

[1]Accuracy note: Accuracy statement applies to use on a flat surface, with a zero and a calibration performed near the thickness of the film to be measured, with an identical base metal and with the meter stabilized at ambient temperature 18 to 28°C (64 to 82°F).

The accuracy of the reference films or any reference standards should be added to measurement results.

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General Specifications

Operating Conditions	0°C to 50°C (32°F to 122°F) at < 75% R.H.
Storage Conditions	-20°C to 60°C (-4°F to 140°F), 0 to 80% R.H. with battery removed from meter.
Accuracy Conditions	Stated accuracy applies for 18°C to 28°C (64°F to 82°F); <75% R.H.
Reference standards	Non-ferrous (aluminum), Ferrous, and 1006um(39.6mil) film +/-1% (CG104-REF)
Auto Power Off	30 seconds
Standby Current	Consumption < 6µA
Battery Power	1.5V (AAA) x 2pcs
Battery Life	17 hours continuous use with a typical alkaline battery
Low Battery Indication	Icon is displayed when the battery voltage drops below the operating level
Dimensions	105 (H) x 55 (W) x 27 (D) mm (4.1 x 2.2 x 1.1")
Weight	Approx. 80g (2.82 oz.) including battery

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