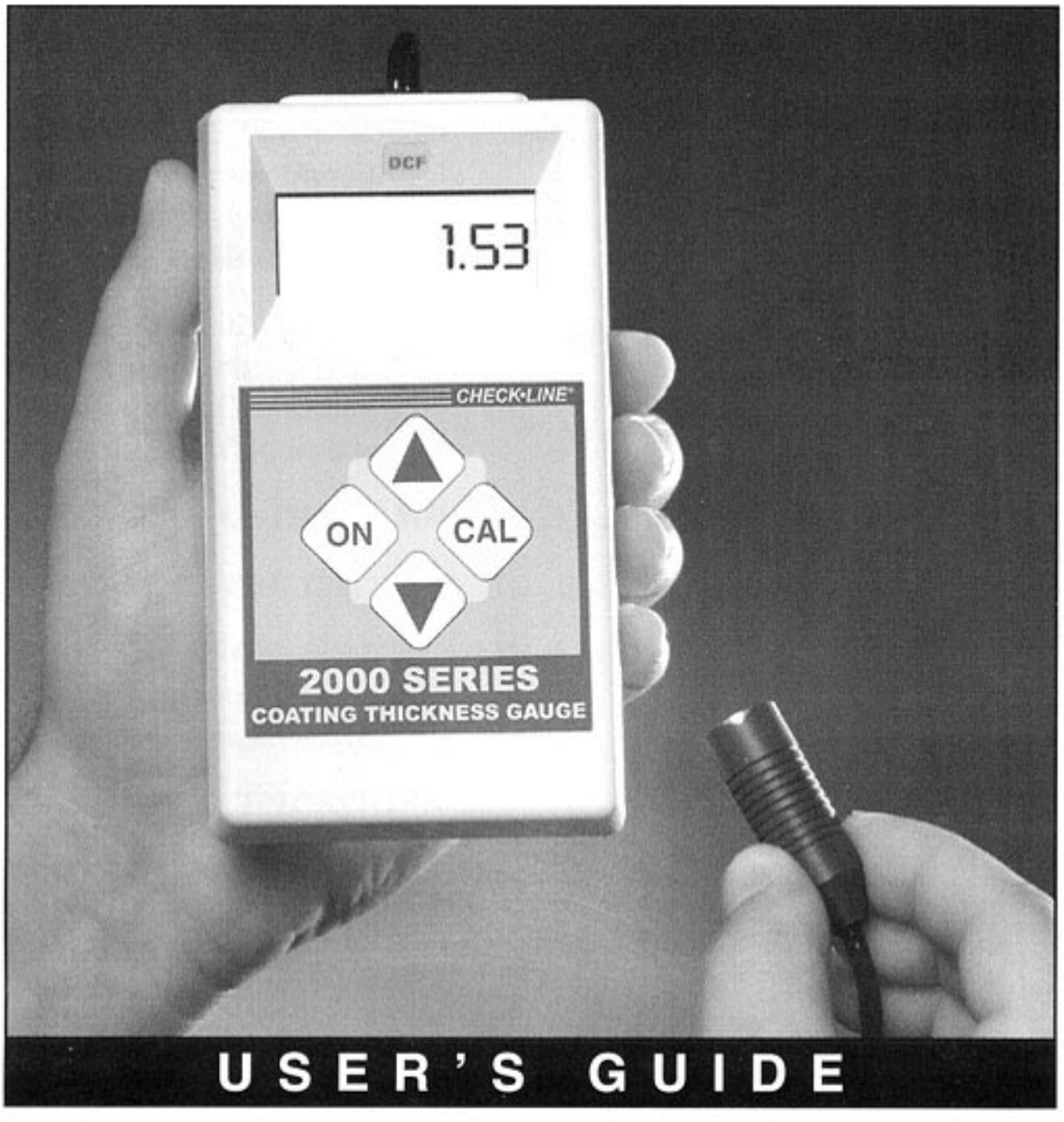
CHECK·LINE®

2000 Series

Coating Thickness Gauges



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1.0. INTRODUCTION

The CHECK•LINE® 2000 Series Coating Thickness Gauges represent the latest technology for the non-destructive measurement of paint, plating, galvanizing and other surface coatings on all metals. While they are very easy and convenient to use, the first-time user should read this entire manual before operating the gauge to minimize operating problems and to fully utilize the instrument's capabilities. A glance through the Table of Contents will outline the areas covered by this manual and will give the user a quick indication of where answers may be found to questions that may arise in the future.

1.1 Applications

Model	Code	Application
DCF-2000	Fe	Ferrous
DCN-2000	NFe	Non-ferrous
DCFN-2000	Fe + NFe	Ferrous & Non-ferrous

2.0. OPERATING PRINCIPLE

2.1. Ferrous Applications

When a magnet is brought into direct contact with a bare magnetic metal surface, a magnetic flux circuit is created. The amount of flux created depends on the strength of the magnetizing force and the magnetic reluctance of the bare metal. A non-magnetic coating or metal plating placed in the path of a magnetic flux circuit creates a "magnetic gap" which increases the circuit reluctance and causes a decrease in the circuit flux, proportional to the thickness of the coating or plating. The 2000 Series Gauges measure this decrease to provide an accurate, direct indication of the coating or plating thickness being measured.

The DCF-2000 & DCFN-2000 gauges will measure the thickness of all non-magnetic coatings, finishes and metal plating. . . on iron, steel and other magnetic alloy surfaces. Examples: paint, powder coatings, plastic, paper, ceramic, rubber, chrome, electroless nickel, brass, non-magnetic stainless steel, tin, zinc, cadmium, etc. . . on iron or steel.

2.2. Non-Ferrous Applications

When an eddy-current producing probe is brought into direct contact with a bare metal surface, a magnetic flux circuit is created. The amount of flux created depends on the frequency and strength of the eddy-current force and the magnetic reluctance of the bare metal. A non-metallic, non-conducting coating placed in the path of a magnetic flux circuit creates a "magnetic gap" which increases the circuit reluctance and causes a decrease in the circuit flux, proportional to the thickness of the coating. The 2000 Series Gauges measure this decrease to provide an accurate, direct indication of the coating thickness being measured.

The 2000 Series Gauges measure thicknesses of all non-metallic, non-conducting coatings, finishes and films on all non-ferrous metals. Examples: Anodizing, paint, powder coatings, plastic, paper, ceramic and rubber on aluminum, brass, bronze, titanium, non-magnetic stainless steel, zinc, etc.

3.0. EQUIPMENT SUPPLIED

3.1. Standard Accessories

The 2000 Series Gauges are supplied with the following standard accessories:

a. Bare test plate for setting ZERO calibration (DCF = steel, DCN = aluminum and DCFN = steel and aluminum).

b. Two (2) plastic, commercial-grade calibrating shims.

c. One 9-Volt DC alkaline battery.

d. 2000 Operating Instructions Manual.

e. Carrying case.

3.2. Optional Calibration Standards

a. Single, plastic, commercial-grade, plastic shims (1 to 60 mils), as available.

b. NIST Certified Standards

Part#	Type	Thickness Std's (mils)			Thickness Std's (µm)		
TSF-4	Fe	0.50	1.50	4.00	12.7	38.1	101.6
TSF-20	Fe	2.00	10.00	20.00	50.8	254.0	508.0
TSN-4	NFe	0.50	1.50	4.00	12.7	38.1	101.6
TSN-7	NFe	0.50	3.00	7.00	12.7	76.2	177.8

Note: Ferrous plates are steel, non-ferrous plates are aluminum.

4.0 KEYPAD FUNCTIONS

Single-Function Probe

Dual-Function Probe

ON — 1. Turns the power on

CAL — 1. Enters calibration mode
2. Sets the calibration point when adjusting calibration

▲ — 1. Increases displayed value when adjusting calibration
2. Enters zero point when adjusting calibration

▼ — 1. Decreases displayed value when adjusting calibration
2. Changes units of measure from mils to microns to mils

5.0 OPERATING PROCEDURE

5.1 HANDLE PROBE CAREFULLY

5.2 Taking Measurements

1. Press the ◇ON◇ key to turn on the power. The LCD will momentarily flash "run." The display will then show:

   " -- -- . --" for mils (thousandths of an inch): English or
   " -- -- --" for µm (microns): Metric

   To change units of measure press the ◇▼◇ key. Refer to section 7.0 for additional details.

2. Hold the probe by the outer shell and gently press the tip against the surface to be measured. Use enough pressure to cause the outer shell to contact the measurement surface.

   A thickness reading in mils or microns will be displayed.

5.3 Notes On Measurements

1. The gauge will automatically turn the power off after 90 seconds of non-use.

2. The 2000 Series Gauges are *continuous reading* type gauges which will provide readings as long as the probe is in contact with the surface. When the probe is removed, the minimum reading that was measured will be recalled to the display and will be retained until a new measurement is taken.

   If the thickness reading continues to get smaller while the probe is in contact with the coating, it indicates that the coating is soft and that the probe is sinking into the coating.

6.0 CALIBRATION

6.1 Introduction

The 2000 Series Gauges normally do not require calibration before use. However, whenever the product or part to be checked varies greatly from the steel test plate supplied, in either thickness or shape, it is best to check or verify the calibration using an uncoated sample of the actual product or part using one of the plastic calibration shims provided.

Check the calibration as noted in section 6.2, below and change the calibration, if necessary, following the procedure described in section 6.3. If a calibration change is necessary, continue to use the bare part in lieu of the steel test plate supplied whenever checking or changing calibration.

Calibration checking and changing procedures are very simple and take only a few minutes. They should be used when the product material thickness or shape changes.

6.2 Checking Calibration

1. Turn the power on by pressing the ON key.
2. Holding the probe by its outer shell, place the tip on the uncoated metal part. Gently push the probe shell until it contacts the bare surface.
   a. If the display shows **0.00**, proceed to step 3., below.
   b. If the display shows any value other than **0.00**, proceed no further since the calibration must be changed. (When using the Non-Ferrous probe, a reading between 0.00 and 0.03 mils is acceptable. Recalibration isn't necessary.)
3. Place one of the plastic calibration shims on top of the bare metal part, place the probe tip on top of the shim and metal part and measure as described in section 5.2, above.

   If the displayed value *matches* the thickness value noted on the shim (within the accuracy limits described in the Specifications section 10.0) the calibration is verified.

THE GAUGE IS NOW READY FOR USE.

6.3 Changing Calibration

1. Turn the power on by pressing the ON key.
2. Press the CAL key to start the calibration process.

Setting The Zero" Point

3. After pressing the CAL key, the display will flash "CAL" followed by "CAO." Place the probe on the bare metal part and press until the shell contacts the surface.
4. The display will show zero or some other small value. Press the ▲ key until a beep is heard, then remove the probe from the bare metal part.
5. The display will then show CA1.

Note: You can choose one thickness calibration point for convenience or two thickness points for greater accuracy. If one calibration point is selected, use a calibration shim that is close to the thickness you wish to measure or higher. If two calibration points are desired, use two calibration shims that are respectively close to the upper and lower limits of the coating thickness that you will be measuring.

Setting The Calibration Point

6. Place the thinner plastic calibration shim on top of the bare metal part and measure the combination of the two.
7. The display will show a thickness reading.

   If the displayed reading does not match the shim thickness use the ▼ and ▲ keys to increase or decrease the displayed value until it matches the value marked on the plastic shim.

8. When the displayed value matches the thickness marked on the shim, press the CAL key and a beep will be heard.

   a. If you want to use *one calibration point*, press the CAL key again, another beep will be heard and the display will flash run. Remove the probe; the calibration is complete, and you are ready to take readings.

   b. If you want to use *two calibration points*, remove the probe, the display will show CA2, and place the thicker calibration foil on the bare metal part. Hold the probe on the foil and use

the ▲ and ▼ keys to adjust the value until it matches the value marked on the shim. Press the CAL key, another "beep" will be heard and the display will flash "run." Remove the probe; the calibration is complete, and you are ready to take readings.

7.0 CHANGING UNITS OF MEASURE ▼

To change the units of measure from mils to microns, and vice versa , press the ▼ key. Each time it is pressed the units will change from one to the other.

8.0. CHANGING THE BATTERY

Warning: when the low battery, "Lo," appears on the LCD, replace the battery.

When "run" appears and then the LCD goes blank after pressing the ON key, replace the battery.

Battery Type: Any high-quality 9-volt alkaline battery.

Battery Life: Approximately 6 months when the 2000 Series Gauges are used for 80 readings per day.

9.0 MAINTENANCE, SPARE PARTS & SERVICE

9.1 Maintenance

Except for keeping all parts clean and replacing worn-out batteries, there are no special maintenance requirements.

DO NOT USE ANY LUBRICANTS, SOLVENTS OR ABRASIVES. A mild soap solution, used sparingly, can be used to clean the housing and connecting cable. Do not use any water or solvent on the probe body or tip. Keeping the probe tip clean is critical for obtaining accurate, repeatable readings. Use a dry cloth to keep the tip clean. It is recommended that the gauge be stored in its carrying case when not in use.

9.2 Spare Parts & Service

A complete stock of replacement spare parts and a service facility are maintained at ELECTROMATIC Equipment Co.,Inc., Cedarhurst, NY 11516-USA. TEL. 800-645-4330 (USA and Canada only) or 516-295-4300. FAX 516-295-4399.

If there are any questions regarding the operation of the gauge, and before sending any unit back for repair, it is strongly recommended that the user contact ELECTROMATIC's service facility above by telephone or fax.

10.0 GAUGE SPECIFICATIONS

Measuring Range	0–78 mils 0–1980 µm
Accuracy	±1% of Reading plus 0.03 mils ±1% of Reading plus0.8 µm
Resolution	0.01 mils (0–7 mils) 0.1µm (0–99.9 µm) 0.1 mils (7–78 mils) 1 µm (100–1980 µm)
Minimum Substrate Thickness	
Ferrous:	15 mils (375 µm)
Non-ferrous:	10 mils (250 µm)
Calibration Standards	Bare metal test plate plus two (2) precision calibration foils
Battery Type	9 Volt Alkaline
Battery Life	6 months (approx.), normal use with auto shutoff after 90 seconds of non-use
Dimensions	5.7" x 3.1" x 1.5" (145 x 79 x 38 mm)
Weight	12 oz. (340 g)
Temperature Limits	
Material	32 – 300 °F (0 – 149 °C)
Ambient	32 – 120 °F (0 – 50 °C)
Warranty	One year

11.0 WARRANTY

ELECTROMATIC Equipment Co., Inc. (ELECTROMATIC) warrants to the original purchaser that this product is of merchantable quality and confirms in kind and quality with the descriptions and specifications thereof. Product failure or malfunction arising out of any defect in workmanship or material in the product existing at the time of delivery thereof which manifests itself within one year from the sale of such product, shall be remedied by repair or replacement of such product, at ELECTROMATIC's option, except where unauthorized repair, disassembly, tampering, abuse or misapplication has taken place, as determined by ELECTROMATIC. All returns for warranty or non-warranty repairs and/or replacement must be authorized by ELECTROMATIC, in advance, with all repacking and shipping expenses to the address below to be borne by the purchaser.

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Some State jurisdictions or States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. The duration of any implied warranty, including, without limitation, fitness for any particular purpose and merchantability with respect to this product, is limited to the duration of the foregoing warranty. Some states do not allow limitations on how long an implied warranty lasts but, not withstanding, this warranty, in the absence of such limitations, shall extend for one year from the date of invoice.

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