

Warranty

The manufacturer fully warrants its products against defects in workmanship or materials for a period of one year from date of purchase. In the event that a gage is found to be defective, return the product with proof of purchase to your dealer, and the defective product will be repaired or replaced at the manufacturer's option.

No responsibility is assumed for incidental or consequential damages.

The warranty is voided if the gage has been opened.

Data subject to change without notice.

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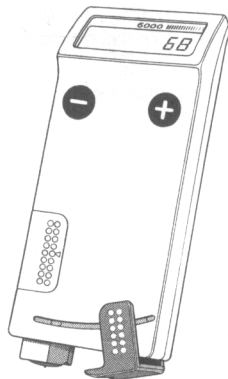
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6000 Series

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Coating Thickness Gage



Instruction Manual
version 2.0

The model **6000** non-destructively measures the thickness of coatings on metals.

Each **6000** has a model number describing its abilities and options. The gage identifies itself during power-up. (e.g. *6000 FNS3 = Ferrous/Non-ferrous, Separate probe, memory capable*)

CODE MEASURES

- F* non-magnetic coatings on ferrous metals
 - N* non-conductive coatings on non-ferrous metals
 - FN* coatings on all metals with only one probe - combines the full abilities of F and N models
 - NR* anodizing and other thin coatings on non-ferrous metals
 - FT* thick coatings on ferrous metals
- 5 Denotes Separate Probe version

CODE	OPTIONS
<i>1</i> = basic	mils/microns switchable
<i>2</i> = standard	basic capabilities plus average, standard deviation & user adjustable Hi/Lo limits
<i>3</i> = memory	standard capabilities plus storage capacity for 1500 readings in up to 100 groups for computer/printer downloading

Calibration

The model **6000** instantly and automatically calibrates itself to stored N.I.S.T. (*National Institute of Standards & Technology*) calibration data. No further calibration is required. To adjust the gage to your particular substrate conditions, measure your uncoated part first. (See *GOLDEN RULE*).

Calibration can be **verified** using N.I.S.T. – traceable Coating Thickness Standards or by placing one of the enclosed plastic shims on your uncoated part. Measurements should be within the combined tolerances of the standards and the gage. (*Contact your dealer to order Standards*).

How to take a measurement

- Slide probe cover open **FULLY**. It acts as a second “foot” to steady the Gage when required. (*Sep. Probe models - remove plastic cap*).
- Press **+** to turn the gage on. (*Integral Probe models also turn on automatically when placed on measuring surface*.)
- Place probe **FLAT** and steady on measuring surface. Gage beeps twice and displays the measurement.

Lift probe **AT LEAST TWO INCHES (50 mm)** from surface between measurements - OR - leave probe on surface for continuous measurement.

When finished, slide probe cover shut
(*Sep. Probe models - recap probe if
desired.*)

Golden rule

Measure Your **Uncoated** Part First

A quick **zero-check** determines if any adjustment is needed on your particular substrate. This compensates for deviations in shape, diameter, composition, roughness etc.

- Measure your uncoated part.
- If necessary, lift probe from surface and adjust display to zero "0" using **⊖** or **⊕** button. (*If an uncoated part is not available, measure an uncoated part similar in shape, composition and surface roughness.*)

NOTE: **FN** models retain separate **F** and **N** zero settings. Adjustments are made to the currently-displayed mode only.

Zeroing on rough surfaces*

*Standard and Memory models

To improve repeatability on rough surfaces, performing an AVERAGE ZERO is recommended.

- Select **STATS ON**
- Take a series of readings on the uncoated surface (*typically 5 to 10*)
- Press **⊕** for the average
- Select **STATS OFF**
- adjust the display to zero "0" using **⊖** or **⊕** button

Adjustment to a known thickness

It is sometimes necessary to adjust the gage to read a known thickness such as another coated object, Standards or the enclosed Plastic Shims.

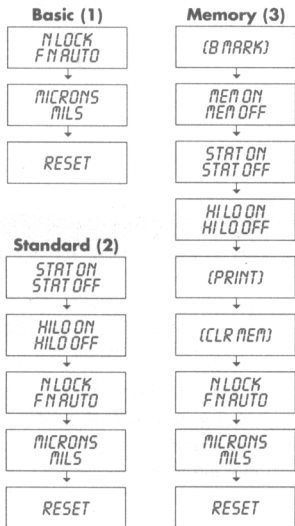
Measure the object. If the expected reading is not obtained, lift probe from surface and adjust the display to the expected thickness.

Menu

Turn the gage on. Press the **⊖** and **⊕** buttons **simultaneously** to display the first MENU choice.

To answer "YES" to the current question, press **⊕**.

To answer "NO", press **⊖** and the next option is displayed.



N LOCK and **FN AUTO** apply only to **FN** models.

Bracketed options () only appear when there are readings stored in memory.

Options may appear in a different order depending on the current mode.

FN combination models

FN gages first attempt a measurement using the *magnetic principle*. If the coating is non-magnetic, within the gage thickness range, and the substrate is ferrous, a reading is displayed with the letter **F**.

If no valid reading is obtained, the gage automatically attempts a measurement using the *eddy current principle*. If the coating is non-conductive, within the gage thickness range, and the substrate is non-ferrous, a reading is displayed with the letter **N**.

If a reading is still not obtained, dashes (- - - - -) appear on the display.

N LOCK / FN AUTO

Use **N LOCK** (*Non-Ferrous Lock*) when operating regularly on non-ferrous substrates. When engaged, the eddy current principle is *always* used, regardless of the substrate. This shortens measurement time and extends battery life.

TIP: Measuring Coatings on Galvanized Steel: In **AUTO**matic (*normal*) mode, the gage measures **TOTAL THICKNESS** of paint and zinc over steel. Using **N LOCK**, the gage measures the thickness of paint **ONLY** on zinc.

WARNING: With **N LOCK** engaged it is possible to obtain readings when measuring a non-conductive coating on steel. Eddy current is not the preferred measuring principle on steel.

- any button is pressed, in which case the last reading is displayed.

HIL0 must be off to activate STATISTICS. Calibration adjustments using \ominus or \oplus cannot be made while STATISTICS is on. To turn STATISTICS off, select "*STATOFF*".

HiLo

Standard and Memory Models only


Select *HIL0 ON*. The current *LO* setting is displayed. Adjust down or up using the \ominus or \oplus buttons. Set it by pressing the \ominus \oplus buttons simultaneously. Follow the same procedure to adjust the *HI* setting. The \overline{HI} symbol indicates the *HIL0* is ON.

Future measurements will now be compared to your defined limits. The gage BEEPS TWICE (*normal*) if measurements are within those limits, and ONCE if measurements are outside those limits. The single BEEP is a LOW tone with a down arrow if it is below the *LO* limit, and a HIGH tone with an up arrow if it is above the *HI* limit.

STATISTICS must be off. Calibration adjustments cannot be made while in *HIL0*. To turn *HIL0* off select "*HIL0 OFF*".

Memory

Memory Models¹ only

When *MEM ON* is selected the  symbol and a counter (*D*) will appear. Up to 1500 readings in up to 100 batches (*groups*) can be stored.

The current BATCH number (*B T*) is displayed during measurement. Delete the last reading from memory by pressing \ominus . Erase ALL stored readings by selecting "*CLR MEM*". Calibration adjustments using \ominus or \oplus cannot be made. To turn MEMORY off select "*MEM OFF*".

■ Batch markers

Readings taken for different jobs or parts can be grouped together or "separated" by placing Batch Markers between sets of measurements. Select "*B MARK*". Batch Markers are set automatically if *HIL0* or *STAT (statistics)* are turned on or off. Statistical summaries are calculated for each batch during printing.

■ Memory and Statistics together

When both these MODES are ON, individual measurements ARE NOT STORED. Instead, when the \oplus button is pressed, the average, standard deviation and number of readings are simultaneously displayed and stored in memory. Again, statistical summaries are calculated for each batch during printing. This delivers the average of a set of average readings as required by **SSPC PA-2** guidelines.

■ Printing / downloading

Data can be sent to a serial printer or IBM compatible computer (*RS232 serial port*) using the supplied cable – or directly to the wireless **HP IR** printer.

1. Select **PRINT** (if connected to a computer using **PosiSoft**[®], downloading begins now).
2. Choose output option:

ALL All individual readings
+ Statistical Summary

HISTO Statistical Summary
+ Histogram

3. Select **IR PRT** if printing to the **HP IR** – or –

Select a **TYPE** if printing to a serial printer or computer

<u>TYPE</u>	<u>BAUD</u>	<u>HANDSHAKE</u>
TYPE 1P	9600	Xon/Xoff(PosiPrinter)
TYPE 2P	9600	DTR
TYPE 3P	1200	Xon/Xoff
TYPE 4P	1200	DTR

If uncertain which TYPE pertains to your printer, try each one, one at a time.

Each batch (*group of readings*) is printed separately. The mean, max and min thickness, standard deviation and number of readings is printed for each batch.

In REGULAR mode, all readings are output.

In HiLo mode, each reading is followed by an indication of which limit they exceeded.

In STATISTICS mode, only the averages and standard deviations are output.

READINGS stored in memory are not erased. Any new readings will be added to those already there. Selecting **CLEARMEM** erases all stored readings.

■ Downloading measurements as they are taken

If a serial printer, data collector or computer is physically connected to a Memory Model gage, readings are immediately sent to the device as they are taken.

■ PosiSoft[®]

Detailed **statistical analysis** can be done using the supplied **PosiSoft**[®] software (*instructions on diskette label*) or any commercial software able to capture ASCII data from a COM port.

■ Printers

The **HP IR** and **PosiPrinter** are available from your dealer for printing. They are specifically designed for field and office use with the **6000**.

Sample printer output (ALL)

15 Readings ← Summary
2 Batches

STATISTICS BATCH # 1 FE ← STATISTICS
and MEMORY
MODES on

#	AVG	STDDEV	n
1	15.20 mil	0.05	5
2	15.20 mil	0.05	3
3	15.10 mil	0.00	3

MAX	15.20 mil
MIN	15.10 mil
N	3
MEAN	15.17 mil ← The Average of averages!
STD DEV	0.06 mil

HI/LO BATCH # 2 FE ← Hi Lo and
MEMORY MODES on

#	READING
1	1.85 mil OK
2	0.00 mil Lo ← 2 readings are outside limits
3	5.30 mil Hi ←
4	1.85 mil OK

MAX	5.30 mil
MIN	0.00 mil
N	4
MEAN	2.25 mil
STD DEV	2.21 mil

1 READINGS BELOW 1.75 mil
1 READINGS ABOVE 2.10 mil
2 READINGS WITHIN Hi Lo

Serial communications configuration


8 bit words, no parity, 1 stop bit
9600 baud
XON-XOFF handshaking

The supplied serial cable is a 3.5 mm
STEREO JACK (*gage connection*) to a
DB9 F.

Pinout	Description
2	TXD Transmit data (from Gage)
3	RXD Receive data (from PC or Printer)
5	GROUND


Battery

USE ONLY 9V ALKALINE BATTERIES

The Gage can still be used if the low battery symbol  appears during measuring, however, once it remains on, the battery should be changed immediately.

Disconnect battery **only** while the gage is off, to retain all user settings and stored memory readings.

NOTE: *MEM LOST* may also indicate a low battery.

Nickel-cadmium and nickel-metal hydride rechargeable batteries will work, however,  may stay on.

Battery Life:

Approx : 30 hours continuous
15,000 readings

Temperature

Operating range: +32° to +120°F (0° to +50°C).

Temperature compensation is automatic. However, allow a few minutes for the Gage to reach ambient temperature before measuring.

Discard the first measurement taken in a notably different temperature condition. When measuring surfaces much hotter or colder than ambient, allow one second off the surface between measurements.

TIP: Extremely Hot or Cold Surfaces: Ferrous substrates with extreme temperatures between -150°F and +450°F (-100°C and +230°C) can be measured with the *PosiPen*®. Contact your dealer.

■ Temperature / instability indicator

If the probe is touching very hot or cold surfaces, or is not held steady, a high, fast, beeping sound may be emitted.

Once automatic temperature compensation is complete, or the probe has been stabilized, the beeping will stop and a measurement will be displayed.

Measuring on round stock

Use the "V" groove in the probe (*and sliding probe cover*) to align to your part. With Separate Probe models, the chamfered side offers additional stability on inside diameters.

Be sure to first zero-check the Gage on your uncoated part.

Troubleshooting

MEM LOST: (Memory Lost) can appear if the battery is disconnected while the gage is **ON** or can indicate a low battery. Take another measurement to clear this condition. Substrate (*zero*) adjustments will have to be re-done.

If **MEM LOST** persists – put in a **new alkaline** battery and **RESET** the Gage.

SHOCK: If the gage experiences a shock (*physical, temperature, etc.*) it may be necessary to reset all its internal functions. Select **RESET**.

SERVICE: Gage must be returned to the manufacturer or an authorized representative for repair if **any** service message is displayed.

Technical data

CONFORMS TO:

FERROUS

BS5411 (11), BS3900 (C5),
SSPC-PA2, ISO 2178, ISO 2808,
DIN 50981, ASTM B499

NON-FERROUS

BS541 (3), BS3900 (C5), ISO 2360,
ISO 2808, DIN 50984

RANGE

0-60 mils & 0-1500 microns:
all gages except:

FT2, FT3

0-250 mils & 0-6 mm

NA2, NAS2, NA3, NAS3

0-2 mils & 0-50 microns

INCREMENTS

F1, FS1, F2, FS2, F3, FS3

0.05 (0 - 2 mils)

0.1 (2 - 60 mils)

1 (0 - 50 μ m)

2 (50 - 1500 μ m)

N1, NS1, N2, NS2, N3, NS3

0.1 mil or 2 μ m

FT2, FT3

2 (1 - 150 mils)

5 (150 - 250 mils)

0.05 (0 - 3.5 mm)

0.1 (3.5 - 6 mm)

NA2, NAS2, NA3, NAS3

0.02 mils or 0.5 μ m

VARIABLE TOLERANCE

$\pm 1\%$ of the reading

FIXED TOLERANCE

F1, FS1, F2, FS2, F3, FS3

± 0.1 mil (± 0.05 mil below 2 mils)

± 2 μ m (± 1 μ m below 50 μ m)

N1, NS1, N2, NS2, N3, NS3

± 0.1 mil or ± 2 μ m

FT2, FT3

± 5 mil (± 2 mil below 150 mils)

± 0.1 μ m (± 0.05 mm below 3.5 mm)

NA2, NAS2, NA3, NAS3

± 0.02 mil or ± 0.5 μ m

Specifications for **FN** models are the same as for the **F1** model when operating on ferrous substrates, and the **N1** model when operating on non-ferrous substrates.

GAGE DIMENSIONS

5.8" x 2.3" x 1.0"

147 x 58 x 25 mm

PROBE PRESSURE

3 1/2 ounces (100 grams)

GAGE WEIGHT

6 ounces (170 grams)

OPERATING TEMPERATURE

+ 32° to + 120°F (0° to + 50°C)

MEASURING SPEED

> 35 readings per minute

SEPARATE PROBE

Active Measuring Area: 1/2" dia. (13 mm)

Minimum Reachable I.D.: 2 1/2" (64 mm)

Minimum measurable O.D.: 1/4" (7mm)