PosiTector 6000

INSTRUCTION MANUAL v. **6.2**/M
for Memory (3) models

Coating Thickness Gages

Bluetooth®

Built-in probe

Separate probe

DeFelsko®

Simple. Durable. Accurate.

Introduction

The *PosiTector 6000* hand-held, electronic Gage non-destructively measures the thickness of coatings on metals, quickly and accurately.

Principles of Operation

- **F** probes use the magnetic principle to measure the thickness of non-magnetic coatings on ferrous metals.

- **N** probes use the eddy current principle to measure the thickness of non-conductive coatings on non-ferrous metals.

- **FN** probes combine the full abilities of both the "*F*" and "*N*" probes.

NOTE: Throughout this manual, the Ⓦ symbol indicates more information about the particular topic or feature is available on our website.

Go to: www.defelsko.com/manuals

Certification

All probes or gages are shipped with a Certificate of Calibration. For organizations with re-certification requirements, gages may be returned at regular intervals for calibration. DeFelsko recommends that customers establish gage calibration intervals based upon their own experience and work environment. Based on our product knowledge, data and customer feedback, a one year calibration interval from either the date of calibration, date of purchase, or date of receipt is a typical starting point. Ⓦ

Power-up / Power-down

The *PosiTector 6000* powers-up when any button is pressed. To preserve battery life, the Gage powers-down after approximately 3 minutes of no activity. All settings are retained.

Quick Start

1. Separate probe models - remove red protective rubber cap from probe if supplied. Built-in probe models - remove Gage from protective rubber holster.

2. Turn Gage on with any button.

3. Place the probe FLAT on the surface to be measured. HOLD STEADY. When a valid measurement is calculated, the Gage BEEPS twice, the bi-color LED blinks green, and the measurement is displayed.
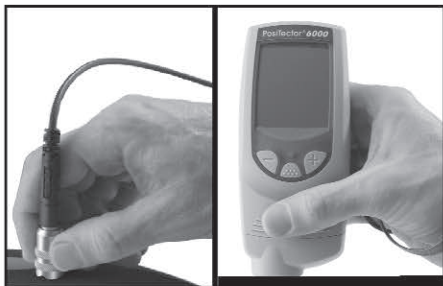
4. Lift probe AT LEAST 2 INCHES (5cm) from the surface between measurements - OR - leave probe on the surface in the same location for continuous measurements every 2 seconds. Do not drag the probe sideways across the surface.
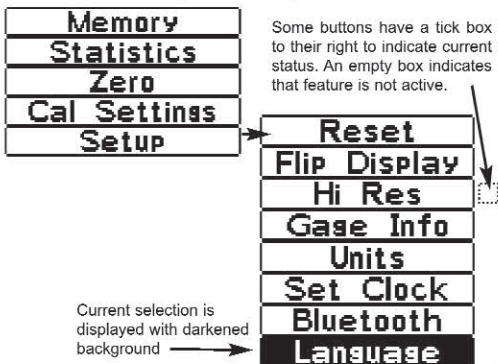
Golden Rule

Measure your uncoated part first! This quick zero-check determines if a *calibration adjustment* is needed for your substrate. (See pg.5)

Next, lay the included plastic shims onto a bare surface and measure them individually to ensure the Gage measures a known thickness within tolerance.
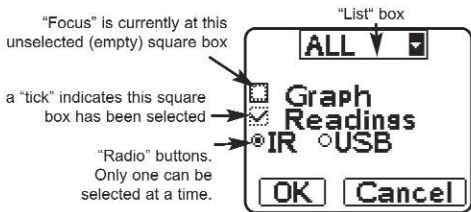
Menu Operation

Gage functions are menu controlled. To access the Menu, turn the Gage on, then press the ⚫ button.

| Memory |
| Statistics |
| Zero |
| Cal Settings |
| Setup |

Some buttons have a tick box to their right to indicate current status. An empty box indicates that feature is not active.

| Reset |
| Flip Display |
| Hi Res |
| Gage Info |
| Units |
| Set Clock |
| Bluetooth |
| **Language** |

Current selection is displayed with darkened background

To navigate, press **(-)** to scroll **DOWN**, **(+)** to scroll **UP** and ⚫ to **SELECT**. Press both **(-)(+)** buttons at any time to exit any menu or select **Exit** from the Menu.

When there are more menu options than can fit onto one screen, a scroll bar will appear. The dark area indicates what portion of the total menu you are currently viewing.

List boxes have a down arrow on the right-hand side. Use the **(-)** and **(+)** buttons until your desired choice appears, then press ⚫ to select this choice and move focus onto the next item.

"Focus" is currently at this unselected (empty) square box

"List" box

| ALL ▼ ▪ |

☐ Graph
☑ Readings

a "tick" indicates this square box has been selected

◉ IR ○ USB

"Radio" buttons. Only one can be selected at a time.

| OK | | Cancel |

4

Calibration, Verification and Adjustment

Three steps ensure best accuracy…

1. **Calibration** - typically done by the manufacturer or a qualified lab
2. **Verification** of Accuracy - as done by the user
3. **Adjustment** - to a known thickness

Calibration

Calibration is the controlled and documented process of measuring traceable calibration standards and verifying that the results are within the stated accuracy of the Gage. Calibrations are typically performed by the Gage manufacturer or by a certified calibration laboratory in a controlled environment using a documented process. (W)

Verification

Verification is an accuracy check performed by the user using known reference standards. A successful verification requires the Gage to read within the combined accuracy of the Gage and the reference standards. (W)

Adjustment

Adjustment, or *Calibration Adjustment* is the act of aligning the Gage's thickness readings to match that of a known sample in order to improve the effectiveness of the Gage on a specific surface or in a specific portion of its measurement range. 1-point or 2-point calibration adjustments are possible and these are stored in calibration settings (pg. 9).
NOTE: the ⌀ symbol disappears whenever a calibration adjustment is made to the gage.

The *PosiTector 6000* is factory calibrated and performs an automatic self-check each time it takes a measurement. For many applications no further

adjustment is necessary after a Reset (pg.15). Just check ZERO on the uncoated substrate, then measure.

But sometimes Gage readings can be influenced by changes in substrate shape, composition, surface roughness or by measuring in a different location on the part. That is why Calibration Adjustments are made possible.

1- or 2-point Calibration Adjustments may be performed if readings are not falling within the expected range of thickness for the application being measured.

Where a calibration adjustment method has not been specified, use a 1-point method first. If measuring the included shims reveals inaccuracies, use the 2-point method. **Factory Calibration settings can be restored at any time by performing a Reset** (pg.15), creating a NEW calibration setting (pg. 9), or by DELETING the adjustments made to the Cal 1 calibration setting (pg.10). The ⚖ symbol appears on the display whenever factory calibration settings are in use.

NOTE: With "*FN*" Gages, calibration adjustments are made only to the "*F*" or "*N*" mode (stored independently under a particular Cal), whichever was measured last.

NOTE: Once adjusted, you may "lock" the current calibration adjustment to prevent further modification. (See "Cal Lock" on pg. 9)

1-point Calibration Adjustment

Also known as an *offset* or *correction value*, there are 4 ways to perform this adjustment:

(1) Simple Zero Calibration Adjustment

Measure your uncoated part. If the Gage does not read "0" within the tolerance of the probe being used, lift the probe from the surface and adjust the display down (-) or up (+) until it reads "0". Measure and adjust until the

6

average of a series of readings on the uncoated surface is "0".

(2) Average Zero Calibration Adjustment

To establish "0" on a rough or curved surface a preferred method is to take several readings on the uncoated part and average the result.

```
    Zero
```

1. Select the **Zero** menu option.

2. Press (+) to select the number of readings to be used to obtain an average, typically 3 to 10 readings. The greater the variation between readings, the more readings should be taken to obtain an average.

3. Repeatedly measure the uncoated part. The Gage will wait 2 seconds between readings to allow the user to correctly position the probe on the surface. After the last measurement the Gage will calculate and display "0" which represents the average of all the **Zero** readings taken.

(3) Simple Adjustment to a Known Thickness

It is sometimes desirable to adjust the Gage to a known thickness, such as a shim, rather than adjusting it to zero.

Measure the object. If the expected reading is not obtained (within tolerance), lift the probe from the surface and adjust the displayed reading down **(-)** or up **(+)** to the expected thickness. Hold the button down to increase the rate of adjustment.

(4) Average Adjustment to a Known Thickness

On rough or curved surfaces a preferred method is to take several readings on the known thickness and average the result.

```
  1 Pt Adjust
```

1. Select **1 Pt Adjust** from the **Cal Settings** menu.
2. Press **(+)** to select the number of readings to be

used to obtain an average, typically 3 to 10 readings. The greater the variation between readings, the more readings should be taken to obtain an average.

3. Repeatedly measure the known thickness reference. The Gage will wait 2 seconds between readings to allow the user to correctly position the probe on the surface. After the last measurement the Gage will calculate and display the reading which represents the average of all the measurements taken. If the expected reading is not obtained (within tolerance) lift the probe from the surface and adjust the reading down **(-)** or up **(+)** to the expected thickness and press ⟨📇⟩ .

2-point Calibration Adjustment

-Preferred for very unusual substrate materials, shapes or conditions. Provides greater accuracy within a limited, defined range.

This method requires taking two readings at known thickness values: a thin value (often zero) and a thicker value. These values should be on either side of the thickness range to be measured.

⎡2 Pt Adjust⎤

1. Select **2 Pt Adjust** from the **Cal Settings** menu.

2. Press **(+)** to select the number of readings to be used to obtain an average on the thinner item, typically 3 to 10 readings. The greater the variation between readings, the more readings should be taken to obtain an average.

3. Repeatedly measure the thinner item. The Gage will wait for 2 seconds on the surface to allow the user to correctly position the probe on the surface. After the last measurement the Gage will calculate and display a thickness value which represents the average of all the readings taken using the factory calibration settings.

8

4. Lift the probe from the surface and adjust the displayed reading down **(-)** or up **(+)** to the known thickness value of the thin item. Press 🔘 to accept this value.

5. Repeat steps 2 - 4 for the thicker item.

Cal Lock

When selected, the 🔒 icon will appear and the current calibration settings are "locked" to prevent further user adjustments.

User Mode Calibration

There are applications where 1- or 2-point calibrations will not work satisfactorily such as when measuring magnetic coatings, or conductive coatings over non-metals. For these applications the included PosiSoft software can download special Cal settir Ⓦ

Calibration Memory
Cal Memory

It is often convenient to retain a particular calibration adjustment before making another. Then, if you return to that part, the corresponding calibration _setting_ can be restored.

A "setting" is any calibration adjustment. The **PosiTector 6000** always displays the currentcalibrationsetting(ex. **Cal 3**) in the upper right corner of the display.

The setting called **Cal 1** has unique features. It can be adjusted but never deleted, and is always made active with factory settings after a **Reset** (see pg.15).

New

-creates a new calibration setting using the next available number (Maximum of 10). *By default, these new Cal settings are initially created with the Gage's factory settings.* This is indicated with the 🔩 icon

9

which appears at the bottom of the display. A warning message will prevent the creation of a new **Cal Memory** if a _batch_ is open and has readings. Delete the batch first. (see pg.12)

Open

-loads an existing setting. Use the **(-)(+)** buttons to scroll the **List** box until the desired setting appears, then press (☺). A warning message will prevent the opening of a stored Cal setting if a _batch_ is open and has readings. Create a new batch first or open a batch containing no readings. (see pg.12)

Delete

-removes a setting completely from the list. That Cal number can be reused later with the New command. A setting cannot be deleted if readings have been stored into a _batch_ using that calibration setting. Delete all readings in that batch first (see **Memory Management** pg. 11). Although **Cal 1** cannot be deleted, the **Delete** function will return it to factory settings.

Print

-sends a list of all Calibration Settings to either the IR printer using the Gage's built-in IR port, or to a PC's default printer using the included USB cable. (W)

Memory Management

The **PosiTector 6000** can record 10,000 measurements in up to 1000 groups (*batches*). Ideal for on-screen statistical purposes, printing to an optional IR printer or PC's default printer, or for downloading to a personal computer using the included **PosiSoft** software and USB cable. Readings are time-stamped as they are taken.

New Batch

-closes any currently opened batch and creates a new batch name using the next higher number. For example, if only **Batch 1** and **Batch 3** exist, then **Batch 4** would be created and made the current batch. The 🖫 icon appears and basic statistics are displayed. Each measurement will now be simultaneously shown on the display and stored into this new batch. On screen statistics are immediately updated with each measurement. New batch names are date stamped at the time they are created. Shortcut: When a batch is open, create a new batch by pressing (+)

Sub-Batch (Appears only if a batch is currently open)

-creates a new sub-batch. In this example, **B2s2** is a sub-batch of **Batch 2**. Sub-batching allows the user to group related batches so that statistics can be accumulated for them. **Batch 2** contains the statistics for **B2s1** and **B2s2**.

Shortcut: When a sub-batch is open, create a new sub-batch by pressing (+)

11
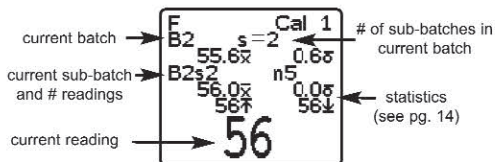
PA2

-the PA2 feature helps the user determine if film thickness over a large area conforms to user specified min/max levels. **(W)**

90/10

-the PSPC 90/10 feature determines if a coating system complies with the IMO performance standard for protective coatings **(W)**

Open

-selects a previously created batch or sub-batch name to open and make current. If it contains measurements, on-screen statistics will immediately reflect values calculated from this batch. The calibration setting (i.e. Cal 2) associated with this batch is also opened (see pg.9).

Close

-stops the recording process, closes the current batch or sub-batch, and removes the statistics from the display.

Delete

-removes a batch or sub-batch completely from memory. The name is deleted and all measurements are erased. Sub-batches can be deleted individually. To delete all related sub-batches, simply delete the top-level batch.

View

-lists all readings onto the display from the current or most recently used batch or sub-batch. It begins by showing the last 10 measurement values. Scroll using the **(-)** or **(+)** buttons. Hold for 1 second to scroll a page at a time.

To change or delete a value, scroll to that value (align the "+" symbol beside it) then either take another measurement to change it, or press 🔜 to delete it or exit. Statistics are updated.

Shortcut: To exit press **(-)(+)** buttons simultaneously.

12

Print

-outputs a statistical summary to the optional IR printer using the built-in IR port, or to a PC's default printer using the included USB cable. Individual measurements with their time stamp are printed if the **Readings** box is ticked. A histogram is printed if the **Graph** box is ticked. HiLo calculations are printed using current HiLo settings if **HiLo Alarm** is turned on (see pg.14).

NOTES:

- Calibration adjustments cannot be made if any measurements were taken with that setting and stored into a batch.

- Remove the last reading from the current open batch by pressing **(-)**.

Downloading Measurements Stored in Memory
Measurements stored in the Gage's memory (in batches) can be downloaded to a computer using the supplied USB cable and the supplied *PosiSoft* software.   Measurements are not erased from memory after downloading.

PosiSoft® ver.2.11 or higher is supplied on a CD for downloading readings to a computer. It runs on Windows-based PC computers using Microsoft Windows® 2000 SP3 or higher with a USB port. It allows entry of notes and annotations, prints histograms and basic charts, manages data, and readings can be exported to a document or spreadsheet. Ⓦ

Statistical Functions
Statistics

Statistics
-when Statistics is selected, a $\bar{x}$ icon and statistical summary will appear on the display.
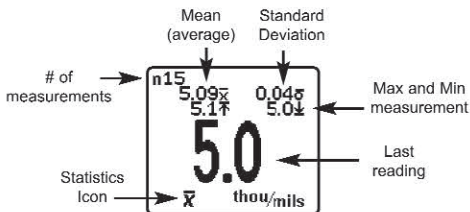
Remove the last measurement by pressing the **(-)** button. Press **(+)** to clear statistics.

HiLo Alarm
-This mode allows the Gage to visibly and audibly alert the user when measurements exceed user-specified limits.

When **HiLo Alarm** is first selected, the current Lo setting is displayed. Adjust down **(-)** or up **(+)**. Alternatively, measure a coating with a thickness close to the required value and make final adjustments with the buttons. Select **NEXT** to accept this value. The current **Hi** setting is now displayed. Follow the same procedure to adjust this setting. The $\mathbb{I}$ icon will appear on the display.

Measurements will now be compared to your defined limits. The Gage beeps and blinks green twice if results are within those limits. A single low tone will display if it is below the **Lo** limit, and a HIGH tone if it is above the **Hi** limit. The LED will blink red if readings are outside limits. Press **(+)** to clear **HiLo** readings.

Clear
-zeros all on-screen **Statistics** and **HiLo** tabulations.

14

Setup Menu

Reset

Reset restores factory settings and returns the Gage to a known, out-of-the-box condition. It is handy when settings have been changed, if the Gage behaves unusually, or if a calibration adjustment is not possible. The following occurs:

- all batches are closed and stored measurements are erased.

- all Cal settings are cleared and returned to the Gage's factory calibration settings (Cal 1).

- this symbol appears on the display: $\sqrt{0}$.   It disappears if a calibration adjustment is made by the user.

- menu settings are returned to the following:

Hi Res = OFF	**Cal Lock** = OFF
Statistics = OFF	**Hi Lo Alarm** = OFF
N Lock = OFF (FN models only)	**Bluetooth** = OFF

A more thorough **Reset** can be performed when the Gage is powered down by holding the **(+)** button until the Reset symbol appears. This is handy when the Gage fails to power-up or operate properly. It performs the same function as a menu Reset with addition of **Units** = microns, **Flip Display** = Normal and **Language** = English.

NOTES:

-Keep the Gage away from metal during a **Reset**.

-Date and Time are not affected by any **Reset**.

Flip Display

This option causes the display to read upside down. Ideal for use on a worktable (separate probe models) and overhead (built-In probe models) with the resultant display conveniently pointed toward the operator.

15

Hi Res

When **Hi Res** is selected, the displayed gage resolution becomes as follows:

Resolution	Range
0.01 mil	0.00 - 99.00 mils
0.1 mil	100.0 - 999.9 mils
0.1 um	0.0 - 999.9 um
1.0 um	over 1000 um

NOTE:

Gage accuracy is not affected by the **Hi Res** Mode.

Units

This menu button converts the display and all stored readings from inch to metric or vice versa.

Set Clock

All batches are *date*-stamped when created, and all measurements are *time*-stamped (24 hour format) when stored into these batches. It is therefore important to keep both the date and time current using this menu button. Alternatively, the date and time can be automatically updated when the gage is connected to *PosiSoft* using the **Gage Utilities -> Set Clock** function in *PosiSoft*.

Bluetooth   **Bluetooth**

Allows individual readings to be sent to a computer or compatible handheld device as they are taken using Bluetooth wireless technology.

On

-Turns Bluetooth functionality **ON**. When selected, the 🚫 icon will appear on the display. To deactivate Bluetooth, re-enter the menu and select **OFF**.

NOTE: Pairing between the gage and receiving device must be completed before readings can be transmitted.

Complete setup information including pairing and use is available on our website. (W)

Separate Probes

Separate Probe Gages consist of a gage <u>body</u> and a <u>probe</u>. A wide selection of interchangeable probes are available. Each retain their own unique calibration information. *All Gage bodies accept all probes*. To disconnect, power-down the Gage and pull the plastic probe connector horizontally (in the direction of the arrow) away from the Gage body.

When powered-up the **PosiTector *6000*** automatically determines what type of probe is attached and does a self-check. Probes "sense" when they are near metal and immediately attempt a measurement followed by another every 2 seconds. They stop when removed from the vicinity of metal and power-down after 3 minutes of no activity.

The continuous measurement feature is only intended to allow careful probe placement on small or odd-shaped surfaces. Simply ignore all readings taken before the probe is properly placed. *Do not drag the probe sideways*.

Standard probes

These constant-pressure, stainless steel probes are hermetically sealed to be totally waterproof - **ideal for underwater use**. Hold them at the 2 knurled rings and push the outer spring-loaded sleeve down. Ⓦ

FN Combination Probe

An ***FN*** probe combines the capabilities of both "***F***" and "***N***" probes. Switching between the two is automatic. The probe first attempts a measurement using the magnetic principle. If the coating is non-magnetic over steel, a reading is displayed with a letter "***F***". If not, the probe

17

automatically attempts a measurement using the eddy current principle. If the coating is non-conductive over metal, a reading is displayed with the letter "*N*".

Non-Ferrous Lock [**N Lock**]

(Option appears on FN Combination models only)

Select **N Lock** when operating regularly on non-ferrous substrates. The probe will only use the eddy current principle when measuring. This shortens measurement time and extends battery life. **N Lock** is also useful in instances such as measuring coatings on plated steel. Ⓦ

Temperature

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

The *PosiTector 6000* compensates automatically for temperature. Allow a few minutes for the probe 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, lift the probe at least 6 inches (15cm) and allow 1 second off the surface between measurements.

TIP: Ferrous substrates with extreme temperatures between -150°F and +450°F (-100°C and +230°C) can be measured with the *PosiPen B*.

Changing The Batteries

The battery icon ▮▮▮▮ displays four bars with fresh alkaline batteries installed. As the batteries weaken, the number of bars will be reduced. When the batteries become very weak ▮▯▯▯ the Power Warning image will display and the Gage will automatically power-down. To maintain user settings and stored measurements, the batteries must be replaced. USE ONLY "AAA" ALKALINE BATTERIES

18

⚠️ This image appears if the memory of the gage has become corrupt. This can occur in the event that the gage batteries were removed while the instrument was powered-on and the gage was not able to self power-down. If this message appears it will be followed by a full reset. All readings in memory will be erased and gage settings will be reset to "out-of-the-box" settings.

NOTES: To retain all user settings and stored memory readings, only replace the batteries after the Gage has automatically powered-down.

-Nickel-cadmium and nickel-metal hydride rechargeable batteries will work but the Gage may appear to have weak batteries.

Troubleshooting

Some common reports received by our Service Department along with possible causes are located on our website. Most conditions however can be cleared with a **Reset** (pg. 15). Ⓦ

Returning for Service

Before returning the Gage for service…

1. Install new Alkaline batteries in the proper alignment as shown within battery compartment.

2. Examine the probe tip for dirt or damage. The probe should move up and down freely.

3. Perform a Gage **Reset** (pg. 15).

4. Place a plastic shim onto bare metal (steel or non-steel, depending upon whether you have an "*F*" or "*N*" Gage) and attempt a measurement.

If you must return the Gage for service, describe the problem fully and include measurement results, if any. Be sure to also include the Gage, your company name, company contact, telephone number and fax number or email address. Ⓦ

Website: www.defelsko.com/support

Technical Data

Gage body dimensions:
5.75" x 2.5" x 1.2" (146 x 64 x 31 mm)

Battery Life: 50 hours continuous / 36,000 readings.
(W)

Available Options

A variety of accessories are available to help you get the most from your **PosiTector** *6000* coating thickness gage. (W)

Limited Warranty, Sole Remedy and Limited Liability

DeFelsko's sole warranty, remedy, and liability are the express limited warranty, remedy, and limited liability that are set forth on its website:

www.defelsko.com/terms

DeFelsko®

The Measure of Quality

www.defelsko.com