PosiTector® 6000

Coating Thickness Gages

Quick Guide v. 7.4

DeFelsko®

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Introduction

The *PosiTector 6000* hand-held, electronic Gage non-destructively measures the thickness of coatings on all metals, quickly and accurately. It consists of a Gage body (Standard or Advanced) and probe (Built-In or Separate).

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.

PosiTector 6000 Kit Contents

- PosiTector 6000 Probe
- Protective rubber holster with belt clip
- Protective Cap for Probe *(some probes only)*
- Protective Lens Shield
- Wrist strap
- 3 Alkaline AAA batteries
- Quick Guide Instructions
- Nylon carrying case with shoulder strap
- USB Cable
- Precision Plastic Shims
- Certificate of Calibration traceable to NIST
- Two (2) year warranty on Body and Probe

Quick Start

The **PosiTector 6000** powers-up when the center navigation button is pressed. To preserve battery life, it powers-down after approximately 5 minutes of no activity. All settings are retained.

1. Remove the protective plastic cap (if supplied) from probe.

2. Power-up Gage by pressing the center navigation ⊞ button.

3. Place the probe FLAT on the surface to be measured. HOLD STEADY. When a valid measurement is calculated, the Gage BEEPS twice 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.

If memory is ON while continuous measurements are being taken, only the last value on the display (when the probe is lifted) is stored into memory. **Scan** (pg.15) stores ALL measurements into memory.

Protective Cap

Some **PosiTector** *6000* models are shipped with a protective plastic cap over the probe. Remove this cap prior to use. Replace it when the Gage is not in use to protect the probe.

Wrist Strap

We recommend attaching and wearing the supplied wrist strap.
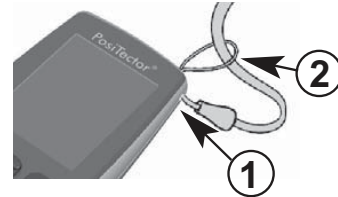
Plastic Lens Shield

The LCD is covered with a thin plastic film for protection against fingerprints and other marks during shipment. This film, while usually removed before using the Gage, can be left in place to protect against paint overspray. Replacements can be purchased.

Golden Rule

Measure your uncoated part first! This quick zero-check determines if a *Calibration Adjustment* is needed for your substrate. (see pg. 10)

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

Certification

All probes include a Certificate of Calibration. For organizations with re-certification requirements, instruments may be returned at regular intervals for calibration. DeFelsko recommends that customers establish 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. Written calibration procedures are available from DeFelsko Corporation at no charge.

PosiTector Body

Advanced LCD Display

PosiTector®

IBeam4   n30

5.06
thou/mils

Separate Probe Style

Advanced model

USB Port

PosiTector®

FN

12.3
thou/mils

Standard LCD Display

Probe Connector

Built-in Probe Style

Standard model

Typical Screen

Substrate → F   Cal 1 ← Current Calibration Setting (Advanced Only)

56 ← Current Measurement

Factory Calibration in Use

Battery Indicator →   microns ← Unit of Measurement

Button Functions- Normal Operation

Adjust Down   Adjust Up

Access the Menu   Restore brightness after dimming *(Advanced only)*
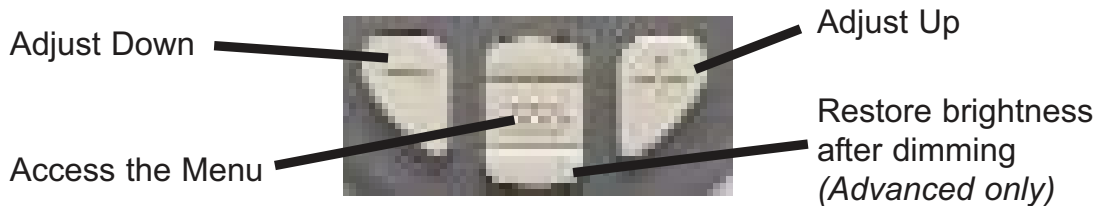
Magnetic & Eddy Current

Theory of Operation

The **_PosiTector 6000_** probes calculate coating thickness measurements using either the magnetic principle (**F** probes - ferrous models) or the eddy current principle (**N** probes - non-ferrous models). Combination **FN** probes (ferrous/non-ferrous) use both principles.

FN probes first attempt a measurement using the magnetic principle and will display a reading with the letter "**_F_**" if the coating is non-magnetic over steel. If the coating is non-conductive over metal, then the probe will _automatically_ attempt a measurement using the eddy current principle and display a reading with the letter "**_N_**" (see also **N Lock** pg. 12).

Probes

The **PosiTector _6000_** consists of a <u>body</u> and a <u>probe</u>. A wide selection of interchangeable probes are available. Each retain their own unique calibration information. _Gage bodies (Standard or Advanced) accept **ALL** probes._ See **Gage Info** (pg. 15) to find your body and probe type. More probe information is available at www.defelsko.com/p6000.

To disconnect a probe from a body, power-down the Gage and pull the plastic probe connector horizontally (in the direction of the arrow) away from the body. Reverse these steps to attach a new probe.

When powered-up the **PosiTector** automatically determines what type of probe is attached and does a self-check. Coating thickness 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 5 minutes of no activity.

This continuous measurement feature is intended to allow careful probe placement on small or odd-shaped surfaces. Ignore all readings taken before the probe is properly placed.

Two Probe Styles:

* **Built-in** - sensor protrudes from bottom of probe connector
* **Separate -** sensor is attached to the probe connector by a
        1.2 meter (3 foot) cable.
        (Extended cables lengths available.)

Available PosiTector 6000 Probes:

"Regular" - These constant-pressure, stainless
steel probes are hermetically sealed to be totally waterproof -
ideal for underwater use.

"Micro" - ideal for measuring small parts and
hard-to-reach areas. Available in 0, 45 or 90 degree angles.

"Thick" - ideal for thick, protective coatings.

"Xtreme" - ideal for measuring rough and hot surfaces up to 250°
C (500° F). Probe features an Alumina wear face and braided
cable.

For complete details, see:
http://www.defelsko.com/p6000/p6000_probe_details.htm

Additional PosiTector Probes:

The *PosiTector* accepts a number of probe types including
magnetic and eddy current coating thickness, surface profile,
environmental and ultrasonic wall thickness probes. Perform the
latest software **Updates** (pg. 33) to ensure probe compatibility with
your Gage. For the latest information on probe interchangeability
see www.defelsko.com/probes

*PosiTector bodies accept all 6000,
200, DPM, UTG, SPG and RTR probes*

Why is Measurement Important?

Dry Film Thickness (DFT) is arguably the single most important measurement made during the application and inspection of protective coatings. Coatings are designed to perform their intended function when applied within a tight DFT range as specified by the manufacturer. Correct thickness ensures optimum product performance. Even the most basic specification will require DFT to be measured.

Many physical and appearance properties of the finished coating are directly affected by the film thickness including the color, gloss, surface profile, adhesion, flexibility, impact resistance, and hardness of the coating. The fit of pieces assembled after coating can be affected when film thickness isn't within tolerance.

Regular film thickness measurement helps control material costs, manage application efficiency, maintain finish quality and ensure compliance with contract specifications. Paint manufacturers recommend target ranges to achieve optimum performance characteristics and clients expect these parameters to be met.

Precisely measuring finish thickness has other benefits, too. Whether to meet International Organization for Standardization (ISO), quality, or customer requirements for process control, companies need to verify coating quality to avoid wasting money reworking product.

Calibration, Verification & Adjustment

PosiTector *6000* probes non-destructively measure the thickness of coatings on metals. Three steps ensure best accuracy…

1. Calibration - typically done by the manufacturer. All probes include a Certificate of Calibration.

2. Verification - typically done by the user on known reference standards such as plastic shims or coated thickness standards.

3. Adjustment - to a known thickness

Calibration

Calibration is the high-level, controlled and documented process of measuring traceable calibration standards over the full operating range of the probe, and verifying that the results are within the stated accuracy of the probe. Calibrations are performed by the manufacturer, their authorized agent, or by an accredited calibration laboratory in a controlled environment using a documented process.

PosiTector *6000* probes are shipped with a Certificate of Calibration showing traceability to a National Metrology Institution. For organizations with re-certification requirements, probes may be returned at regular intervals for calibration. DeFelsko recommends that customers establish calibration intervals based upon their own experience and work environment. Based on DeFelsko's product knowledge, data and customer feedback, a one year calibration interval from either the last date of calibration, date of purchase, or date of receipt is a typical starting point.

Written Calibration Procedures are available online at no charge.

Verification

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

A reference standard is a sample of known thickness(es) against which a user may verify probe accuracy. Reference standards may be plastic shims, coated thickness standards, or sample parts whose coating thickness has been determined using other means.

Verify accuracy at the beginning and the end of each work shift. During the work shift, if the Gage is dropped or suspected of giving erroneous readings, its accuracy should be re-verified.
In the event of physical damage, wear, high usage, or after an established calibration interval, the probe should be returned to the manufacturer for repair or calibration.

Adjustment
Adjustment, or Cal Adjustment, is the physical act of aligning the probe's thickness readings to match those of a known thickness sample (removal of bias) in order to improve the accuracy of the probe on a specific surface or in a specific portion of its measurement range. 1-point or 2-point Cal adjustments are possible.
Probes are factory calibrated and perform an automatic self-check each time a measurement is taken. For many applications no further adjustment is necessary after a **Reset** (pg. 14). Just check ZERO on the uncoated substrate, then measure. However, sometimes probe readings can be influenced by changes in substrate shape, composition, and surface roughness or by measuring in a different location on the part. That is why Cal adjustments are made possible. The symbol disappears whenever a Cal adjustment is made.
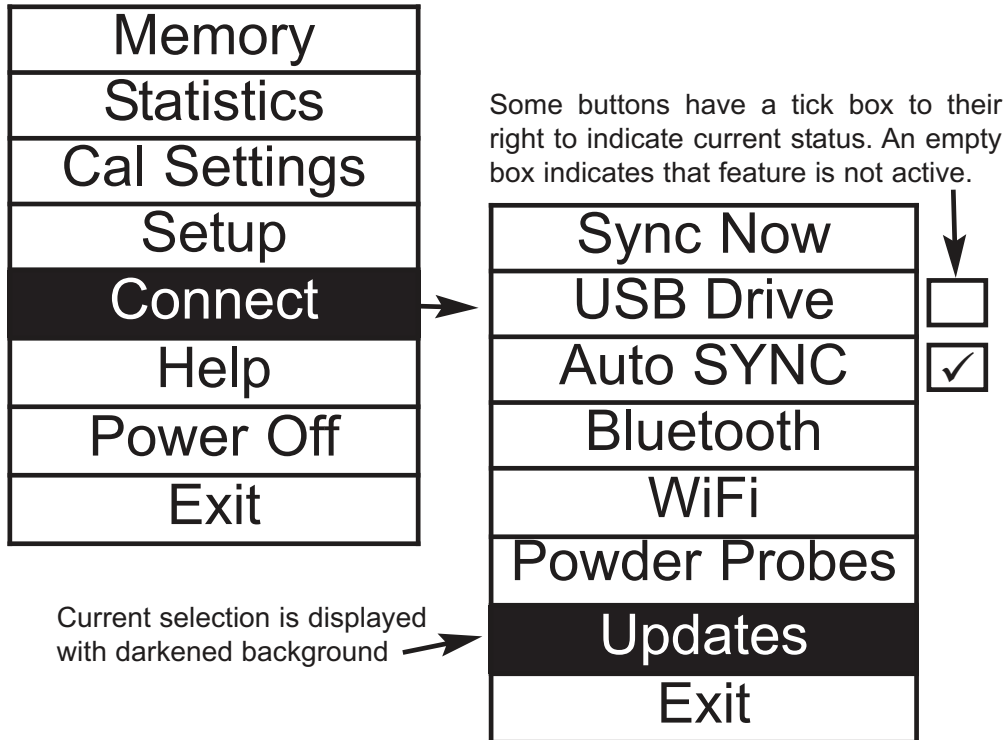
Where a Cal adjustment method has not been specified, use a 1-point method first. If measuring the included shims on your uncoated surface reveals inaccuracies, use the 2-point method. Factory Cal settings can be restored at any time by performing a **Reset** (pg. 14), creating a NEW Cal setting (See **Cal Memory** pg. 13), or by DELETING the adjustments made to the Cal 1 calibration setting (pg. 13). The symbol appears on the display whenever factory Cal settings are in use.
With "FN" probes, calibration adjustments are made only to the "F" or "N" mode (stored independently under a particular Cal), whichever was measured last.
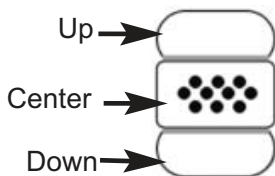
Menu Operation

Gage functions are menu controlled. To access the Menu, power-up the Gage, then press the center navigation button.

Below is a sample menu for a **PosiTector** *6000* Advanced Model:

Memory
Statistics
Cal Settings
Setup
Connect
Help
Power Off
Exit

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

Sync Now	
USB Drive	☐
Auto SYNC	☑
Bluetooth	
WiFi	
Powder Probes	
Updates	
Exit	

Current selection is displayed with darkened background

Navigation Button

Up
Center
Down

To navigate, use the **Up** and **Down** buttons to scroll and [•••] to **SELECT**.

Select **Exit** to exit from any menu.

NOTE: The center [•••] button is purposely recessed to help eliminate unintentional powering-up of the Gage.

Cal Settings Menu

1-point Calibration Adjustment

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

(i) 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 average of a series of readings on the uncoated surface is within tolerance of "0" .

Zero

(ii) Average Zero Calibration Adjustment

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

(a) Select | **Zero** | from the **Cal Settings** menu.

(b) 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.

(c) Repeatedly measure the uncoated part. The Gage will wait 2 seconds after placing the probe on the surface to allow the user to correctly position the probe on the surface. After the last measurement the Gage will calculate a Zero which represents the average of all the **Zero** readings taken.

(iii) 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.

1 Pt Adjust

(iv) Average Adjustment to a Known Thickness

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

(a) Select **1 Pt Adjust** from the **Cal Settings** menu.

(b) 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.

(c) 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 Pt Adjust

2-point Calibration Adjustment

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

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.

11

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 🔒C icon will appear and all calibration settings are "locked" to prevent further user adjustments. Uncheck to make further adjustments.

N Lock	✓
(FN ferrous/non-ferrous combination probes only)

Select **N Lock** (Non-Ferrous Lock) when operating regularly on non-ferrous substrates. The 🔒N icon will appear and the probe will only use the eddy current principle to shorten measurement time and extend battery life.

N Lock is useful when measuring coatings on plated steel. Normally the probe measures both the coating + plating over the steel using the magnetic principle. N Lock makes the Gage measure the coating over the plating only.

Select **N Lock** to measure over slightly magnetic substrates; i.e. clear-coat on gold over nickel-plated brass. Although the probe's magnet is used for the magnetic principle, it is also used in N Lock to magnetically saturate a slightly magnetic substrate and allow the eddy current principle to operate unhindered.

`CAUTION:` With N Lock engaged it is possible to obtain a reading when measuring non-conductive coatings on steel. This is not recommended.

Calibration Memory

Cal Memory   *(Advanced models only)*

It is often convenient to store 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 current calibration setting (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** (pg.14).

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 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 (pg. 21).

Open

Loads an existing setting. Use the **Up** or **Down** buttons to scroll 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 (pg. 20).

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 (pg. 21). Although **Cal 1** cannot be deleted, the **Delete** function will return it to factory settings.

View

View stored Calibration Settings.

Setup Menu

Reset

Reset (soft reset) restores factory settings and returns the Gage to a known condition. The following occurs:

- All batches, stored measurements, images, and batch names are erased.
- The ⏻ icon will appear on the display.
- Menu settings are returned to the following:

Memory = OFF	**Cal Lock** = OFF
High Res = OFF	**Bluetooth** = OFF
Statistics Mode = OFF	**Display** = None
Hi Lo Alarm = OFF	**N Lock** = OFF
Scan Mode = OFF	

Perform a more thorough **Hard Reset** by powering down the Gage, waiting several seconds, then simultaneously holding both the center [▦] and **(+)** buttons until the **Reset** symbol ↻ appears. This returns the Gage to a known "out-of-the-box" condition.   It performs the same function as a menu **Reset** with addition of:

- All calibration adjustments and Cal Memory are cleared and returned to the Gage's factory calibration settings.
- Bluetooth Pairing info is cleared.
- Menu settings are returned to the following:

Units = microns	**Language** = English
Flip Display = Normal	**Battery Type** = Alkaline
Auto Sync = OFF	**Backlight** = Normal
White on Black = OFF	**Bluetooth Streaming** = OFF
Fast Mode = OFF	**USB Drive**= ON

NOTES: - Keep the Gage away from metal during a **Reset.**
　　　　　- Date, Time and WiFi are not affected by either **Reset**.

```
┌─────────────────┐
│    Gage Info    │
└─────────────────┘
```
Displays the model number & serial number, probe type & serial number, PosiSoft.net registration key, the amount of remaining memory for storage of readings, date and time, and software packages.

For security purposes, the registration key is required to add the Gage to your free PosiSoft.net account.

```
┌─────────────────┐ ┌───┐
│     Hi Res      │ │ ✓ │
└─────────────────┘ └───┘
```
Increases the displayed Gage resolution 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.

```
┌─────────────────┐ ┌───┐
│      Fast       │ │ ✓ │  ▶▶
└─────────────────┘ └───┘
```
Increases measurement speed for most probes. Useful for quick inspection or when measuring large areas with thick coatings where proper probe positioning is not critical. Swift up/down probe movement is required. Reduced accuracy may be noted.

```
┌─────────────────┐ ┌───┐
│      Scan       │ │ ✓ │      (Advanced models only)
└─────────────────┘ └───┘
```
In ordinary operation, the **PosiTector 6000** takes thickness measurements every 2 seconds when placed onto a surface. Normally, the user raises the probe after it has taken a single measurement and relocates it to a second location. Scan mode modifies this behavior in two ways. First, measurements are taken much faster. Second, all measurements are recorded when memory is on. As the probe slides along the surface in scan mode, the **PosiTector 6000** takes single measurements in quick succession. This may reduce the life of the probe. *Recommended for smooth surfaces only*.

Flip Display

This option causes the display to rotate 180°. Ideal for right-side-up viewing when the sensors are pointed away from the user.

White on Black *(Advanced models only)*

Inverts the LCD display to white on a black background to provide better readability in some surroundings.

Backlight (*Advanced models only*)

Selects display brightness (Sun, Normal or Night). All settings will dim slightly after a period of no activity to conserve battery life. Press the **Down** button to brighten the display.

Set Clock

All measurements are date and time stamped (24 hour format) when stored into memory. It is therefore important to keep both the date and time current using this menu option. Use the **Up** and **Down** buttons to scroll, and the **(-)** and **(+)** buttons to adjust a value. The Gage's data and time can also be viewed in **Gage Info** (pg. 15).

Battery Type

Selects the type of batteries used in the Gage from a choice of "Alkaline", "Lithium" or "NiMH" (Nickel-metal hydride rechargeable). If NiMH is selected, the Gage will trickle charge the batteries while connected via USB to a PC or optional AC charger (Gage must be powered ON). The battery state indicator icon is calibrated for the selected battery type. No damage will occur if the wrong battery type is selected.

DeFelsko recommends *eneloop* (NiMH) rechargeable batteries (pg. 35).

Units

Converts the display from inch to metric or vice versa. Stored measurements in memory are not converted. Switching units will turn off Statistics, HiLo Alarm and closes Memory.
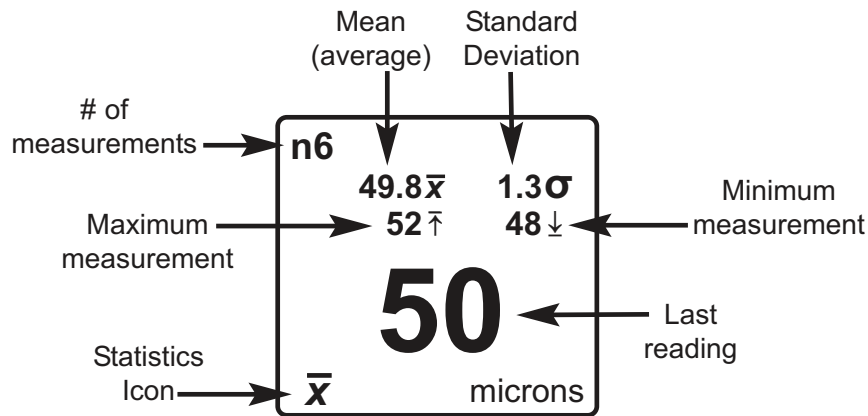
Language

Converts displayed and printed words to the selected language.

Statistics Menu

Statistics	$\checkmark$

When selected, a $\overline{x}$ icon and statistical summary will appear on the display.

Mean (average) Standard Deviation

# of measurements → **n6**

49.8$\overline{x}$ **1.3σ**

Maximum measurement → **52$\uparrow$**   **48$\downarrow$** ← Minimum measurement

50 ← Last reading

Statistics Icon → $\overline{x}$ microns

Remove the last measurement by pressing the **(-)** button. Press **(+)** to clear statistics.

HiLo Alarm	$\checkmark$

Allows the Gage to visibly and audibly alert the user when measurements exceed user-specified limits.

When **HiLo Alarm** is 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 the **Hi** setting.

The ⥮ icon will appear on the display.

Measurements will be compared to your defined **HiLo** limits. The Gage beeps if results are within those limits. A single low tone will sound if the reading is below the **Lo** limit, and a high tone if it is above the **Hi** limit. Press **(+)** to clear **HiLo** readings.
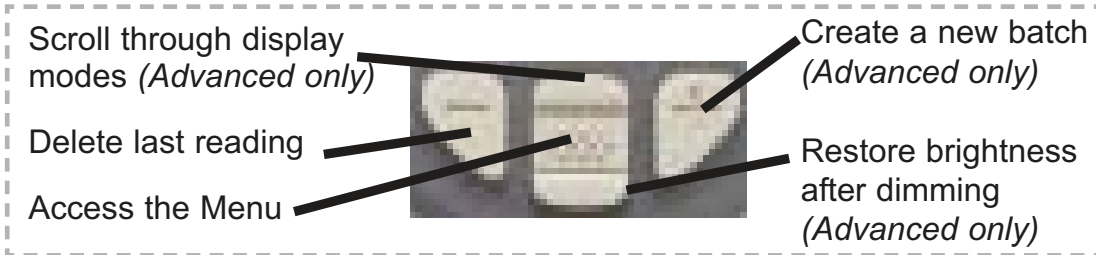
Clear

Clears all on-screen **Statistics** and **HiLo** tabulations.

Memory Management

The **PosiTector** *6000* has internal memory storage for recording measurement data. Stored measurements can be reviewed on-screen or accessed via computers, tablets and smart phones. Measurements are date and time-stamped.

Button functions with **Memory** ON:

Scroll through display modes *(Advanced only)*

Create a new batch *(Advanced only)*

Delete last reading

Access the Menu

Restore brightness after dimming *(Advanced only)*

Standard models store up to 250 readings in one batch.

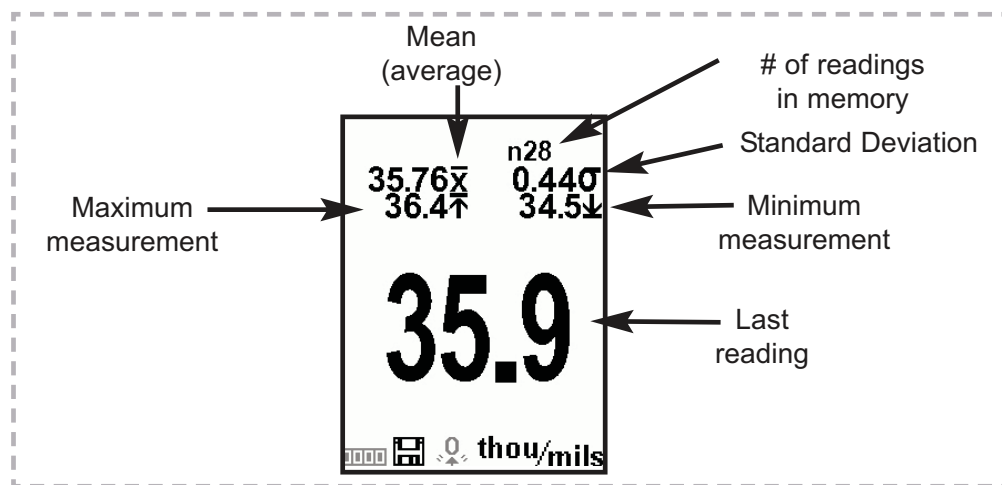The **Memory** Menu includes the following options...

On: turns memory on and begins recording
Off: stops recording (stored readings remain in memory)
Clear: removes all readings from memory
View: lists group statistics and all stored readings on the display. It will begin by showing statistics based on all readings in memory. Use the **Up** and **Down** buttons to scroll through all readings. Press [⠿] to exit.

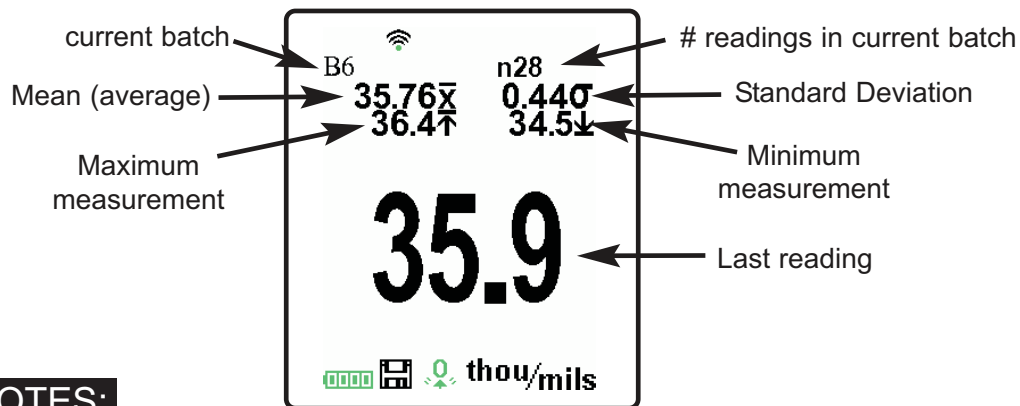Standard model display with **Memory** ON shows measurement statistics:

Mean (average)

# of readings in memory

n28

Standard Deviation

35.76x̄   0.44σ

Maximum measurement

36.4↑   34.5↓

Minimum measurement

35.9

Last reading

thou/mils

Advanced models store 100,000 readings in up to 1,000 batches. The **Memory** Menu includes the following options...

New Batch

Closes any currently opened batch and creates a new batch name using the lowest available number. For example, if only **Batch 1** and **Batch 3** exist, then **Batch 2** would be created and made the current batch. The 💾 icon appears and basic statistics are displayed. Each measurement will be displayed 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, press **(+)** to create a new batch

current batch ⟶ B6   n28 ⟵ # readings in current batch
Mean (average) ⟶ 35.76X̄   0.44σ ⟵ Standard Deviation
                    36.4↑   34.5↓
Maximum measurement   Minimum measurement
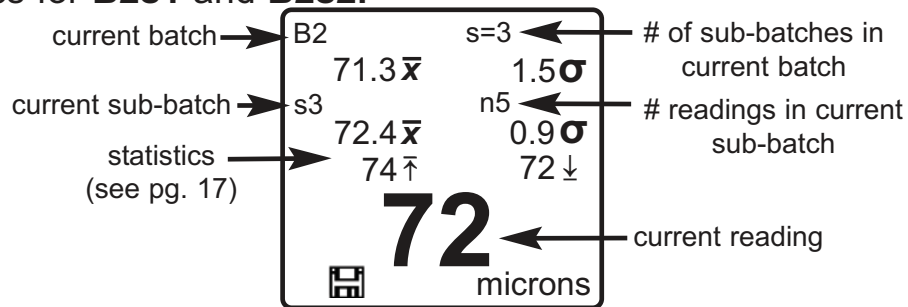
35.9 ⟵ Last reading

thou/mils

NOTES:

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

- Calibration adjustments cannot be made if readings are stored in memory.

New Sub-Batch *(appears only if a batch is currently open)*

Creates a new sub-batch within the currently opened batch.

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

In the following 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.**

current batch → B2   s=3 ← # of sub-batches in current batch
             71.3 $\bar{x}$ 1.5 σ

current sub-batch → s3   n5 ← # readings in current sub-batch
             72.4 $\bar{x}$ 0.9 σ

statistics → 74 ↑   72 ↓
(see pg. 17)

72 ← current reading

💾   microns

New PA2

Helps determine if film thickness over a large area conforms to user specified min/max levels. See www.defelsko.com/pa2

New 90/10

Determines if a coating system complies with the IMO performance standard for protective coatings.
See www.defelsko.com/9010

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 (pg. 13).

NOTE: A solid triangle ▶ is displayed to the right of the batch name when sub-batches are present. Press 🔳 to view sub-batches. This also applies to the *Delete*, *View* and *Print* options.

Close

Stops the recording process, closes the current batch, and removes batch information 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

Scroll using the **Up** or **Down** buttons through information, statistical summary, and a list of each reading in the currently opened batch. Press ⬛ to exit.

| Annotate | (Advanced models only)
|---|

Create meaningful batch names and enter notes directly on the Gage using a familiar onscreen *QWERTY* keyboard.

Use the Gages navigation and **(-)(+)** buttons to enter annotations.

Annotations can be synchronized with PosiSoft.net, PosiSoft Mobile and are included in PosiSoft USB Drive reports.

Print

Sends a statistical summary and individual measurements to the optional Bluetooth wireless printer.

NOTE: To cancel printing, press and hold the **(-)** and **(+)** buttons simultaneously
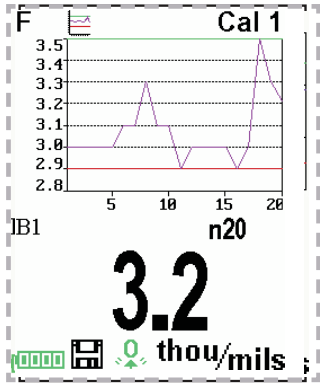
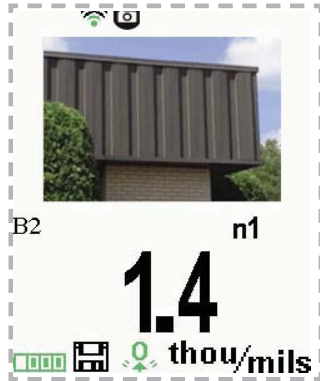| Display | *(appears only if a batch is currently open)* |

The following user selectable display options are available:

⊠ **_Chart_**: A real-time chart of batch readings

**x-y Chart** for
Single Layer Application

🔘 **_Image_**: Batch image

𝐴 **_Notes_**: Instructions, descriptions or notes (see **Annotate**, pg.21)

None: Default screen shows statistics

Shortcut: When a batch is open, press **Up** to scroll through the above display options.

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- PosiSoft.net and PosiSoft Mobile are used to insert an *Image* and *Notes* into a batch.

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

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

- If memory is ON while continuous measurements are being taken, only the last value on the display (when the probe is lifted) is stored into memory. **Scan Mode** stores ALL measurements into memory (pg. 15).

- Each batch can contain a maximum of 10,000 readings.

Summaries (Advanced models only)

Displays a summary of all stored batches including the name, probe type, number of readings and type.

In the following example, Batch 3 (**B3**) indicates an "**F**" *6000* coating thickness probe was used to record a total of "**6**" readings in "**PA2**" mode.
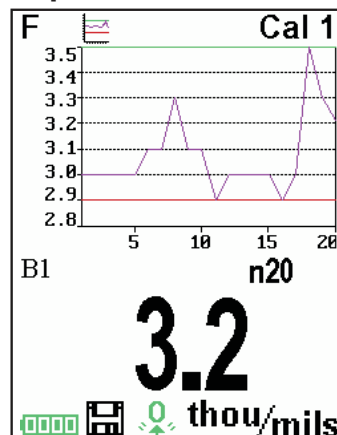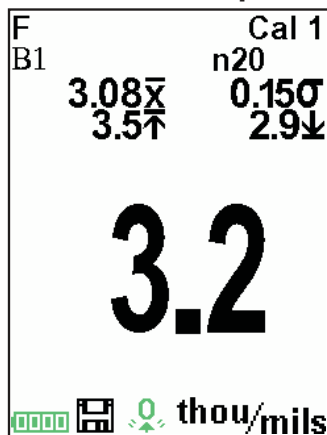
Batch Summaries
Page 1/1

Batch Name	Probe Type	#	Type
B4	SPG	20	
B3	F	6	PA2
B2	F	10	
B1	UTG-C	5	

OK

S c r e e n   C a p t u r e

Press both **(-)(+)** buttons at any time to capture and save an image copy of the current display. The last 10 screen captures are stored in memory and can be accessed when connected to a computer (see *PosiSoft USB Drive* pg. 27).

Sample Screen Captures

F   Cal 1
B1   n20
3.08$\overline{x}$ 0.15σ
3.5$\uparrow$ 2.9$\downarrow$

3.2

thou/mils

F   Cal 1
3.5
3.4
3.3
3.2
3.1
3.0
2.9
2.8
     5   10   15   20
B1   n20

3.2

thou/mils

Accessing Stored Measurements Data

PosiSoft solutions for viewing, analyzing and reporting data:

PosiSoft USB Drive - connect the **PosiTector** to a PC/Mac using the supplied USB cable to access and print stored readings, graphs, photos, notes and screen captures. No software or internet connection required. **USB Drive** must be selected (See pg. 27).

PosiSoft.net - a free web-based application offering secure centralized storage of **PosiTector** readings. Access your data from any web connected device. Go to: www.PosiSoft.net

PosiSoft 3.0 - Desktop Software for downloading, viewing and printing your measurement data.

PosiSoft Mobile *(Advanced models only)* - access readings, graphs, capture photos and update annotations through WiFi enabled devices, such as tablets, smart phones and computers.

PosiSoft Desktop Manager (PDM):

A small Windows based application which allows automatic two-way communication (synchronization) between the Gage and *PosiSoft.net* (internet connection required). When installed, PDM runs as a start-up application and resides in the Windows notification area (system tray) of a PC. PDM is available as a free download within your PosiSoft.net account or at www.defelsko.com/downloads

Register your Gage on PosiSoft.net to take full advantage of your Gage's capabilities. See www.PosiSoft.net

NOTE: PDM is not required for **WiFi** enabled gages (pg. 30).

PosiSoft.net:

To enhance the operation of your Gage, all **PosiTector** users have access to the features provided by *PosiSoft.net*. It is a web-based application offering secure centralized management of readings.

After (1) a user account has been created, (2) a Gage has been registered, and (3) the *PosiSoft Desktop Manager* is downloaded and installed onto a Windows PC (not required for WiFi connected gages), synchronization of measurement data can be performed either manually or automatically whenever the **PosiTector** is connected to a web enabled PC (USB cable or Bluetooth wireless technology) or WiFi network (Advanced gages only). Gage measurements stored in memory are uploaded; images and batch notes are synchronized.

Uploaded data can be manipulated using a standard internet web browser from any location in the world - job site or head office. Reports and graphs with annotations and corporate logo can be generated. Data can be exported to XML or CSV (comma delimited) text files.

Measurement data can be shared with authorized users via a secure login from any computer and most web enabled devices including smart phones.

`NOTE:` A *PosiSoft.net* account is not required to **Update** (pg. 33) your **PosiTector**. Simply download and install *PosiSoft Desktop Manager* at www.defelsko.com/downloads

PosiSoft 3.0:

Desktop Software that can be installed onto your Windows PC and allows the user to download, view, print and analyze their measurement data.

Reports and graphs with annotations and corporate logo can be generated.

`NOTE:` *PosiSoft Software* is available for use with DeFelsko's complete line of electronic instruments and is available for download at www.defelsko.com/posisoft

PosiSoft Mobile:

Is a Gage-based software application featured in all **PosiTector** Advanced instruments (serial numbers 730,000+).

PosiSoft Mobile allows users to:

- browse stored measurement data including notes, images, statistics and charts
- update batch names/notes using your mobile device's keyboard
- insert images directly into Gage batches using your mobile device's camera or image library
- remotely view the live display of a working **PosiTector** & more

PosiSoft Mobile can be accessed from any WiFi enabled device using a standard web browser. Ideal for use with devices such as Windows Phone/Mobile, Blackberry (RIM), Android, Apple iOS and more.

In addition to browser based access, *PosiSoft Mobile Manager* is available for Apple iOS and Android users.

See www.defelsko.com/wifi/wifi_mobile

Connect Menu

Synchronizing (Sync) is the process whereby **PosiTector** stored measurement data uploads to *PosiSoft.net* (from both Standard and Advanced models) while images and batch notes are downloaded to the Gage (*Advanced model only*). This transfer occurs when the Gage is connected via USB, Bluetooth or directly through your WiFi router/hotspot via WiFi. It can be triggered either manually (USB, Bluetooth or WiFi) or automatically (USB only).

Sync Now

When selected, the Gage immediately synchronizes stored measurement data via USB, Bluetooth or WiFi to *PosiSoft.net (PosiSoft Desktop Manager (pg. 24) and an internet connection are required when using USB or Bluetooth.)*

Multiple gages can be synchronized simultaneously when connected using multiple connections (for example two gages connected via USB and one gage connected via WiFi or Bluetooth).

Auto SYNC ☑

Allows the Gage to automatically synchronize stored measurements with *PosiSoft.net* when initially connected to the internet via a PC running *PosiSoft Desktop Manager* (pg. 24) or a local WiFi network.

Additional measurements added to memory while connected are synchronized only when the USB cable is disconnected, then reconnected or when the **Sync Now** option is selected.

USB Drive ☑

Universal Serial Bus (USB) is a specification for communication between devices and a host controller (usually a personal computer). USB has effectively replaced a variety of interfaces such as serial and parallel ports.

The **PosiTector** uses a USB mass storage device class which provides a simple interface to retrieve data in a manner similar to USB flash drives, cameras or digital audio players.

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When checked, any computer can view datasets stored in memory by navigating a virtual drive labeled "PosiTector" using the included USB cable.

A formatted HTML report is viewed by selecting the "index.html" or "START_HERE.html" file found in the root directory. Optionally, text ".txt" files located in each batch folder provide access to measurement values. Stored datasets and graphs can be viewed or copied using universal PC/Mac web browsers or file explorers.
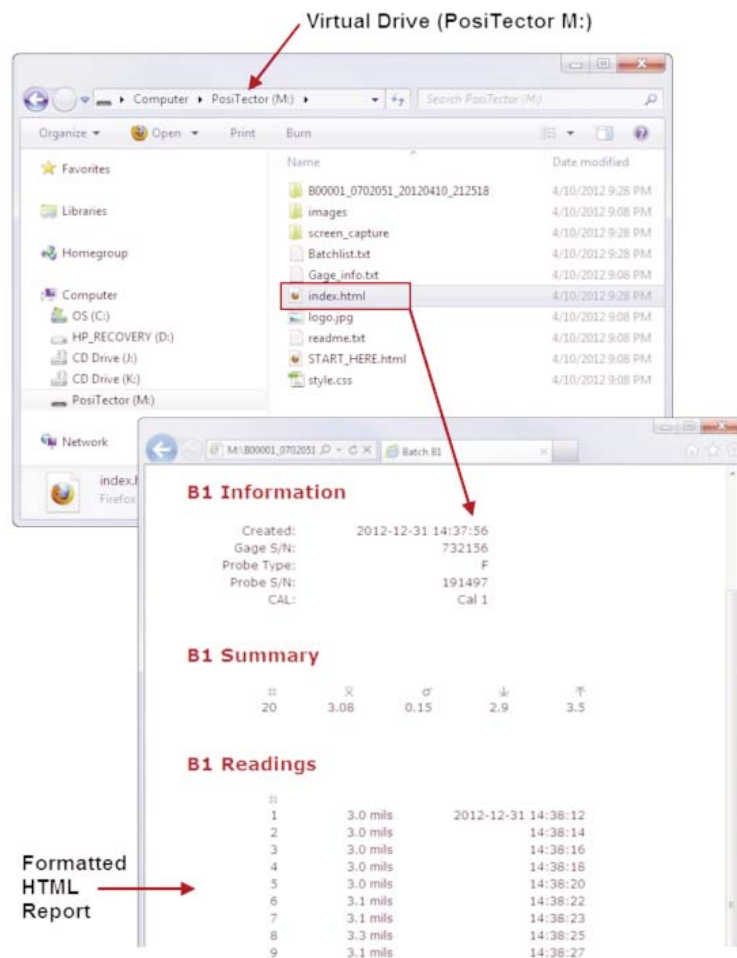

When your **PosiTector** is first connected to your Windows PC via a USB cable, an enumeration process is started that installs device drivers without re-booting your computer. You may see several pop-up windows in the taskbar at the bottom right of your screen. Wait for the entire process to be completed before proceeding.

NOTE: When connected, power is supplied through the USB cable. The batteries are not used and the body will not automatically power down. If rechargeable (NiMH) batteries are installed, the Gage will trickle charge the batteries.

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Retrieving stored screen captures

The last 10 screen captures (pg. 23) stored in memory can be accessed by navigating to the "screen_capture" directory within the "PosiTector" virtual drive.
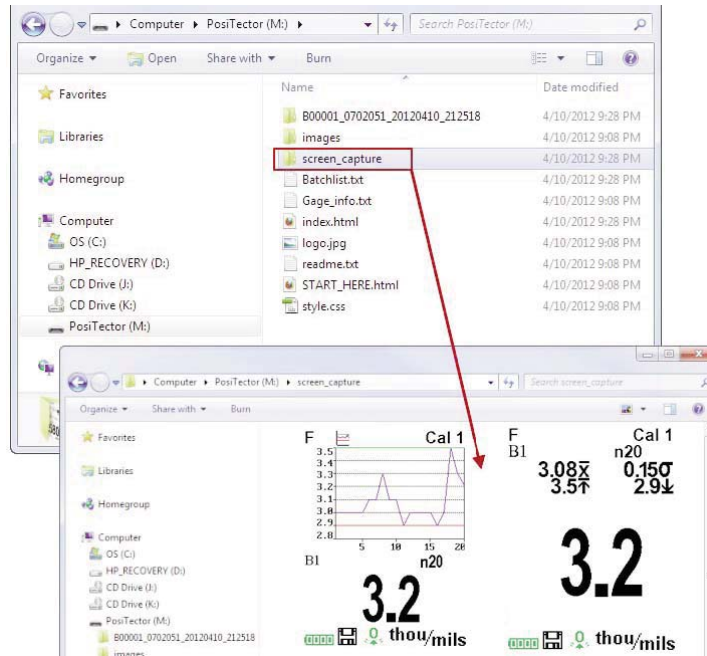
| **Bluetooth** | (*Advanced models only*) |

PosiTector Advanced models have Bluetooth functionality to:

- **Communicate** with the *PosiSoft Desktop Manager (PDM)* in lieu of a USB cable.
- **Stream** individual datasets to a computer or Bluetooth wireless printer as they are taken.
- **Print** to the optional battery powered Bluetooth wireless printer.

On: Turns Bluetooth functionality **On**. When selected, the icon will appear on the display. To deactivate Bluetooth, select **Off**.

Pairing: The Gage and receiving device must be paired before stored or streamed datasets can be transmitted. For pairing instructions, see www.defelsko.com/bluetooth

Info: Lists information about your current Bluetooth connection, including the currently paired device and MAC address.

Stream: When checked, the Gage will stream datasets to the paired Bluetooth Device as they are taken. Datasets can be streamed as they are taken to the optional Bluetooth printer or third-party computer software.

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Bluetooth Wireless Printer

PosiTector Advanced models can output to the optional battery powered Bluetooth wireless printer one of two ways:

•   Stream individual readings as they are taken.

•   Print stored batch readings and summaries.

Begin by entering the **Connect > Bluetooth** menu. Turn Bluetooth **ON** and "**Pair**" the **PosiTector** to the printer. See: www.defelsko.com/bluetooth

Streaming: In the **Connect > Bluetooth** menu, select the **Stream** tick box. All readings will now be simultaneously displayed on the LCD and sent to the printer.

Printing: In the **Memory** menu, select **Print**.

| WiFi | *(Advanced models only)*

Allows wireless communication with devices such as tablets, smart phones and computers connected to your local wireless network or portable mobile hot spot. See www.defelsko.com/WiFi

On/Off ☑ : Turns WiFi functionality **On**. When selected, the 📶 icon will appear on the display. To deactivate WiFi, select **Off**.

Access Point ☑ : Connect your smart device/computer to a PosiTector Advanced body wirelessly without the need for a separate network. Wirelessly import readings into *PosiSoft 3.0 Desktop Software* (pg. 24) or access *PosiSoft Mobile* (pg. 26) in the field or whenever a WiFi network is not available or out-of-range.

To enable, select **Access Point** from the **Connect > WiFi** menu. The Access Point icon 📶 will display in the upper left of the PosiTector display.

Securing your Access Point

To ensure the PosiTector is only accessible to authorized devices, it is important that you enter a passphrase (password) for the Access Point. The default Passphrase is **password**.

In the **Connect > WiFi > Setup** menu, select **AP Passphrase**. Press [⊞] button to display on-screen keyboard. Enter a Passphrase for the Access Point. The Passphrase will be required for all devices connecting to the PosiTector's Access Point.

The PosiTector is now visible to all WiFi enabled devices. Simply connect your devices WiFi to the new PosiTector Access point. All PosiTectors are uniquely identified by their respective gage body serial numbers.

AP Channel

Default Channel: 6
For most users the default channel will not have to be altered. If you are experiencing poor connection or are unable to connect, try another channel.

In the **Connect > WiFi > Setup** menu, select **AP Channel**. Press the **UP** center navigation button to highlight the channel. Use the (**-**) or (**+**) buttons to change the channel. Press the **DOWN** navigation button and select **OK**. Press the [⊞] button.

Import readings into PosiSoft 3.0 Desktop Software (pg. 25)

From the PosiSoft 3.0 menu, select **Import > From Gage**. All connected gages will display their unique serial number. Measurement data will be displayed upon completion of the import.

The time it takes for import will depend on the number of Batches and measurements present within the gage. Imports generally take no longer than a few seconds.

Batches are not erased from the gages memory during import. They remain on the gage until they have been deleted by the user. For more information regarding PosiSoft 3.0:
http://www.defelsko.com/posisoft/posisoft_software.htm

For use on Apple iOS and Android devices:

PosiSoft Mobile Manager apps exist for Apple iOS and Android users. Simply download the App from the Apple App Store or Google Play.

Once your smart device/computer has been connected to the PosiTector Access Point, open the *PosiSoft Mobile Manager* app. Select your PosiTector from the list to open PosiSoft Mobile.

For use with all WiFi enabled devices:

Any WiFi enable device connected to the PosiTector Access Point can view the instrument's built-in PosiSoft Mobile web interface. Using your device's web browser, enter the IP address of your PosiTector to access the features of PosiSoft Mobile.

In the **Connect > WiFi** menu, select **Information** to view the IP address associated with your PosiTector.

Enter the displayed IP address into your devices web browser exactly as it appears. Example: 192.168.0.1:8080

For more information regarding PosiSoft Mobile:
http://www.defelsko.com/posisoft/posisoft_mobile.htm

Networks: The Gage will allow the user to add a new network and will automatically check for available local networks. Available networks detected by the Gage are listed on the screen along with any networks that the Gage has previously been connected to that are not currently within connection range.

Information: Gage displays information about the local WiFi network connection including...
- SSID: the network's name
- State: displays if the Gage is connected to the network or not
- IP Address: the network's IP Address. Users can enter this number into a web-browser of any WiFi enabled device that is connected to the same network in order to view the Gage's synced batches through **PosiSoft Mobile** (See pg. 26).

**Setup:** Allows user to setup a WiFi connection
- IP Settings: enter the IP information as follows... IP Type (DHCP or Static), IP Address, Gateway, Netmask, DNS1, DNS2.
- Server Enable: enables a connection between the network and the Gage.
- Gage Name: enter a name for the Gage (up to 14 Characters).
- WiFi Reset: erases all WiFi settings.

Updates

Determines if a software update is available for your Gage. If an update is available, a prompt will appear allowing the user to choose to perform the update at this time or not.

To perform an update the Gage must be connected to an internet connected PC with *PosiSoft Desktop Manager* (pg. 24), or **WiFi** network (pg. 30).

NOTE: Ensure that stored measurements are backed up to a PC or *PosiSoft.net*. The Gage may perform a **Hard Reset** (pg. 14) after completion of the update and ALL datasets in memory would be erased.

Updates - Sample Screen

Currently installing update 2 of 3 total ⟶ **2 / 3**

Progress bar ⟵
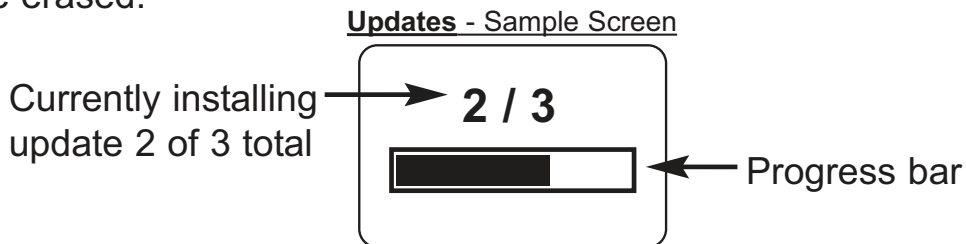
⚠ **DO NOT** unplug the Gage during the update operation.

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.

Power Supply / Battery Indicator

Power Source: 3 AAA alkaline, Lithium or optional Nickel-metal hydride (NiMH) rechargeable batteries. For best battery indicator results, ensure the appropriate **Battery Type** is selected in the **Setup** > **Battery Type** menu (pg. 16).

The battery indicator 🔋 displays a full bar with fresh alkaline or fully charged batteries installed. As the batteries weaken, the bar will be reduced. When the battery symbol is low 🔋 the Gage can still be used, but the batteries should be changed or recharged at the earliest opportunity. The Gage will turn off automatically when batteries are very low, preceded by a Low Battery Warning on the display.

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

Battery performance decreases at low temperatures.

Rechargeable Batteries (available option)

DeFelsko recommends the use of eneloop (NiMH) rechargeable batteries. They combine the advantages of rechargeable batteries and disposable (Alkaline) batteries. They discharge very slowly and can be stored for long periods without having self discharge concerns. (See www.eneloop.info)

Additional Accessories

Rechargeable Battery Pack - 4 AAA eneloop batteries

The **PosiTector** can operate on rechargeable batteries and DeFelsko recommends the use of *eneloop* (NiMH) rechargeables. *eneloop* batteries combine the advantages of regular rechargeable batteries and disposable (Alkaline) batteries. They discharge very slowly and can be stored for long periods without having self discharge concerns. Eneloop batteries come pre-charged and ready to use immediately. See: www.eneloop.info

AC Power Cable Kit

An optional AC Power Cable Kit is available for continuous operation or battery charging through the **PosiTector's** built-in USB port (as shown on pg. 24). This kit supplies several alternate power solutions for your battery-operated **PosiTector**. They allow the gage to operate continuously without the need for batteries.

Use the cable alone to connect a **PosiTector** to your PC's built-in USB port that acts as a continuous power source. Or connect the cable to the included power adaptor which plugs into any AC wall electrical outlet, 110 or 220V.

A selection of electrical plugs is included which are capable of dealing with most country's outlets.The USB cable provided can also be used for **Accessing Stored Measurement Data** (See pg. 24).

USB Cable

A USB Cable is provided with every **PosiTector**.

Bluetooth Printer

This lightweight printer receives data from all **PosiTector** gages via Bluetooth wireless technology. It is battery-operated and prints readings and statistical summaries.

Nylon Case

Convenient soft shell nylon case for carrying a **PosiTector**. Case has compartments for Certificates of Calibration, instruction manuals and other accessories.

PosiTector Case

Convenient hard shell plastic case for carrying a **PosiTector** and multiple probes - including any of the **PosiTector 6000** - Coating Thickness, **PosiTector 200** - Ultrasonic Coating Thickness, **DPM** - Dew Point Meter, **SPG** - Surface Profile, **RTR** - Replica Tape Reader, or **UTG** - Ultrasonic Wall Thickness probes. Case has compartments for Certificates of Calibration, instruction manuals and other accessories.

Protective Lens Shield

One lens shield is included with every **PosiTector** instrument. Additional package of five (5) thin plastic lens shields are available and ideal for protecting the **PosiTector** display from paint and overspray.

Coating Thickness Standards

Certified Thickness Standards are used to verify the accuracy and operation of coating thickness gages and are an important component in fulfilling both ISO/QS-9000 and in-house quality control requirements. Contracts often specify that coating thickness measurements be taken by gages whose measurement accuracy is traceable to a National Metrology Institute such as NIST or PTB.

Standards are typically purchased as an accessory to coating thickness gages. Many customers find it more practical to verify the accuracy of their own gages in-house, rather than utilize DeFelsko's calibration services. This is particularly true when many gages are in use and/or when accuracy verification is performed often.

There are 5 types of coating thickness standards available:

Certified Coated Metal Plates are the best solution for verifying the calibration, accuracy and operation of most magnetic, eddy current or ultrasonic coating thickness gages including magnetic pull-off gages as well as many competitive models. They fulfill both ISO and in-house quality control requirements. At ±0.43µm (±0.017 mil) Certified Coated Metal Plates are the most accurate solution.

Certified Polystyrene Blocks are for use with gages that measure over 1500 µm (60 mils).

Certified Plastic Shims (foils) provide an economical alternative to coated metal plates. They have a reduced accuracy of ±2 µm (±0.08 mil). A coating thickness Gage measures shim thickness when this shim is placed over a smooth metal surface (zero plate).

Non-Certified Plastic Shims (foils) provide a quick operational check of the Gage and they allow the user to perform practice measurements when placed over metal. They protect the probe from damage or premature wear when placed over hot or abrasive surfaces, and they can be placed on top of soft or tacky coating films to obtain thickness measurements without the Gage probe depressing the coating film. A set of 5 shims is included with every **PosiTector *6000*.**

Zero plates are uncoated steel or aluminum disks. A zero plate is included with most coated metal sets. The first Gage measurement is on a zero plate to verify that the Gage measures zero correctly. Electronic gages can usually be adjusted to "0" if necessary. A zero plate is also a convenient base onto which a plastic shim or polystyrene block can be placed for measurement. Zero plates are also used to provide a substrate where none exists. Large sheets of material such as paper, plastic, fabric and rubber can be measured with a coating thickness Gage by placing the material over the zero plate. This is useful when the measured item is too large to access with a micrometer or other device.

For more information, see www.defelsko.com/standards.

Troubleshooting

Most conditions can be cleared with a **Hard Reset** (see pg. 14). If not, visit our Service & Support page for information on sending your Gage to us for a no charge evaluation.

See: http://www.defelsko.com/service

Probe attempts a measurement even while held in the air:

The probe may have been left near metal, including jewelry, during power up or at rest. Possibly a finger was held over the probe. Try measuring on an uncoated object. Otherwise turn the Gage off, and then on again. Finally try a **Reset** (pg. 14).

Thickness readings are inconsistent:

- Probe tip may be damaged, scratched or worn
- Make sure you lift the probe well clear of the surface between measurements
- Try measuring on a different surface with the included plastic shims
- Hold the probe on the surface and allow it to take several measurements. If the second and subsequent measurements are consistent, you are not putting the probe onto the surface fast enough.
- The substrate and/or coating surface is uneven, in which case inconsistent readings are to be expected. Take several measurements and average them to get a meaningful result.

Gage powers up but will not take any readings:

- Substrate may not be metal. "F" probes measure coatings on ferrous metals such as steel and iron, and "N" probes measure over non-ferrous metals such as aluminum.
- Protective cap must be removed from probe (if outfitted with one).
- An extreme calibration adjustment might have been made.

Gage will not print to the Bluetooth wireless printer:

- Ensure the Gage has been paired for use with the printer and the Gage menu option **Connect > Bluetooth > Stream** box is ticked.
- Check printer batteries. Switch it off and then on again.

Technical Data

Measuring Range:
varies depending
probe model

Gage Size:
137 x 61 x 28 mm
5.4" x 2.4" x 1.1"

Accuracy:
varies depending
on probe model

Weight: (without batteries)
140 g
 4.9 oz

Resolution:
varies depending
on probe model

Temperature Range:
+32° to +120°F
0 to +50°C

Conforms to:
ISO 2178/2360/2808, ISO 19840,
ASTMB499/D1186/D1400/D7091/E376/
G12, BS3900-C5, SSPC-PA2 and others

Returning for Service

Before returning the Gage for service:

1. Install new or newly recharged 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 **Hard Reset** (pg. 14)

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

IMPORTANT:

If you must return the Gage for service, please fill out and include the Service Form located at www.defelsko.com/support with the Gage. Be sure to also include the probe, your company name, company contact, telephone number and fax number or email address.

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

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