PosiTector® 200

Ultrasonic Coating Thickness Gage

Instruction Manual

54

microns

DeFelsko®
The Measure of Quality

Introduction

The **PosiTector** *200* is a hand-held Coating Thickness Gage that uses a non-destructive ultrasonic principle to measure coating thickness on a wide variety of substrates. It consists of a body (Standard or Advanced) and a probe (see **Probes** pg. 2).

Quick Start

Press the ≣ button to power up the Gage. To conserve battery life, the gage will automatically go to sleep after 5 minutes of inactivity. While in **Sleep Mode**, the gage powers up significantly faster— convenient when moving between parts or locations. The gage will completely power off after 4 hours of inactivity. Alternatively, select **Power Off** from the main menu. All settings are retained.

1. Remove the protective rubber cap from the probe.

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

3. Zero the probe (pg. 5).

4. Verify accuracy and adjust if necessary (pg. 4).

5. Apply couplant (pg. 3) to the surface of the part.

6. Measure the part (pg. 4).

Menu Operation

To access the Menu, power-up the gage, then press the center navigation button ≣. Either the keypad or touch screen can be used to navigate the menu. If desired, touch screen functionality can be disabled within the Setup menu (See **Touch**, pg. 10).

Select a menu option by touching it, or use the ▲ and ▼ buttons to highlight the desired option and press ≣ to select it.

On menus longer than one page, the current page number is displayed below the menu name. Navigate between pages using ▲ when the first menu item is selected, or ▼ when the last menu item is selected. If using touch, navigate between pages by touching ← or →, or by swiping up or down.

Press the ⊖ button or swipe right to return to a previous screen. Select **Exit** to close the Menu.
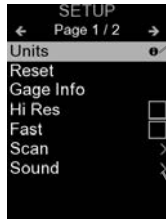
When a Menu option is highlighted, the 🛈 icon indicates on-gage help is available. Press ⊕ or touch the 🛈 icon to display the help.

Update your gage to ensure that you have the latest on-gage help information.

indicates that a sub-menu exists for the Menu option. Select the option to display its sub menu.

Probes

When powered-up, the *PosiTector* automatically determines which probe is attached and does a self-check.

To disconnect a probe from a body, slide the plastic probe connector horizontally (in the direction of the arrow) away from the body. Reverse these steps to attach a different probe. It is not necessary to power-down the Gage when switching probes.

PosiTector 200 probes are available for measuring a wide variety of coating thickness applications.

■ *B probe* - 13 to 1000 microns (0.5 to 40 mils)
   Ideal for polymer coatings on wood, plastic, composites, etc.
■ *C probe* - 50 to 3800 microns (2 to 150 mils)
   Ideal for thicker coatings on concrete, fiberglass, etc.
■ *D probe* - 50 to 7600 microns (2 to 300 mils)
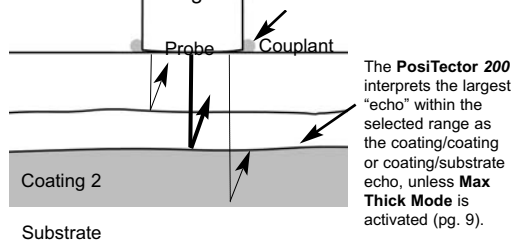   Ideal for thick, soft (attenuative) coatings such as polyurea

NOTE: *Range limits apply to polymer coatings only.*

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Couplant

Couplant is required to propagate ultrasound into the coating. Water is a good couplant for smooth coatings. Use the supplied glycol gel for rougher coatings. While it is unlikely that the couplant will damage the finish or leave a stain on the surface, we suggest testing the surface by using the couplant on a sample. If testing indicates that staining has occurred, a small amount of water can be used instead of couplant. Consult the Material Safety Data Sheet available on our website and your coating supplier if you suspect the couplant may damage the coating. Other liquids such as liquid soap may also be used.

PosiTector 200 - Theory of Operation

PosiTector *200* probes emit a high frequency sound pulse that travels into the coating via a couplant and reflects from ANY surface that is different in density. Coating thickness readings are obtained by measuring the time taken for the ultrasonic signal to propagate from the probe to the coating/substrate interface and back. The travel time is divided by two and multiplied by the velocity of sound for the coating to obtain the thickness of the coating.

Probe   Couplant

Coating 2

Substrate

The **PosiTector** *200* interprets the largest "echo" within the selected range as the coating/coating or coating/substrate echo, unless **Max Thick Mode** is activated (pg. 9).

How to Measure

1. Remove the protective rubber cap from probe.

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

3. Apply couplant (pg. 3) to the surface of the part.

4. Place the probe FLAT on the surface and press down.

5. Lift the probe when you hear a double BEEP, - OR - leave probe on the surface in the same location for continuous measurements.

6. When completely finished, wipe the probe clean of couplant then return the Gage to the protective pouch. There is no need to disconnect the probe from the **PosiTector** during storage.

Verify accuracy at the beginning and the end of each shift, or if the gage is dropped or suspected of giving erroneous readings.

Calibration, Verification and Adjustment

Three steps ensure best accuracy…

1. **Calibration** - typically done by the manufacturer or a qualified lab. All probes include a Certificate of Calibration.

2. **Verification of Accuracy** - as done by the user on known reference standards such as the included plastic shims, test block or optional coating thickness standards.

3. **Adjustment** - to a known thickness, if necessary.

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.

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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.

Adjustment

Adjustment, or Calibration Adjustment is the act of aligning the Gage's thickness readings to match that of a known reference sample in order to improve accuracy of a gage on a specific coating. See *Thickness* pg. 6

NOTE: The **PosiTector** *200* measures most polymer coatings accurately out-of-box with no adjustment required.

Cal Settings Menu

Zero

The probe must be periodically zeroed using the **Zero** menu option to compensate for both temperature and probe wear effects. Before using, allow the probe to reach ambient temperature. Wipe the probe clean of couplant.

If measurements will be made in extreme hot or cold temperatures, it is recommended to **Zero** the probe in the working environment. If measurements will be made on rough surfaces, it is recommended to periodically **Zero** the probe to compensate for wear.

Set Range

The measuring range of each probe can be changed depending on the specific application or the expected thickness range of the coating system.

For most applications, the default range values do not need to be adjusted. But some conditions, like surface roughness, may cause the Gage to display very low or non-repeatable readings. In this case, the low range may be increased to cause the Gage to only display readings above the Lo value set by the user.

To adjust **Set Range** values...

1. Select **Lo** or **Hi** .

2. Use the ⊖ ⊕ buttons to decrease/increase the displayed value.

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The **PosiTector** *200* will ignore any readings outside the selected range. If the coating thickness is outside this range, incorrect or dashed readings may occur.

Here are some typical Range settings...

Expected paint thickness	Lo	Hi
500 µm (20 mils) on concrete	130 µm (5 mils)	1000 µm (40 mils)
50 µm (2 mils) on wood	25 µm (1 mil)	250 µm (10 mils)

Thickness

The **PosiTector** *200* measures most polymer coatings accurately out-of-box with no adjustment required.

To determine if an adjustment is necessary, select a coating sample of known thickness as close as possible in composition to the intended application. For best results, the thickness of the sample should be equal to or slightly greater than the maximum expected thickness of the coating to be measured.

Measure the coated sample. If the average of a series of measurements on the sample is not close to the known thickness...

1. Select the **Thickness** menu option.

2. Use ⊖ or ⊕ to decrease/increase the displayed measurement thickness value to match the known thickness of the sample.

3. For *Advanced models* with multiple layers selected, use the ▼ button to select the next layer and adjust as necessary.

4. To save adjustments, use ▼ button to highlight **OK** and press the ☰ button.

Polyurea ✓ *(PosiTector 200 D probes only)*

When checked, the Gage loads a pre-programmed calibration adjustment optimized for measurement of polyurea coatings.

Cal Lock ✓

When checked, the Ⓒ icon appears and the current calibration adjustment is "locked" to prevent further user adjustments.

Cal Reset

Restores the gage back to factory calibration and range settings. The $_{\wedge}0_{\wedge}$ icon will appear on the display.

Setup Menu

Units

Converts the display from microns to mils and vice versa.

Reset

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

- All batches, stored measurements, images, batch names and screen captures are erased.
- All calibration and range adjustments are cleared and returned to the Gage's factory settings.
- Menu settings are returned to the following:

Memory = OFF	**Display** = None	**Layers** = 1
Graphics = OFF	**Bluetooth** = OFF	**Layer Name** = Layer 1
Cal Lock = ON	**BLE Keyboard** = OFF	**Layer Color** = Blue
Auto Dim = ON	**WiFi & Access Point** = OFF	**Max Thick Mode** = OFF

Perform a more thorough **Hard Reset** by powering down the Gage, waiting several seconds, then simultaneously holding both the ☰ and ⊕ buttons until the **Reset** symbol ⟳ appears. This returns the instrument to a known, "out-of-the-box" condition. It performs the same function as a menu **Reset** with the addition of:
- Bluetooth Pairing info is cleared.
- Menu settings are returned to the following:

Units = Microns	**Bluetooth Smart** = OFF
Flip Lock = OFF	**Battery Type** = Alkaline
Language = English	**Backlight** = Normal
Sound = Medium	**USB Drive** = ON
Touch = ON	

NOTE:

Date, Time and WiFi settings are not affected by either **Reset**

Advanced models of the **PosiTector** *200* are capable of numerically displaying up to 3 individual layer thicknesses in a multi-layer system.

Select the **Layers** menu option to:
- Choose up to 3 individual layer thickness values.
- Edit layer names and Batch Chart colors.

NOTES:

• Before setting up the Gage for multi-layer measurement, it is recommended to first take measurements in single layer mode and interpret the results using the **Graphics** option.
• When a batch is **Open**, press the ▲ button to view the Chart.

Graphics ✓ *(Advanced models only)*

When selected, the Gage displays a graphical representation of the ultrasonic pulse as it travels through the coating system.

As the probe is depressed and the ultrasonic pulse travels through the coating system, the pulse encounters changes in density at the interfaces between coating layers and between the coating and the substrate.
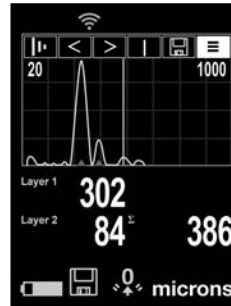
These interfaces are depicted by a "peak". The greater the change in density, the higher the peak. The more gradual the change in density, the greater the width of the peak. For example, two coating layers made of essentially the same material and "blended" would result in a low, wide peak. Two materials of very different density and a well-defined interface would result in a high, narrow peak.

The *PosiTector 200* has the ability to measure the thickness associated with either the highest peak(s) or the deepest peak(s), depending on whether **Max Thick Mode** is enabled

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(below). The reported peaks will be indicated with small red triangles on the graph.

| ⅠⅠⅠ | Lo | Hi | Ⅰ | 🖫 | ☰ |

Use the navigation ▲ (move left) and ▼ (move right) buttons to highlight icons on the graphic display.

ⅠⅠⅠ **Zoom** - Visually magnifies the waveform of the displayed peaks for more visibility. Pressing the ⊖ or ⊕ button repeatedly will decrease/increase the zoom.

➖ **Threshold** (replaces 'Zoom' ⅠⅠⅠ when **Max Thick Mode** is enabled [below]) – Press the ⊖ or ⊕ buttons to adjust the threshold using a horizontal cursor. Peaks below the cursor will be ignored.

Lo Hi **Set Range** - Press the ⊖ or ⊕ buttons to adjust the Gage's **Lo** or **Hi** measuring range. (pg. 5)

Ⅰ **Cursor** - The Cursor allows for further analysis of displayed waveform. Use the ⊖ or ⊕ buttons to move the green cursor line left or right over the waveform. The thickness value is displayed at the top right of the cursor. This feature is particularly useful in multi-layer applications where there are more than 3 distinct layers.

🖫 **Screen Capture** - Press ☰ to capture and save an image of the current display. The last 100 screen captures are stored in memory and can be accessed when connected to a computer (see *PosiSoft USB Drive* pg. 12).

Shortcut: Press and hold the ⊖ and ⊕ buttons simultaneously to capture any screen.

☰ **Menu** - Press ☰ to access the Gage's main menu.

Max Thick Mode

By default, the **PosiTector** *200* reports a coating thickness result associated with the loudest ultrasonic echo (the highest peak in **Graphics Mode** [pg. 8]), within the set range. This loudest echo often represents the total coating thickness above the coating-substrate interface. When multiple layers are selected (Advanced

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models only), the loudest echoes are reported as individual layer thicknesses.

In some applications, surface roughness and/or coating layers with significant density differences near the surface can result in a louder ultrasonic echo than the one from the coating-substrate interface, resulting in a lower than expected reading. While the **Lo Range** (pg. 5) can be adjusted to ignore these loud, unwanted echoes, this sometimes requires that the range be adjusted too close to the expected coating thickness for reliable measurement.

When **Max Thick Mode** is selected, the **PosiTector** *200* reports the echo or peak associated with the deepest interface in the coating system, instead of the loudest. This is often more effective at reporting the total coating thickness above the substrate interface, and eliminates the need to adjust the **Lo Range** (pg. 5). Since there will inevitably be some small echoes from within the substrate, only echoes above a pre-set loudness threshold will be reported. On Advanced models, this threshold can be adjusted from within **Graphics Mode** (pg. 8). When multiple layers are selected (Advanced models only), the layer thicknesses associated with the deepest ultrasonic echoes are reported.

NOTE: **Max Thick Mode** is not recommended for thin metal substrates less than 2.54 mm (100 mils) thick, or substrates such as composites and fiberglass.

Sound

Adjusts the volume of built-in speaker (Off, Low, Medium, High).

Flip Lock ☑

Disables the **Auto Rotate** feature by locking the display in its current orientation.

Touch ☑

Allows the touch screen functionality to be disabled. All gage functions can also be controlled using the navigation buttons.

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Set Clock

All measurements are date and time stamped (24-hour format) when stored into memory. It is therefore important to set the correct date and time. Use the ▲ and ▼ buttons to select a value, and the ⊝ and ⊕ buttons to adjust it. The current date and time setting can also be viewed at the top of the main menu.
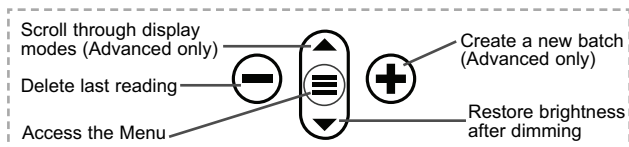
Battery Type

Selects the type of batteries used in the Gage from a choice of "Alkaline", "Lithium" or "NiMH" (nickel-metal hydride rechargeable). The battery state indicator symbol is calibrated for the selected battery type. No damage will occur if the battery type used in the Gage does not match the selected battery type.

Memory Management

The **PosiTector** *200* 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.

Standard models store up to 1,000 readings in one batch.

Advanced models store 250,000 readings in up to 1,000 batches. "New Batch" closes any currently opened batch and creates a new batch name using the lowest available number. The 🖫 icon appears. New batch names are date stamped when they are created.

Scroll through display modes (Advanced only)

Delete last reading

Access the Menu

Create a new batch (Advanced only)

Restore brightness after dimming

Screen Capture
Press both ⊝ and ⊕ buttons simultaneously to save an image of the current display. The last 100 screen captures are stored in memory and can be accessed when connected to a computer (see **PosiSoft USB Drive** pg. 12).

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Keyboard *(Advanced models only)*

When enabled and connected to a computer, the PosiTector will be recognized as a *Keyboard*. Readings are sent to the computer as they are taken, emulating keystrokes, followed by a carriage return.

Stream *(Advanced models only)*

Stream readings via USB Serial Port to SPC data collection software, drones, ROVs, PLCs, and robotic devices.

NOTE: _____

Sync .net Now

The above **WiFi** and **USB** menus contain a **Sync .net Now** option. When selected, the Gage immediately synchronizes stored measurement data via its respective communication method (internet connection required).

Alternatively, select **Auto Sync .net** from within the **USB** connect menu to automatically synchronize upon connection to a PC. Additional measurements added to memory while connected are synchronized only when the USB cable is disconnected and reconnected, or when the **Sync .net Now** option is selected. **WiFi** connected gages automatically attempt synchronization upon power up.

PosiSoft Desktop is required when using USB to synchronize measurements with **PosiSoft.net**.

Bluetooth *(Advanced models only)*

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Bluetooth Smart *(Advanced models only)*

Allows communication with a smart device running the **PosiTector App** (pg.12) via auto-pairing **Bluetooth Smart** (BLE) wireless technology.

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| Sync Batches |

Select batches to flag them for synchronization to the PosiTector App. **Sync Batches** is useful when connecting a new device to a gage with pre-existing batches, since only batches created while **Bluetooth Smart** is enabled are automatically selected.

Selected batches are synchronized when the next reading is taken in a batch flagged for synchronization, or when the **Sync Batches** option is selected at the bottom of the list of selected batches.

`NOTE:` If **Bluetooth Smart** is disabled or disconnected, data from batches selected in the **Sync Batches** menu are held in a queue until communication with the PosiTector App is re-established.

| Send Batches |

Transfers selected batches to the PosiTector App. **Send Batches** is useful when switching between devices, as only readings and batches that have yet to be synchronized with any smart device are synchronized automatically.

The **Send Batches** option is visible in the menu when the Gage is connected to a smart device running the PosiTector App.

| BLE Keyboard | *(Advanced models only)*

When enabled and connected to a computer, the PosiTector will be recognized as a wireless **Keyboard**. Readings are sent to the computer as they are taken, emulating keystrokes, followed by a carriage return.

`WARNING:` The Gage will perform a **Hard Reset** after an update. (see pg. 7)