

PosiTector[®] **UTG**

Ultrasonic Thickness Gage

Instruction Manual



Introduction

The **PosiTector UTG** is a hand-held Ultrasonic Thickness Gage that uses the non-destructive ultrasonic pulse-echo principle to measure the wall thickness of a wide variety of materials. It consists of a body (Standard or Advanced) and probe.

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. 8).
4. Verify accuracy and adjust if necessary (pg. 7).
5. Measure the part (pg. 5).

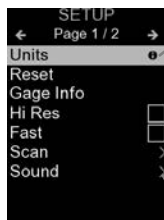
Menu Operation

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. 12).

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.

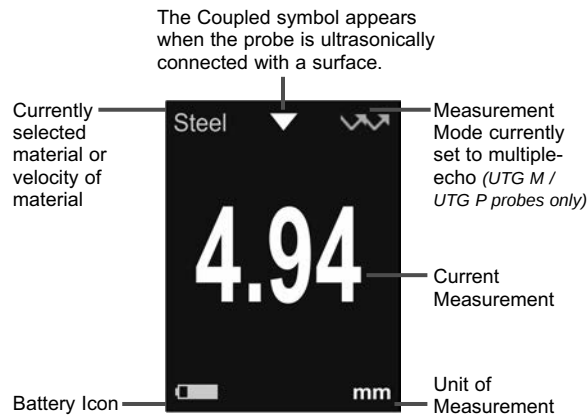


When a Menu option is highlighted, the **i** icon indicates on-gage help is available. Press **+** or touch the **i** icon to display the help.

NOTE: 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.

Typical Display



Probes

When powered up the **PosiTector** automatically determines what type of 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 new probe. It is not necessary to power-down the Gage when switching probes.



Additionally, the **PosiTector** gage body accepts a wide variety of probe types including magnetic, eddy-current, and ultrasonic coating thickness, surface profile, environmental, hardness, salt contamination and ultrasonic wall thickness probes.

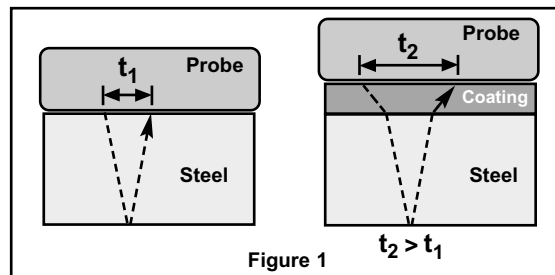
PosiTector UTG probes are available for a variety of wall thickness applications:

- ~~PosiTector UTG CA / UTG C~~ – dual element, single-echo probe ideal for measuring severely corroded/eroded materials. PosiTector UTG CA models feature a built-in probe, while PosiTector UTG C models feature a probe mounted on a 1 m (3 ft) cable.
- **PosiTector UTG CX** - same specifications as UTG C above, but includes a braided stainless steel cable jacket and reinforced strain reliefs for protection in demanding environments.
- **PosiTector UTG CLF** – dual element, single-echo probe designed for measuring thick and/or attenuative materials such as cast iron.
- **PosiTector UTG M** – single element, multiple-echo probe features Thru-Paint capability designed to quickly and accurately measure the metal thickness of a painted structure without having to remove the coating.
- **PosiTector UTG P** – single element probe with automatic single-echo or multiple-echo (Thru-Paint) mode depending on material type and thickness. Ideal for high-resolution measurements on thin plastics and metals.

Ultrasonic Thickness Probes – Theory of Operation

PosiTector UTG probes transmit an ultrasonic pulse into the material to be measured. This pulse travels through the material towards the other side. When it encounters an interface such as air (back wall) or another material, the pulse is reflected back to the probe. The time required for the pulse to propagate through the material is measured by the gage, represented as **t₁** and **t₂** below.

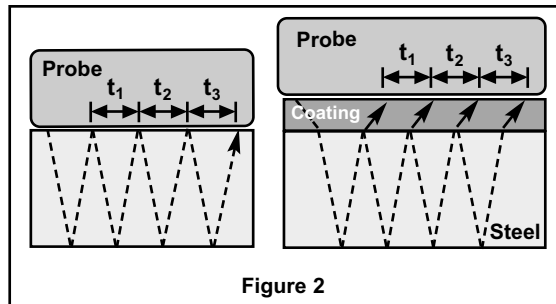
Single-echo **PosiTector UTG** probes (and PosiTector *UTG M* and *UTG P* probes in single-echo mode) determine wall thickness by measuring **t₁** (uncoated) or **t₂** (coated), dividing it by two and then multiplying by the velocity of sound for that material (steel). See Figure 1.



For uncoated materials **t₁** relates directly to material thickness. When a material is coated the propagation time is increased and is shown above as **t₂**.

Coatings such as paint have a slower velocity of sound than that of metal. Thus the single-echo technique will produce a thickness result greater than the actual combined coating+metal thickness.

The **PosiTector UTG M** and **UTG P** in multiple-echo mode determine thickness by measuring the time between at least three consecutive back wall echoes.



In the figure above, multiple-echo mode measures only the time between echoes. Regardless of whether the steel is coated or not, all times between echoes are the same. In multiple-echo mode the gage determines thickness by measuring $t_1 + t_2 + t_3$, dividing it by six and then multiplying by the velocity of sound for that material. The resultant thickness calculation made by the instrument is therefore an accurate measurement of the steel thickness only, disregarding the coating thickness.

PosiTector UTG P Precision probes automatically switch between multiple echo and single echo operation depending upon the type and thickness of the material being measured.

The velocity of sound is expressed in inches per microsecond or meters per second. It is different for all materials. For example, sound travels through steel faster (~ 0.233 in/ μ s) than it travels through plastic (~ 0.086 in/ μ s).

How to Measure

1. Remove rubber cap from probe. Couplant (glycol gel - included) must be applied to the surface to be tested to eliminate air gaps between the wear face and the surface. A single drop of couplant is sufficient when taking a spot measurement.



2. Place the probe flat on the surface. Use moderate pressure to press against the top of the probe with a thumb or index finger when measuring with cabled probes.

When the probe senses echoed ultrasound, a coupled symbol ▼ will appear and thickness values will be displayed. While the probe is coupled, the **PosiTector UTG** continually updates the display. The Gage will emit a "tick" sound every time the probe takes a measurement. The **Reading Tick** option can be disabled in the **Setup menu** (see pg. 11).

3. When the probe is removed from the surface, the last measurement will remain on the display.

Occasionally, excess couplant will remain on the probe when the probe is lifted from the surface. This may cause the **PosiTector UTG** to display a final measurement value different from those observed when the probe was on the surface.

Discard this value using the ⊖ button and repeat the measurement.

Surface Conditions

Ultrasonic measurements are affected by the condition, roughness, and contour of the surface to be tested.

Measurement results may vary on coarse surfaces. Where possible, it is recommended to seat the transducer on a smooth flat surface that is parallel to the opposite side of the material.

On rough surfaces, the use of a generous amount of couplant minimizes the surface effects and serves to protect the transducer from wear, particularly when dragging the probe across a surface.

NOTE: On smooth, uncoated metal surfaces **PosiTector UTG M** and **UTG P** probes (in multiple-echo mode) may occasionally be unable to give a measurement result even when the "coupled" symbol appears. Use additional couplant and lighter pressure on the probe when measuring.

Alternatively, laying a plastic shim on the surface with couplant applied to both sides to simulate a painted surface will help produce a steel-only thickness measurement (multiple-echo

mode). Switching the Gage to single-echo **SE Mode** (see pg. 11) will also help produce a steel-only thickness measurement (PosiTector *UTG M* only).

Calibration, Verification and Adjustment

Three steps ensure best accuracy...

1. **Calibration** - typically performed by the manufacturer or a qualified lab. All probes include a Certificate of Calibration.
2. **Verification of Accuracy** - as performed by the user on known reference standards such as calibration step blocks.
3. **Adjustment** - to a known thickness or sound velocity for the material to be measured.

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.

Verification

Gage accuracy can and should be verified using known reference standards of the material to be tested.

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. See **Calibration Adjustment** pg. 8.

Cal Settings Menu

Zero

PosiTector UTG probes must be “zeroed” after a reset and periodically during use. The Zero process compensates for probe wear and temperature. To maintain the best accuracy, perform a Zero when the ambient temperature changes.

PosiTector UTG C, UTG CA, UTG CX, UTG CLF and UTG M probes:

1. Make sure the Gage is ON and the probe is wiped clean.
2. Apply a single drop of couplant **onto the included zero block (PosiTector UTG CA only) or built-in zero plate** located on the underside of the probe connector. **DO NOT** apply couplant directly onto the probe face.
3. Open the Gage menu, navigate to **Cal Settings**, select the **Zero** menu option, and follow the on-screen prompts.
4. When complete, the Gage will double-beep and display “----”.

PosiTector UTG P probe only:

1. Make sure the Gage is ON and the probe is wiped clean.
2. Hold the probe in the air away from all objects.
3. Open the Gage menu, navigate to **Cal Settings**, select the **Zero** menu option, and follow the on-screen prompts.
4. When complete, the Gage will double-beep and display “----”.

Calibration Adjustment

The **PosiTector UTG** is factory calibrated. In order for it to take accurate thickness measurements of a particular material it must be set to the correct sound velocity for that material. Be aware that material composition (and thus its sound velocity) can vary from stated tables and even between lots from a manufacturer. Adjustment to a sample of known thickness of the material to be measured ensures that the Gage is adjusted as close as possible to the sound velocity of that specific material. Samples should be flat, smooth and as thick as the maximum expected thickness of the piece to be tested. The  symbol disappears whenever a Calibration Adjustment is made to the Gage.

The **PosiTector UTG** allows four simple adjustment choices. All four methods are based on the simple premise of adjusting the sound velocity.

Thickness

The most common method of adjustment is to measure a sample of known thickness. Select a reference standard of material as close as possible in composition to the intended application. For best results, the thickness of the reference standard should be equal to or slightly greater than the thickness of the part to be measured.

Material

If a known thickness of the material is not available, but the material is known, this quick adjustment allows the user to load one of several preprogrammed material velocities.

Velocity

If the sound velocity for the test material is known, the Gage can be adjusted to that specific sound velocity.

2 Pt Adjust

A 2-Point adjustment allows for greater accuracy while simultaneously adjusting probe **Zero**. Select two reference standards as close as possible in composition to the intended application. For best results, the thickness of the thicker reference standard should be equal to, or slightly greater than the thickest part to be measured. The thickness of the thinner reference standard should be equal to, or slightly less than the thinnest part to be measured.

Cal Lock



When checked, the  icon appears and the current **Cal Settings** are "locked" to prevent further user adjustments.

Setup Menu

Units

Converts the display from millimeters to inch 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, batch names and screen captures are erased.
- All calibration adjustments are cleared and returned to the Gage's factory calibration settings.
- Menu settings are returned to the following:

Memory = OFF	A Scan = OFF	SmartCouple = OFF
Statistics = OFF	B Scan = OFF	Bluetooth & Stream = OFF
Hi Lo Alarm = OFF	Cal Lock = OFF	WiFi & Access Point = OFF
Min Scan = OFF	SE Mode = OFF	USB Keyboard = OFF
Reading Tick = ON	USB Stream = OFF	BLE Keyboard = OFF
Auto Dim = ON	Display = None	

Perform a more thorough **Hard Reset** as follows:

1. Power down the Gage and wait 5 seconds.
2. Simultaneously press and hold the ⊕ 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 the addition of:

- Bluetooth Pairing info is cleared.
- Menu settings are returned to the following:

Units = Millimeter	Battery Type = Alkaline
Touch = ON	Language = English
Flip Lock = OFF	Backlight = Normal
Auto Sync .net = ON	Bluetooth Smart = OFF
Sound = Medium	USB Drive = ON

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

Min Scan

Normally, the **PosiTector UTG** continuously takes spot measurements while in contact with a surface. When the probe is lifted, the last reading will remain on the display. However, it is sometimes necessary to examine a larger region to locate the thinnest point. When **Min Scan** is selected, the **PosiTector UTG** will take continuous readings and record min/max thicknesses when the probe is lifted from the surface – ideal for quick inspection over a large area.

A Scan*(Advanced models only)*

Displays a chart with the travel distance of the ultrasonic pulse on the x axis and the received pulse amplitude on the y axis .

PosiTector UTG M and **PosiTector UTG P** probes provide two cursors (vertical green lines) which allow the user to measure the difference between echoes shown in the graphic display.

**B Scan***(Advanced models only)*

Displays a live chart of measured thicknesses, representing a cross-sectional profile of the test material.

**SmartCouple**
☒ Coupled ☐ Smart Coupled

When selected, the probe, once coupled, will remain coupled until the ⊕ button is pressed. Eliminates unintentional decoupling.

SE Mode*(PosiTector UTG M multiple-echo probe only)*

Switches from multiple-echo  to single-echo  mode:

- To increase the measurement range
- To obtain thickness measurements in circumstances where multiple-echo can not

Reading Tick

When ☒ selected (default), the Gage will emit a “tick” sound every time the probe takes a measurement.

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.

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.

Statistics Mode

Statistics



A statistical summary will appear on the display. Remove the last measurement by pressing the ⊖ button. Press ⊕ to clear statistics.

$\bar{X}$ – Average

↑ – Maximum Value

σ – Standard Deviation

↓ – Minimum Value

HiLo Alarm



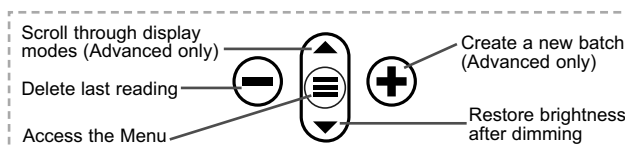
Allows the Gage to visibly and audibly alert the user when measurements exceed user-specified limits.

Memory Management

The **PosiTensor UTG** has internal memory storage for recording measurement data. Stored measurements can be reviewed on-screen or accessed via computers, tablets and smart phones. All stored measurements are date and time-stamped. The  symbol appears when the Gage is set to store measurement data.

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. New batch names are date-stamped when they are created.



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** below).

Accessing Stored Measurement Data

DeFelsko offers the following free solutions for viewing, analyzing and reporting data:

PosiSoft USB Drive - Connect the Gage to a PC/Mac using the supplied USB-C cable. View and print readings and graphs using universal PC/Mac web browsers or file explorers. No software or internet connection required.

PosiSoft Desktop - Powerful desktop software (PC/Mac) for downloading, viewing, printing and storing measurement data. Includes a customizable, templated PDF Report Generator. No internet connection required.

WiFi*(Advanced models only)*

USB

When **USB Drive** is enabled ☒, the PosiTector uses a USB mass storage device class which provides users with a simple interface to retrieve stored data in a manner similar to USB flash drives and digital cameras. **USB Drive** is also required to import stored measurements into **PosiSoft Desktop** software (pg. 13).

NOTE: While connected, power is supplied through the included USB-C cable. The batteries are not used and the body will not automatically power down.

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.

☐ (Advanced models only)

Stream individual readings to a USB connected computer via a serial protocol. Ideal for use with serial compatible SPC data collection software.

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.

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

Bluetooth (Advanced models only)



☐ (Advanced models only)



Allows communication with a smart device running the PosiTector App (pg. 14) via auto-pairing **Bluetooth Smart** (BLE) wireless technology.

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. 10)

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.
 3. Perform a **Hard Reset** (pg. 10) and a **Zero** (pg. 8).
 4. If issue is not resolved, **Update** (pg. 16) your **PosiTector** gage body and re-attempt measurements.
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