PosiTector® UTG

Ultrasonic Thickness Gage

Quick Guide v. 3.0

Advanced model

DeFelsko®

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 (*UTGC* or *UTGM*, see pg. 2).

This Quick Guide summarizes the basic functions of the instrument. Download the full instruction manual at:
www.defelsko.com/manuals

Quick Start

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

1. Remove the protective rubber cap from the probe.

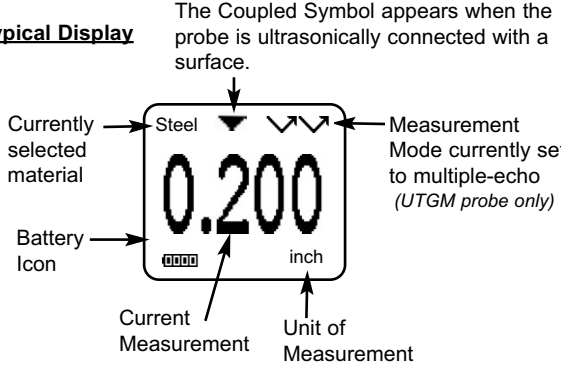
2. Power-up Gage by pressing the center navigation button.

3. Zero the probe (see pg. 6)

4. Select the correct velocity of sound (see pg. 7)

5. Measure the part (see pg. 3)

Typical Display



Probes

To disconnect a probe from a body, power-down the instrument and slide 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.

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 propogate through the material is measured by the Gage, represented as $\mathbf{t_1}$ and $\mathbf{t_2}$ below.

PosiTector *UTGC* and ***UTGM*** (in single-echo ↘↗ mode) probes determine thickness by measuring $\mathbf{t_1}$ (uncoated) or $\mathbf{t_2}$ (coated), dividing it by two and then multiplying by the velocity of sound for that material (steel). See Figure 1.

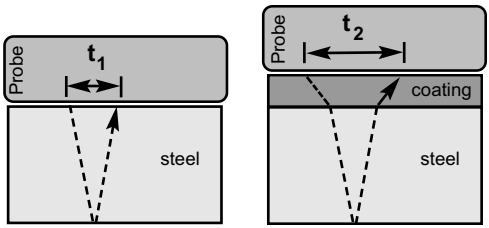


Figure 1

For uncoated materials $\mathbf{t_1}$ relates directly to material thickness. When a material is coated the propagation time is increased and is shown above as $\mathbf{t_2}$.

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 *UTGM*** in multiple-echo mode ↗↗ determines thickness by measuring the time between at least three consecutive back wall echoes.

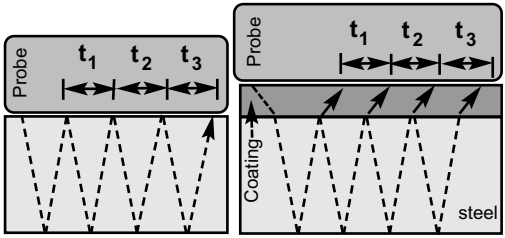


Figure 2

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 $\mathbf{t_1+t_2+t_3}$, 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.

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/µs) than it travels through plastic (~0.086 in/µs).

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 the thumb or index finger.

When the probe senses echoed ultrasound, a coupled symbol ▼ will appear on the display and thickness values will be displayed. While the probe is coupled, the ***PosiTector UTG*** continually updates the display.

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 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.

UTGM Probes: On smooth, uncoated metal surfaces the Gage (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. 9) will also help produce a steel-only thickness measurement.

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 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. 6.

Cal Settings Menu

Zero

PosiTector *UTG* probes can be "zeroed" to compensate for temperature and wear. This action is not required when operating in multiple-echo mode (*UTG M probes only*) except when the instrument is new and after a **Reset** (pg. 8). However it ensures best accuracy when operating in SE (single-echo) mode. Therefore it is a good idea to "zero" the probe before each work shift and when the temperature of the part changes. During zeroing, it does not matter what the current velocity setting is.

1. Make sure the instrument is on and the probe is wiped clean.
2. Apply a single drop of couplant ***onto the zero plate*** located on the underside of the probe connector. ***DO NOT*** apply couplant directly onto the probe face.
3. Select the **Zero** menu option and follow the on-screen prompts.

Calibration Adjustment

The ***PosiTector UTG*** is factory calibrated. But 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 ***PosiTector UTG*** allows four simple adjustment choices. All four methods are based on the simple premise of adjusting the sound velocity. The first three adjustment methods make 1-point calibration adjustments to optimize the linearity of the ***PosiTector UTG*** over small ranges. The fourth method makes a 2-point calibration adjustment to allow for greater accuracy over a large range.

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 as close as possible to the lower end of the expected measurement range.

Cal Lock ☑

When checked, the 🔒 icon appears and the current Cal settings are “locked” to prevent further user adjustments. Uncheck to make further adjustments.

Setup Menu

Reset

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

- All batches, stored measurements, images, and batch names 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	**Display** = None
Statistics Mode = OFF	**B Scan** = OFF	**SE Mode** = OFF
Hi Lo Alarm = OFF	**Cal Lock** = OFF	
Scan Mode = OFF	**Bluetooth** = OFF	

Perform a more thorough **Hard Reset** by powering down the instrument, waiting several seconds, then simultaneously holding both the center [◆] 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 = millimeter	**Battery Type** = Alkaline
Flip Display = Normal	**Backlight** = Normal
Auto Sync = OFF	**Bluetooth Streaming** = OFF
White on Black = OFF	**USB Drive**= ON
Language = English	

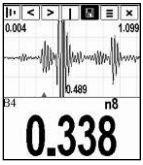
NOTE: - Date and Time are not affected by either **Reset**.

Scan ☑

Normally, the ***PosiTector UTG*** takes a single spot measurement at a rate of 6 readings per second while in contact with a surface. When the probe is lifted, the last reading will remain on the display.

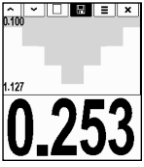
It is sometimes necessary to examine a larger region to locate the thinnest point. When **Scan** is selected, the ***PosiTector UTG*** will measure at a rate of 20 readings per second and display min/max values.

A Scan ☑ *(Advanced models only)*



A display in which the received pulse amplitude is represented along y axis and the travel distance of the ultrasonic pulse is represented along the x axis.

B Scan ☑ *(Advanced models only)*



A display in which a cross sectional profile of the test material is represented.

SE Mode ☑ *(UTGM multiple-echo probes only)*

Switches from multiple-echo ↗↗ to single-echo ↗ mode:
- To detect pits and flaws
- To increase the measurement range
- To obtain thickness measurements in circumstances where multiple-echo can not

Battery Type Selects the type of batteries used in the instrument from a choice of "Alkaline", "Lithium" or "NiMH" (Nickel-metal hydride rechargeable). If NiMH is selected, the instrument 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.

Statistics Mode

Statistics ☑ $\bar{x}$

A statistical summary will appear on the display. Remove the last measurement by pressing the **(-)** button. Press **(+)** to clear statistics.

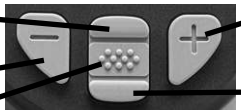
$\bar{x}$ - Average σ - Standard Deviation
$\bar{\uparrow}$ - Maximum Value $\downarrow$ - Minimum Value

HiLo Alarm ☑

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

Memory Management

The **PosiTector *UTG*** can record readings in memory for printing to the optional Bluetooth wireless printer, downloading or synchronizing with *PosiTector.net*. Readings are time-stamped as they are taken.



Standard models store up to 250 readings in one batch.

Advanced models store 100,000 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.

NOTE: This Quick Guide summarizes the basic functions of the instrument. Download the full instruction manual at: www.defelsko.com/manuals

Screen Capture

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 **USB mass storage** pg. 11).

Outputting Stored Readings

USB mass storage - connect your PosiTector to a PC/Mac using the supplied USB cable to access and print stored readings and graphs. No software or internet connection required.

PosiTector.net - a free web-based application offering secure centralized storage of thickness readings. Access your readings from any web connected device. www.PosiTector.net

Connect Menu

Sync Now

Immediately initiates synchronization with *PosiTector.net* when connected (USB or Bluetooth) to an internet connected PC running *PosiTector Desktop Manager*.

Auto SYNC ☑

Allows the instrument to automatically synchronize with *PosiTector.net* when initially connected to an internet connected PC running *PosiTector Desktop Manager*.

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

USB Drive ☑

The instrument 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.

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 instrument will trickle charge the batteries.

Bluetooth *(Advanced models only)*

Allows individual readings to be sent to a computer or compatible device as they are taken using Bluetooth wireless technology. See www.defelsko.com/bluetooth

Updates

Determines if a software update is available for your instrument. Must be connected to an internet connected PC running *PosiTector Desktop Manager*. See www.defelsko.com/update

NOTE: The instrument may perform a **Hard Reset** (pg. 8)

Returning for Service

Before returning the instrument 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. 8) and a **Zero** (pg. 6)

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

Website: www.defelsko.com/support

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