

PosiTector[®] **UTG**

Ultrasonic Thickness Gage

Full Guide v. 3.3



Advanced model

DeFelsko[®]
The Measure of Quality



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Testing Equipment Since 1969!

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Table of Contents

Introduction	1
Quick Start	1
Certification	3
Probes	3
How to Measure	6
Surface Conditions	7
Calibration, Verification and Adjustment	8
Menu Operation	9
Cal Settings Menu	10
Zero	10
Thickness	11
Material	11
Velocity	12
2 Pt Adjust	12
Cal Lock	13
Cal Reset	13
Setup Menu	13
Reset	13
Min Scan	14
A Scan	15
B Scan	17
SE Mode	18
Smart Couple™	19
Statistics Mode	20
Memory Management	21
Annotate	24
Summaries	25
Screen Capture	25



Accessing Stored Measurement Data	26
PosiSoft Desktop	26
PosiSoft.net	26
PosiTector App	26
Connect Menu	26
WiFi.....	26
Access Point.....	27
USB.....	28
USB Serial Streaming.....	29
Sync.net Now.....	29
Bluetooth Smart.....	30
Bluetooth.....	30
Updates	31
Application Notes	32
Measuring on pipes	32
Measuring on rough surfaces	32
Measuring on hot surfaces	33
Measuring laminated materials	33
Troubleshooting - General.....	34
Gage fails to power down.....	34
Probe measures when lifted from surface.....	34
Gage is coupled but not measuring.....	34
Gage readings double expected thickness	34
Measurement jumps when probe is lifted	34
Troubleshooting - Multiple Echo probes.....	35
Power Supply / Battery Indicator	38
Technical Data	38
Probe Details & Specifications.....	38
Operating Temperature Range.....	38
Size / Weight.....	38
Returning For Service	40
Warranty	40



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 interchangeable *UTG* probe.

PosiTector UTG: Included Accessories

Probe only


(*UTG C*, *UTG CA*, *UTG CX*, *UTG CLF*, *UTG P* or *UTG M*):


- Quick Guide instructions
- Zero plate
- Protective rubber cap for probe
- 4 ounce (118 ml) bottle ultrasonic couplant
- Certificate of Calibration traceable to NIST

Gage (in addition to above Probe accessories):

- Protective rubber holster with belt clip
- USB cable
- Wrist strap
- Nylon carrying case with shoulder strap
- Protective lens shield
- 3 AAA alkaline batteries

Quick Start

The **PosiTector UTG** powers-up when the center navigation button  is pressed. To preserve battery life, the Gage 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. 10)
4. Select the correct **velocity** of sound (see pg. 12)
5. Measure the part (see pg. 6)

Protective Cap

PosiTector UTG gages ship with a protective plastic cap over the probe. Remove this cap prior to use. Replace it when the instrument is not in use to protect the probe.

Wrist Strap

DeFelsko recommends attaching and wearing the supplied wrist strap.



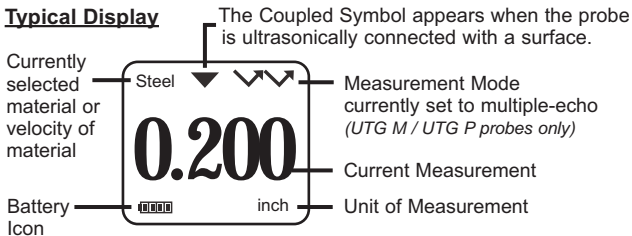
Protective Lens Shield

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 instrument, can be left in place to protect against paint overspray or debris. Replacements can be purchased.

PosiTector Gage Body



Typical Display



Certification

All **PosiTector UTG** 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 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.

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. See www.defelsko.com/probes


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

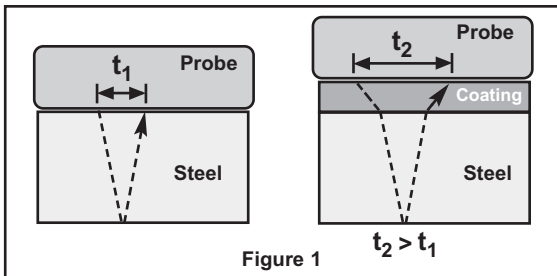
- **PosiTector *UTG CA / UTG C*** – dual element, single-echo probe ideal for measuring severely corroded/eroded materials. PosiTector *UTG CA* models feature a built-in probe, while PosiTector *UTG C* models feature a probe mounted on a 1m (3ft) cable.
- **PosiTector *UTG CX*** - same specifications 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 multiple-echo or single-echo mode depending on material type and thickness, can be used for Thru-Paint applications. Ideal for high-resolution measurements on thin plastics and metals.

For **PosiTector *UTG*** probe specifications, see **Technical Data** (pg. 38)

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.

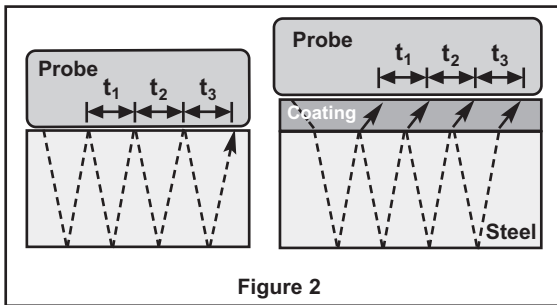
All PosiTector *UTG* probes determine thickness by measuring **t1** (uncoated) or **t2** (coated), dividing it by two and then multiplying by the velocity of sound for that material (steel). [*UTG M* and *UTG P* single-echo  mode only] See Figure 1.



For uncoated materials t_1 relates directly to material thickness. When a material is coated the propagation time is increased and is shown above as 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 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).

Additional PosiTector Probes:

The **PosiTector** 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.

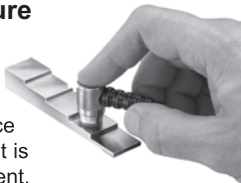
See www.defelsko.com/probes



PosiTector gage bodies accept all PosiTector 6000, 200, DPM, IRT, SPG, RTR, SST, SHD, BHI and UTG probes

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 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. 13).

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.

NOTE: When using the **PosiTector UTG P**, it is especially important to avoid using excess couplant when taking a reading. The **PosiTector UTG P** is designed for measuring thin materials and will measure a thin layer of couplant left on the probe face after a 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.

During scanning operations, the probe can become physically decoupled, that is physically separated, from the material, either due to the rough and/or scaly surface of the material or due to user operation. Avoid this by using the **Smart Couple™** feature (pg. 18).

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. 18) will also help produce a steel-only thickness measurement (**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. The standards used in the calibration are such that the combined uncertainties of the resultant measurement are less than the stated accuracy of the Gage.

Written Calibration Procedures are available online at no charge www.defelsko.com/resources

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.

To guard against measuring with an improperly adjusted Gage, verify the Gage 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 Gage should be returned to the manufacturer for repair or calibration.

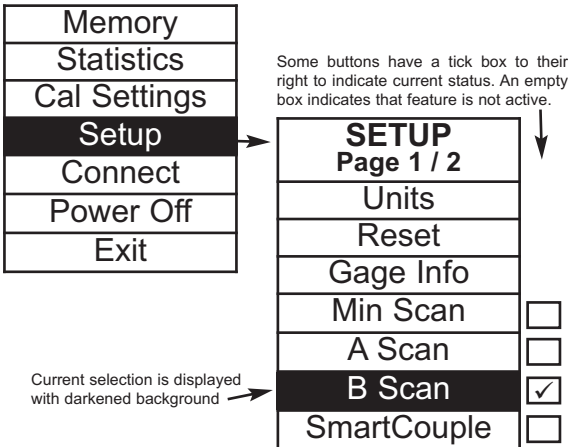
Adjustment

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. 11.

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 UTG** Advanced Model:

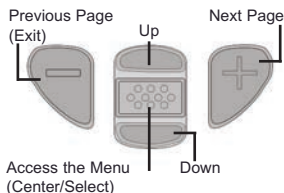


To navigate, use the **Up** and **Down** buttons to scroll vertically and  to **SELECT**.

Press the **(+)** button to switch pages in a multipage menu.

Press the **(-)** button to return to the previous menu or page.

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



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 (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** and 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** and 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 **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.

1. Apply a drop of couplant onto the reference standard.
2. Measure the reference standard.
3. Lift the probe. Select **Thickness** from the **Cal Settings** menu.
4. Adjust the display down (-) or up (+) to the reference thickness.
5. Press  to store the adjustment and exit.

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.

1. Select **Material** from the **Cal Settings** menu.
2. Navigate to the desired material.
3. Press  to select and exit.


Pre-programmed Material Velocities

Material (Menu Option)	Longitudinal Velocity		Min. Range*		Max Range*	
	in/us	m/s	inch	mm	inch	mm
CAST IRON (Iron)	0.179	4547	0.040	1.02	5.00	127.00
SS 303 (SS303)	0.223	5664	0.040	1.02	5.00	127.00
STEEL 1018 (Steel)	0.233	5918	0.040	1.02	5.00	127.00
AL 2024 (Alum)	0.251	6375	0.050	1.27	5.00	127.00
COPPER (Cu)	0.180	4572	0.040	1.02	5.00	127.00
PLEXIGLAS (Plexi)	0.106	2692	0.040	1.02	2.00	50.80
PVC (PVC)	0.094	2388	0.035	0.89	2.00	50.80
POLYSTYRENE (Poly)	0.081	2057	0.035	0.89	2.00	50.80

* Measurement ranges shown for *UTG C* and *UTG CX* probes. Actual measurement range will depend upon probe type, surface roughness, temperature, or material properties.

Velocity



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

1. Select **Velocity** from the **Cal Settings** menu.
2. Adjust the display down (-) or up (+) to the desired velocity. Holding the (-) or (+) buttons increases the rate of change.
3. Press  when the desired velocity is reached.

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.

1. Select **2 Pt Adjust** from the **Cal Settings** menu.
2. Measure the thinner reference sample.
3. Lift the probe from the sample and adjust the display down (-) or up (+) to the expected thickness.

4. When the expected thickness is reached, press .
5. Measure the thicker reference sample.
6. Lift the probe from the reference sample and adjust down (-) or up (+) to the expected thickness.
7. Press  to store the adjustment and exit.

Cal Lock



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

Cal Reset

Clears all user calibration adjustments and returns the **Material to Steel**. The factory calibration icon  is displayed.

Setup Menu


Units

Converts the display from millimeters to inch and vice versa.

NOTE: Switching units will turn off **Statistics**, **HiLo Alarm**, and closes **Memory**.



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

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

1. Power down the Gage and wait 5 seconds.
2. Simultaneously press and hold the (+) and  center 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	Language = English
Flip Display = Normal	Battery Type = Alkaline
Auto Sync .net = ON	Backlight = Normal
Sound = ON	Bluetooth Smart = OFF
	USB Drive = ON

NOTE: Date, Time and WiFi settings 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 instrument to your PosiSoft.net account.

Min Scan



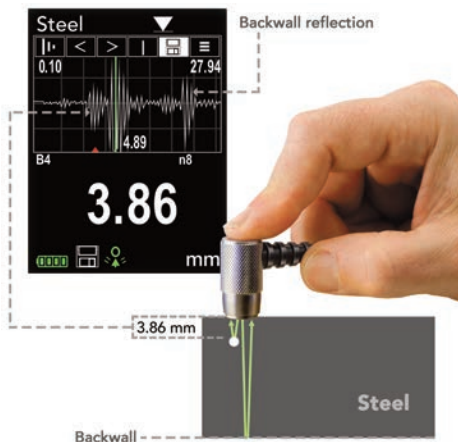
Normally, the **PosiTector UTG** continuously takes spot measurements while in contact with a surface. When the probe is lifted, the last reading will remain on the display. However, it is sometimes necessary to examine a larger region to locate the thinnest point.

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.

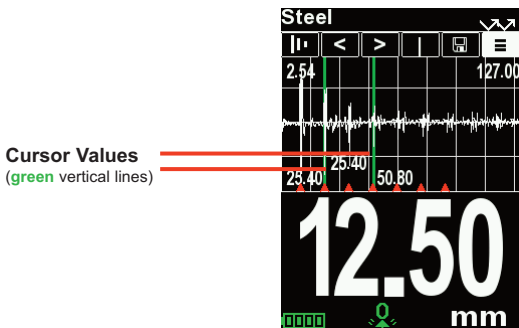
During scanning operations, the probe can become physically decoupled, that is physically separated, from the material, either due to the rough and/or scaly surface of the material or due to user operation. Avoid this by using the **Smart Couple™** feature (pg. 18).

A Scan*(Advanced models only)*

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

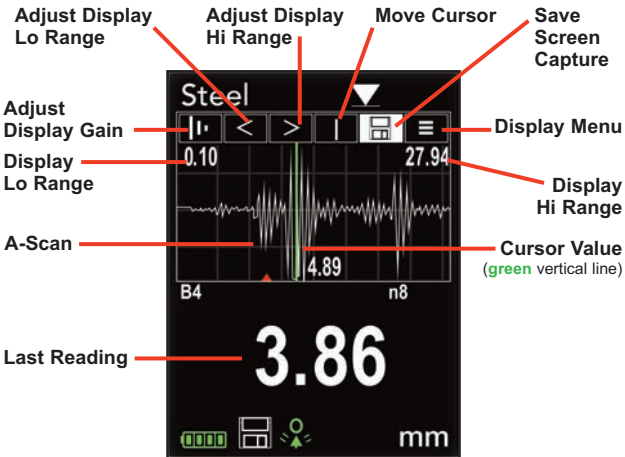


PosiTector UTG M and **PosiTector UTG P** probes provide two cursors (vertical green lines) which allow the user to measure the difference between echoes shown in the graphic display.



A-Scan Menu


Use the **Up** (move left) and **Down** (move right) buttons to navigate.




Adjust Display Gain - Adjusts the A-Scan amplitude/sensitivity. Use the (-) and (+) buttons to decrease/increase gain.

Adjust Display Lo/Hi Range - Adjusts the minimum and maximum displayed range for the A-Scan. Use the (-) and (+) buttons to decrease/increase gain. Note: This does not change the instruments measuring range.

Move Cursor - The Cursor allows for further analysis of the A-Scan. Use the (-) and (+) buttons to move the cursor along the A-Scan.

Save Screen Capture - Press  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 Drive** pg. 28).

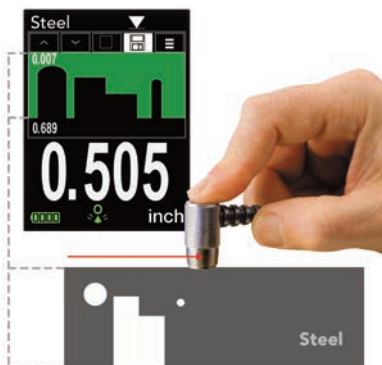
Display Menu - Press  to display the **Gage** menu (pg. 9).

B Scan



(Advanced models only)

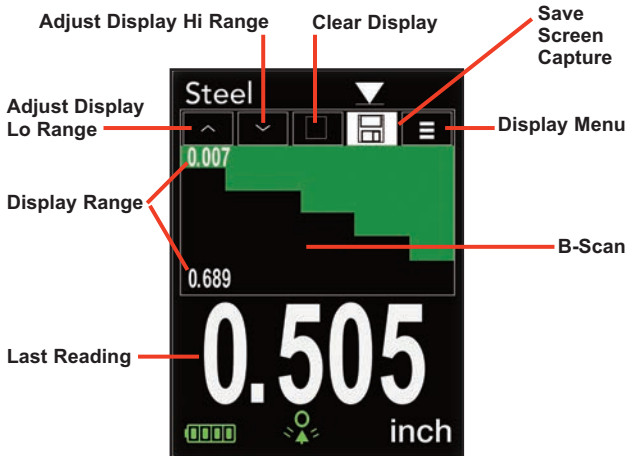
A display in which a cross sectional profile of the test material is represented.




B-Scan Menu





Use the **Up** (move left) and **Down** (move right) buttons to navigate.



Adjust Display Lo/Hi Range - Adjusts the minimum and maximum displayed range for the B-Scan. Use the (-) and (+) buttons to decrease/increase gain. Note: This does not alter the instruments measuring range.

Clear Display - Press  to clear the B-Scan display and start over.

Save Screen Capture - Press  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 Drive** pg. 28).

Display Menu - Press  to display the **Gage menu** (pg. 9).

SE Mode



(PosiTector UTG M multiple-echo probe 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

SmartCouple



 Coupled  Smart Coupled

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

During scanning operations, the probe can become physically decoupled, that is physically separated from the material, either due to the rough and/or scaly surface of the material or due to user operation.

When this happens, analysis of the material stops and statistics are displayed for only that portion of the surface to which the probe was coupled. If the probe re-couples on purpose or accidentally, statistical values are reset to zero, and a new measurement analysis session begins.

Due to the physical decoupling of the probe, the Gage may output two or more independent measurement sessions. If the intention was to measure the maximum and minimum thicknesses continuously, erroneous indications may result due to the physical decoupling of the probe from the material.

Smart Couple™ mode maintains a continuous measurement session regardless of whether the probe becomes physically decoupled from the material, and analyzes the thickness values of the material at all locations where the probe was coupled.

This mode of operation provides a number of advantages. For example, the user can make multiple passes between various points of a material to be measured, and not have to actively concentrate on ensuring that the probe is physically coupled to the material. The user can therefore focus on the material itself, rather than the instrument, or can focus more closely on the measurement results displayed on the display. In addition, it provides higher accuracy and faster scanning, since the user does not have to stop and record between different scanning operations. The user can deliberately lift the probe and scan a new area knowing that all results will be analyzed if it were from one continuous scan.

Reading Tick



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

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.

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 instrument’s date and time can also be viewed in **Gage Info** (pg. 14).

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 power supply (USBAC). 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.

DeFelsko recommends *eneloop* (NiMH) rechargeable batteries.

Language

Converts displayed and printed words to the selected language.

Statistics Mode

Statistics



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



HiLo Alarm



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 material 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.

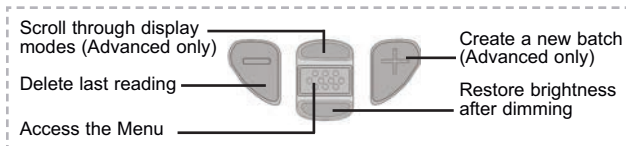
Clear

Clears all onscreen **Statistics** and **HiLo** tabulations.

Memory Management

The **PosiTector 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.

Button functions with **Memory ON**:




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.

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. Each reading is also data/time stamped.

Shortcut: When a batch is open, press **(+)** to create a new batch

NOTES:

- Remove the last reading from the current open batch by pressing **(-)**.
- Calibration adjustments cannot be made if readings are stored in memory.
- If memory is ON, continuous measurements can be taken but results will not be 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, **B5s1** is a sub-batch of **Batch 5**. Sub-batching allows the user to group related batches so that statistics can be accumulated for them. **Batch 5** contains the statistics for **B5s1** and **B5s2**.



Open

Selects a previously created batch or sub-batch name to open and make current. If it contains measurements, onscreen statistics will immediately reflect values calculated from this batch.

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

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

Use the Gage's navigation and (-) and (+) buttons to enter annotations.

Annotations can be synchronized with PosiSoft.net and are included in all PosiSoft reports (see **Accessing Stored Measurement Data**, pg. 26).

NOTE: Annotations can also be created using **PosiSoft.net** (pg. 26) or the **PosiSoft App** (pg. 26).



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

Notes: Instructions, descriptions or notes (see **Annotate**, pg.24)

None: Default screen shows statistics

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

NOTES:

- Remove the last reading from the current open batch by pressing (-).
- Calibration adjustments cannot be made if any measurements were taken with that Cal setting and stored into a batch.
- 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 and number of readings.

In the following example, Batch 3 (B3) indicates an “FN” 6000 coating thickness probe was used to record a total of “6” readings.

Screen Capture

Press both the (-) and (+) 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. 26).

Batch Summaries		
Batch Name	Probe Type	#
B3	FN	6
B4	FN	5
B2	FN	14
B1	UTG	23

OK

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 cable. View and print readings and graphs using universal PC/Mac web browsers or file explorers. No software or internet connection required. **USB Drive** must be selected in the Gage's "**Connect > USB**" menu (pg. 28).



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.

PosiSoft.net - Web-based application offering secure, centralized storage of measurement data. Access your data from any web-connected device.

PosiTector App - (*Advanced models only, serial numbers 784000+*) App for compatible iOS and Android smart devices. Permits users to create, save and share professional PDF reports. Add images and notes using the smart device's camera and keyboard.

For more information on our PosiSoft solutions, see: www.defelsko.com/posisoft

Connect Menu

WiFi

(*Advanced models only*)


Allows connection to your local wireless network or mobile hot spot. Ideal for using your network's internet connection for synchronizing stored measurements with **PosiSoft.net**.



See www.defelsko.com/wifi

Enable




Turns WiFi functionality **ON**. When selected, the  icon will appear on the display. To deactivate WiFi, uncheck the Enable box.

Access Point




Connect your smart device/computer to a PosiTector Advanced body wirelessly without the need for a separate network.

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 gage'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.

Networks: With WiFi Enabled (pg. 26) 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

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).
- **AP Channel:** the access point channel corresponding to a frequency range. (Default Channel: 6)
- **AP Passphrase:** a series of characters, numbers or symbols used to log on to a WiFi network. (Default Passphrase: password)
- **WiFi Reset:** erases all WiFi settings

USB

When **USB Drive** is checked the PosiTector gage 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, digital cameras and digital audio players.

USB Drive is also required to import stored measurements into **PosiSoft Desktop** software (pg.26). Once connected, any computer can view measurements 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.

Keyboard

*(Advanced models only,
serial numbers 784000 and greater)*



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,
serial numbers 784000 and greater)*

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

NOTE: For more information on USB Keyboard and Streaming visit: www.defelsko.com/developer-resources

Retrieving stored screen captures:

The last 10 screen captures stored in memory can be accessed by navigating to the “screen capture” directory within the “PosiTector” virtual drive.

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.

Sync .net Now

The above **WiFi**, **USB** and **Bluetooth** 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.

WiFi connected gages automatically attempt synchronization upon power-up.

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

Bluetooth Smart *(Advanced models with serial numbers 784000+ only)*

When enabled , allows communication with a smart device running the **PosiTensor App** (pg.26) via auto-pairing **Bluetooth Smart** (BLE) wireless technology.

Sync Batches

Select batches to flag them for synchronization to the **PosiTensor App**. New batches created while **Bluetooth Smart** is enabled are automatically selected.

With **Bluetooth Smart** enabled, select **Sync Batches** to transfer selected batches to the **PosiTensor App**. Only readings and batches that have yet to be synchronized with any smart device are synchronized automatically.

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

Send Batches

Transfers selected batches to the **PosiTensor App** (useful when switching between devices). The **Send Batches** option is visible in the menu when the Gage is connected to a smart device running the **PosiTensor App**.

Bluetooth *(Advanced models only)*



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

Pairing

The instrument 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.

Stream

When checked, the instrument will stream readings to the paired Bluetooth Device as they are taken. Readings can be streamed as they are taken to the optional Bluetooth printer or third-party computer software.

Powder Probes

Displays menu options that enable the **PosiTensor Advanced** body to communicate with wireless **PosiTensor PC** probes.

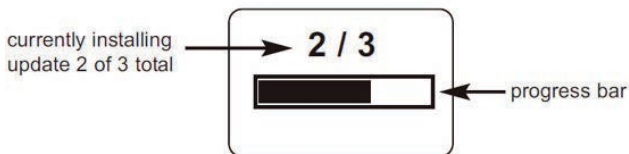
Updates

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 computer with **PosiSoft Desktop** (pg. 26), or **WiFi** network (pg. 26).

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

Updates - Sample Screen



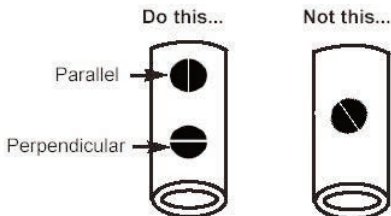
DO NOT unplug the Gage during the update operation.

Application Notes

Measuring on pipes

(*UTG C, UTG CA, UTG CX, and UTG CLF probes*)

When measuring the thickness of pipe walls, the proper placement of the transducer is important. On pipe diameters larger than 10cm (4 inches), it is recommended to place the probe parallel to the long axis of the pipe. For smaller diameter pipes, it is recommended that two measurements be taken, one with the probe perpendicular, and another with the probe parallel to the long axis of the pipe. The smaller of the two measurements should be recorded as the thickness for that area.



Parallel - Better when measuring pipes with a diameter greater than 10cm (4 inches).

Perpendicular - Typically better when measuring small diameter pipes.

Measuring on rough surfaces

To optimize measurement results, the surface should first be cleaned of any foreign debris including rust and scale. Depending on the amount of contamination/ roughness, abrasion with a wire brush or grinding tool may be necessary.

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

During scanning operations, the probe can become physically decoupled, that is physically separated, from the material, either due to the rough and/or scaly surface of the material or due to user operation. Avoid this by using the **Smart Couple™** feature (pg. 18).

Measuring on hot surfaces

Measurements taken at higher temperatures (above 100° C / 212° F) require special consideration. Both material sound velocity and probe zero will change with temperature. For maximum accuracy at high temperatures, adjustment should be performed using a material of known thickness heated to the temperature where measurements are to be performed. The probe should remain on the surface **only** as long as it takes to get a measurement.

The surface temperature of the test piece should not exceed (150° C / 300° F).

Measuring laminated materials

The density (and thus sound velocity) of laminated materials often varies considerably within a single piece or from piece to piece. For best accuracy, perform a calibration adjustment to a sample of known thickness. This sample should be as close as possible to the density characteristics of the part to be measured. Be aware that air gaps between laminates will likely cause strong reflections, resulting in the Gage measuring a lower thickness value than the actual total thickness.

Calibration

Measurement accuracy is directly related to the accuracy and care taken when performing a gage calibration adjustment. Adjustments will likely be required whenever the test material or temperature changes. Periodic checks with samples of known thickness are recommended to verify that the Gage is operating properly.

Taper or Eccentricity

If the measured surface and the back wall are not parallel to one another, measurement accuracy may be diminished due to a distorted echo.

Sound Scattering


Some materials have conditions which can limit the accuracy and thickness range of the Gage. For example, individual crystallites in cast metals and dissimilar materials in composites can scatter the ultrasonic pulse. The return echo may be too weak for the Gage to effect a measurement.

Troubleshooting

Below is a list of some common problems and resolutions received by the DeFelsko Service Department

Most conditions however can be cleared with a **Reset** (pg. 13).

Gage fails to power down

Ensure the probe is clean and free of couplant. The Gage will not turn off if coupled symbol  is displayed on LCD.

Probe continues to measure after lifted from surface

Wipe away any excess couplant on probe tip and repeat the measurement.

NOTE: When using the **UTG P**, it is especially important to avoid using excess couplant when taking a reading. The **UTG P** is designed for measuring thin materials and will measure a thin layer of couplant left on the probe face after a measurement.

Gage is coupled, but not measuring

See *Surface Conditions*, pg. 7.

Gage readings appear to be double the expected thickness

This sometimes occurs near the minimum measuring range of the instrument. The first return echo is unmeasurable, so the Gage measures the second return echo. The resultant calculation is double the actual thickness.

Measurement jumps as probe is lifted from surface

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.

Troubleshooting (cont.)

UTG M and UTG P multiple echo (ME) probes only

Gage displays --- (dashed lines) when measuring on a smooth uncoated surface in Multiple Echo mode

On smooth, uncoated metal surfaces the Gage (in **ME 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 (**ME mode**). Switching the Gage to single-echo **SE mode** (see pg. 18) will also help produce a steel-only thickness measurement.

Gage is coupled, but not measuring

On smooth, uncoated metal surfaces the Gage (in multiple echo / **ME 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. Switching the Gage to **SE mode** (pg. 18) will also help produce a steel-only thickness measurement (*UTG M only*). 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 in **ME mode**.

When measuring non-parallel surfaces, ME mode does not display a reading

Measurement accuracy may be diminished when **ME mode** is used to measure a part that has non-parallel surface and back walls. A distorted echo or no echo at all may result. Switch to **SE mode** (pg. 18) and retry (*UTG M only*).

Thickness values are repeatable, but seem incorrect

1. When measuring thick, hard coatings on thin metal, **ME and SE modes** may both give improper results. This unusual condition results in many gages interpreting the thick coating as the metal and the thin metal as a coating on the backside. The Gage therefore displays the thickness of the coating using the velocity calibration for the metal. This application may not be measurable.

Or

3. Too much loose rust or scale may be present on the surface. Scrape away loose material with a wire brush or scaper and apply sufficient couplant. In extreme cases, rotary sanders or grinding wheels may be necessary using care not to gouge the surface.

Or

4. There may be a coating on both sides of the metal. Switch to **SE mode** for best results (see pg.18).

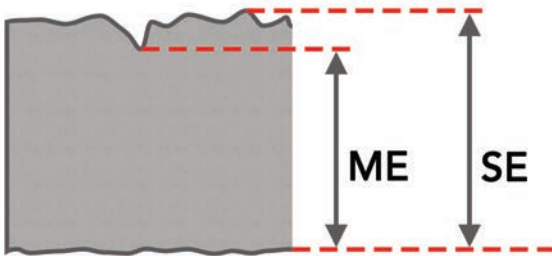
ME (multiple echo) and SE (single echo) results are not the same

When measuring a COATED piece of metal, **ME and SE modes** will likely produce different thickness values as expected. The ME value will be thinner since it represents the thickness of only the metal (ignores the coating).

Measurements of an UNCOATED piece of metal, however, should be the same (within tolerance) except in the following circumstances...

Surface Roughness, scale, etc.

ME mode may produce thinner measurement results because it may ignore the surface roughness in much the same way it ignores coatings.



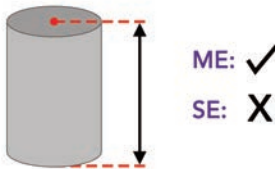
Flaws, voids or pits

A void or flaw inside a metal object is better detected in **SE mode** where the Gage will measure the distance from the surface down to the flaw. **Min Scan** will help locate the flaw. In **ME mode** the Gage may not “see” the flaw and will display a thicker, total thickness value



Measuring the depth of a rod

ME mode may produce accurate results in situations where **SE mode** may not be able to measure at all.



Probe pressure

Applying too much hand pressure on the probe while measuring may squeeze out too much couplant and make it difficult for ME mode to effect a measurement.



Temperature


Probe temperature: ME values are not affected by temperature changes within the probe. But the Gage should be zeroed (pg. 10) for best accuracy when operated in **SE mode**.

Metal temperature: Sound waves travel faster when the material is heated. Preprogrammed sound velocities within the **PosiTector UTG** are valid for normal temperatures in the vicinity of 15°C and must be adjusted for extreme temperatures. For best results in either mode, the Gage should be adjusted to the known thickness of the material at a temperature similar to the part being measured.

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. 20).

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.

Technical Data

Operating Range:

Gage: 0 to 50° C (+32° to +120° F)

Probe: -20° to 55° C (-4° to +131° F) continuous

Material Surface Temp: -40° to +150° C (-40° to +300° F)

Size: 146 x 61 x 28 mm (5.75" x 2.4" x 1.1")

Weight: 140 g (4.9 oz.) without batteries

Conforms to: ASTM E797

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Probe Details	Corrosion			
Probe	UTG CA	UTG C	UTG CX	UTG CLF
Probe Type	5 MHz Dual Element			2.25 MHz Dual Element
Thru-Paint Capability (Multiple Echo)	No			
Measurement Mode	Single Echo			
Measurement Range*	0.040" to 5.000" 1.00 to 125.00 mm			
Resolution	0.001" 0.01 mm			
Accuracy	+0.001" ±0.03 mm			

Probe Details	Multiple Echo	
Probe	UTG M	
Probe Type	5 MHz Contact	
Thru-Paint Capability (Multiple Echo)	No	Yes
Measurement Mode	Single Echo	Multiple Echo
Measurement Range*	0.100" to 5.000" 2.50 to 125.00 mm	0.100" to 2.500" 2.50 to 60.00 mm
Resolution	0.001" 0.01 mm	
Accuracy	+0.001" ±0.03 mm	

Probe Details	Precision	
Probe	UTG P	
Probe Type	15 MHz Single Element Delay Line	
Thru-Paint Capability (Multiple Echo)	Yes	
Measurement Mode	Steel	Plastic
Measurement Range*	0.008" to 0.475" 0.2 to 12.0 mm	0.005" – 0.175" 0.125 - 4.500 mm
Resolution	0.0001" 0.002 mm	
Accuracy	± 0.0004" ± 0.01 mm	

* Measurement range is for carbon steel and depends upon surface condition, temperature and material.



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. 14) and a **Zero** (pg. 10).
4. If issue is not resolved, **Update** (pg. 31) your **PosiTector** gage body and re-attempt measurements.

IMPORTANT:

If you must return the Gage 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

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