

Ultrasonic Thickness Gauge

Multigauge 5500 User Manual



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1. Introduction

Thank you for purchasing a Tritex Multigauge 5500. We are sure that the gauge will give you many years of reliable use. To ensure that you gain maximum benefit from the gauge, please read this manual carefully.

The Multigauge 5500 has been designed for hands free use when climbing on staging, ladders, scaffolding or when accessing by rope. Whether it's onboard a ship, on large storage tanks, climbing on top of a road tanker or inspecting underneath a bridge, the 5500 will make the job much easier.

The Tritex Multigauge 5500 has been manufactured to comply with British Standard BS EN 15317:2007, which covers the characterisation and verification of ultrasonic thickness measuring equipment.

1.1. Multigauge 5500 Specification Table

Sound Velocity Range	<i>From 1000 m/s to 8000 m/s (0.0394 in/μs to 0.3150 in/μs)</i>		
Single Crystal Soft Faced Probe Options	2.25 MHz	3.5 MHz	5 MHz
Probe Measurement Range	3 - 250 mm (0.120" to 10")	2 - 150 mm (0.080" to 6")	1 - 50 mm (0.040" to 2")
Probe Sizes	13 mm (0.5") & 19 mm (0.75")	13 mm (0.5")	6 mm (0.25") & 13 mm (0.5")
Resolution	0.1 mm (0.005") or 0.05 mm (0.002")		
Accuracy	± 0.1 mm (0.005") or ± 0.05 mm (0.002")		
Display	Red 4 character seven segment LED		
Batteries	3 x Disposable AA alkaline batteries or rechargeable NiMH / NiCD		
Battery Life	20 Hours continuous use using alkaline batteries		
Gauge Dimensions	147 mm x 90 mm x 28 mm (5.75" X 3.5" X 1")		
Gauge Weight	320g (11.3 ounces) including batteries		
Environmental	Case rated to IP65. RoHS and WEEE compliant		
Operating Temperature	-10°C to +50°C (14°F to 122°F)		
Storage Temperature	-10°C to +60°C (14°F to 140°F)		

2. Kit Contents



Key:

- 1 - Test Block -** The 15 mm test block is used to test the performance and serviceability of the gauge.
- 2 - Gauge Body -** See page 10 for further details.
- 3 - Probe -** See page 7 for further details.
- 4 - Membrane Key -** Used to remove the membrane retaining ring. See page 9 for further details.
- 5 - Probe Cable -** 1.45m long. Longer or shorter cables can be ordered.
- 6 - Membranes -** See page 9 for fitting instructions. Pack of 10 supplied.
- 7 - Ultrasonic Gel -** 150 ml.
- 8 - Membrane Oil -** 15 ml.
- Other Accessories -** Manual, calibration certificate and 3 year warranty certificate.

3. Getting Started

3.1. Quick Start Guide

Following is a quick start guide to help you get a feel for the gauge without reading the entire manual. For a more detailed explanation of each of these steps, please read the full manual.

- 1 Unscrew the probe knurled ring and apply a few drops of membrane oil to the face of the probe. (Pg 9)
- 2 Screw the knurled ring back onto the probe ensuring no air has been trapped and the membrane is flat to the probe face. (Pg 9)
- 3 Connect the probe, cable and gauge together. (Pg 5)
- 4 Turn the gauge on using the 'ON/OFF' switch. (Pg 11)
- 5 Apply a small amount of ultrasonic gel to the surface being measured. (Pg 19)
- 6 Place the probe onto the ultrasonic gel / test piece.
- 7 A measurement will be displayed.

3.2. Assembly

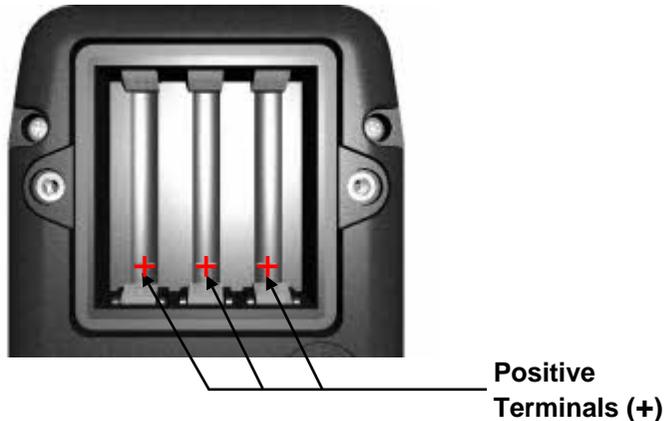
To assemble the gauge for use:

- i Attach the probe to the probe cable by pushing the cable Lemo plug into the socket on the probe.
- ii Connect the other end to the gauge Lemo socket.

Note: To remove the connectors, simply pull back on the connector collars to release the plug from the socket. Do not force under any circumstances.

3.3. Batteries

The Multigauge 5500 uses 1.5Vdc 'AA' alkaline disposable batteries supplied with the kit. NiMH and NiCD rechargeable batteries can also be used. Insert the batteries into the battery compartment as shown below, ensuring the batteries are inserted the correct way round:



Note: If the gauge is to be left unused for an extended period of time then it is advisable to remove the batteries prior to storage.

Warning: Do not mix rechargeable and disposable batteries in the gauge.

3.4. Low Battery Warning

When the batteries become low, the warning 'LO Bat' is given in advance. The batteries should now be replaced. Otherwise after a short time the gauge will turn off automatically.

4. Probes

4.1. Introduction

All probes used with Tritex Multigauges are single crystal soft faced probes. The table below identifies the different probe options and which probe is the most suitable for different applications. All probes are colour coded to help identify their frequency.

The single crystal means that measurements are taken using a straight path of ultrasound, giving perfect linearity throughout the measuring range. The probes are not affected by V-beam error.

4.2. Intelligent Probe Recognition (IPR)

All probes also have **IPR** (Intelligent Probe Recognition). IPR transmits data from the probe to the gauge so that it is instantly recognised. This includes data such as the probe serial number, frequency, size and the unique signature of the probe. The gauge uses this information to automatically adjust settings to achieve the best performance. When a probe is connected, the display will show 'ProbE=2.25 P13', depending on the probe that has been connected.

If a probe is connected that does not have IPR, the gauge will display 'SELEcT=2.25 P13' and allow manual selection using the '+' (1) and '-' (3) buttons.

See 'Probe Selection' on page 16 for further details.

4.3. Probe Selection Table

Frequency	2.25 MHz	3.5 MHz	5 MHz
Measuring Range	3 - 250 mm (0.120" to 10")	2 - 150 mm (0.080" to 6")	1 - 50 mm (0.040" to 2")
Colour	Yellow	Green	Blue
Diameters Available	13 mm (0.5") & 19 mm (0.75")	13 mm (0.5")	6 mm (0.25") & 13 mm (0.5")
Suitable for	Most thickness gauging applications. Works particularly well on heavy corrosion, especially the 19 mm probe.	Will measure relatively thin metal which is corroded. Normally used only if measuring down to 2 mm is of importance.	Ideal for measuring thin metal in relatively good condition. Not advisable to use as the main probe.

4.4. Probe Membranes

All probes are fitted with protective membranes to help prolong the life of the probe. The membranes also provide a flexible interface which acts as an aid when working on rough surfaces. Membrane wear should be monitored and checked at regular intervals.

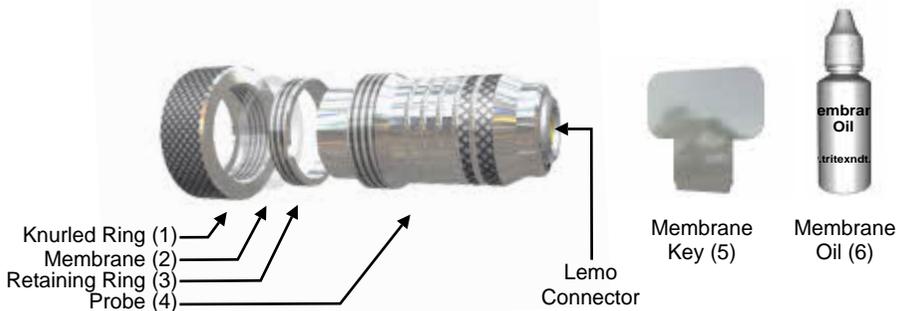
Normal Temperature Membranes

Standard membranes allow measurements to be taken on hot surfaces up to a maximum of 70°C (158°F).

High Temperature Membranes

Teflon™ membranes are available for measurements on hotter surfaces. In this case measurements can be taken on surfaces up to 150°C (302°F). Care should be taken that the probe does not overheat. The probe should be allowed to cool down in between each measurement. A high temperature ultrasonic gel is advised for this application.

4.5. Changing the Membrane



- i Unscrew the knurled ring (1) from the probe (4).
- ii Using the membrane key (5), remove the retaining ring (3) from inside the knurled ring (1).
- iii Push the old membrane (2) out from the front.
- iv Fit a new membrane (2) from the back and push it down until it locates in the groove on the inside front edge.
- v Refit the retaining ring (3) and secure it in place using the membrane key (5).
- vi Place a few drops of membrane oil (6) onto the face of the probe (4). Do not use too much.
- vii Screw the knurled ring (1) back onto the probe (4) whilst applying pressure on the membrane (2) with the thumb to expel any air from behind the membrane.

Note: Do not apply too much membrane oil underneath the membrane. Once fitted, the membrane should be flat with no air bubbles trapped behind.

Warning: Never use a probe without a membrane fitted

4.6. Care of Probes

All probes should be treated with respect. When taking measurements, they should not be scraped or dragged along the surface. Although the membranes will protect the probe against everyday wear and tear, they will not protect against rough treatment and misuse.

Warning: Never try to repair a probe or try to remove scratches from the face of the probe. This may result in further damage. Always return it to Tritex NDT for investigation and possible repair.

5. Getting to know your MultigaUGE 5500



Belt Attachment Clip (8)



5.1. Switching the Gauge On

- i To switch the gauge on press the 'ON/OFF' switch (2)
- ii The display will show a greeting message 'HELLO' followed by the current velocity of sound setting.
- iii One or two flashing bars will indicate that the gauge is ready to measure.

Note 1: If no probe is connected when the gauge is turned on, the display will show 'no ProbE'. See page 17 for further details.

Note 2: If a probe other than a Tritex probe is attached before switching on then the gauge will display 'SELEct=2.25 P13'. See manual selection on page 16 for further details.

5.2. Switching the Gauge Off

- i To switch the gauge off, press and release the 'ON/OFF' switch (2).
- ii After a few seconds the gauge will display 'byE byE' and turn off.

5.3. Automatic Shutoff

The gauge will automatically shut off after 10 minutes of inactivity to save battery power.

5.4. Belt Attachment Clip

- i Secure the Belt Attachment Clip (8) onto a waist belt.
- ii Locate the Belt Attachment Button (4) on the back of the gauge into the slot on the Belt Attachment Clip (8) and slide down until a positive lock is heard and felt.
- iii To release the gauge from the Belt Attachment Clip (8), squeeze both buttons on either side of the clip and slide the gauge upwards.

5.5. Measurement Hold Feature

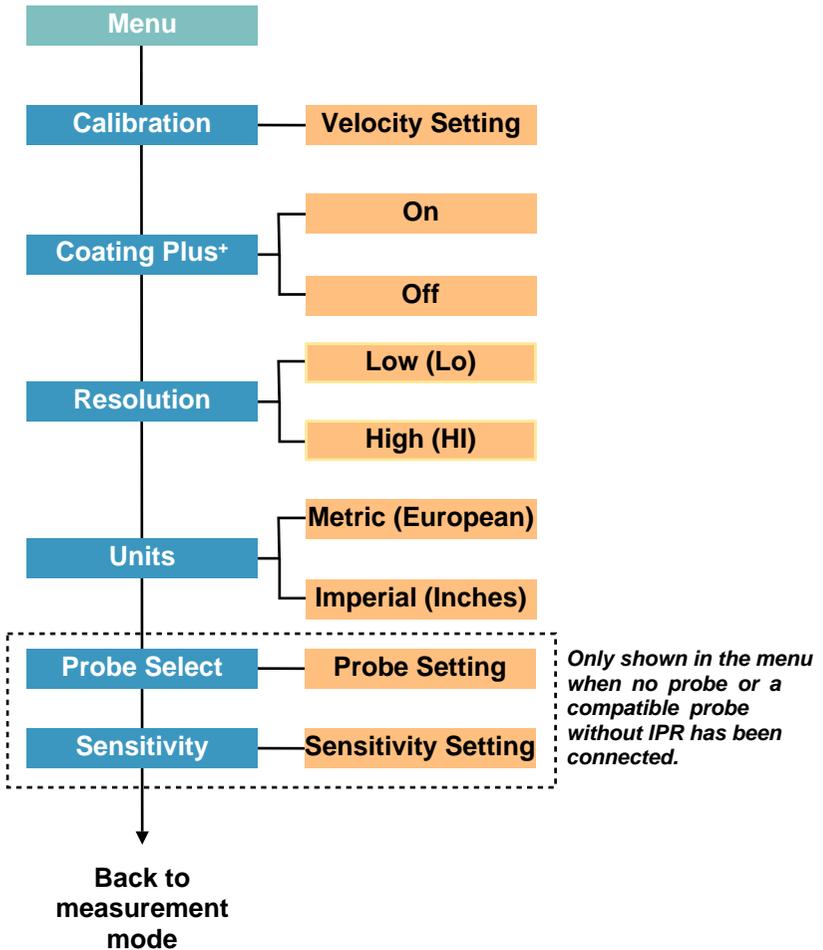
To hold a measurement, press either the '+' (1) or '-' (3) buttons whilst a measurement is displayed.

6. Navigating the Menu

6.1. Entering the Menu

- i Press and hold the 'ON/OFF' switch (2) for a few seconds.
- ii The display will show the first menu item 'CAL'.
- iii To navigate the menus use the 'ON/OFF' button (2).
- iv After scrolling through once, the gauge will return to measurement mode.

6.2. Navigation Table



6.3. Setting the Calibration

The gauge should be calibrated to the type of material that is being measured. This is because all materials have different velocity of sound properties.

There are two methods of changing the calibration. Either adjust the velocity of sound setting according the metal being measured, or adjust the the gauge to a known thickness of metal.

Gauges are supplied with the calibration set to mild steel at approximately 5900 m/s (0.2323 in/ μ s). This may vary according to the properties of the supplied 15 mm test block material.

Note: The calibration does not need to be reset each time the gauge is used. The last setting will be remembered.

Calibrating the Velocity of Sound

- i Select 'CAL' from the menu using the 'ON/OFF' button (2).
Use the navigation table on pg 12 as a guide.
- ii 'CAL' and the current velocity setting will be displayed alternately.
- iii Use the '+' (1) and '-' (3) buttons to adjust the velocity of sound to the the required new velocity.
- iv Press the 'ON/OFF' button (2), the gauge will display 'rEADY' and return to the measurement mode.

Calibrating to a Known Thickness

- i Select 'CAL' from the menu using the 'ON/OFF' button (2).
Use the navigation table on pg 12 as a guide.
- ii 'CAL' and the current velocity setting will be displayed alternately.
- iii Place the probe on a piece of material of a known thickness such as the test block supplied with the kit.
- iv 'CAL' and the measurement will be displayed alternately.
- v Adjust the measurement displayed to the known thickness using the '+' (1) and '-' (3) buttons.
- vi Press the 'ON/OFF' button (2), the gauge will display 'rEADY' and return to the measurement mode.

6.4. Velocity Table (approximate values)

The given values are in certain cases strongly dependent on the alloy, heat treatment, manufacturing and processing and are therefore only approximate standard values. They are given here as a guide only.

Reference: Mathies, Klaus (1998), Thickness Measurement with Ultrasound, Berlin: German Society of Nondestructive Testing.

Material	Velocity - m/s	Velocity - in/ μ s
Aluminium	6200 - 6360	0.2441 - 0.2504
Rolled	6420	0.2528
Duraluminium	6320	0.2488
Bronze (5%P)	3531	0.1390
Copper	3666 - 4760	0.1443 - 0.1874
Glass, Plate	5766	0.2270
Inconel, Forged	7820	0.3079
Lead	2050 - 2400	0.0807 - 0.0945
Steel, Mild	5890 - 5960	0.2319 - 0.2346
Supplied Test Block	5900 approx.	0.2323 approx.
Steel, Stainless	5530 - 5790	0.2177 - 0.2280
10 Cr Ni 18 8, ann	5530	0.2177
Steel, Tool		
C105 Annealed	5490 - 5960	0.2339 - 0.2346
C105 Hardened	5854	0.2305
Tin	3210 - 3320	0.1264 - 0.1307
Titanium	5823 - 6260	0.2293 - 0.2465
Zinc	3890 - 4210	0.1531 - 0.1657

6.5. Coating Plus+

Coating Plus+ mode is used to measure metal thickness when thick coatings up to 20 mm exist. Normal measurement mode will ignore coatings up to approximately 6 mm. In both modes, the actual thickness of coating that can be ignored depends on the type of coating.

- i Select 'CoatinG-PLUS' from the menu using the 'ON/OFF' button (2). *Use the navigation table on pg 12 as a guide.*
- ii Either 'CoatinG-PLUS=On' or 'CoatinG-PLUS=OFF' will be displayed depending on the current setting.
- iii Use the '+' (1) and '-' (3) buttons to select the required setting between 'ON' and 'OFF'.
- iv Press the 'ON/OFF' switch (2), the gauge will display 'StorEd' and return to the measurement mode.

Note: Coating Plus+ mode should not be left on for all measurements. The gauge will achieve a better performance on standard coatings with this function turned off.

6.6. Setting the Resolution

The resolution can be set between low (0.1 mm / 0.005") and high (0.05 mm / 0.002").

- i Select 'rES' from the menu using the 'ON/OFF' button (2). *Use the navigation table on pg 12 as a guide.*
- ii Either 'rES=LO' or 'rES=HI' will be displayed depending on the current setting.
- iii Use the '+' (1) and '-' (3) buttons to select the required resolution between 'HI' and 'LO'.
- iv Press the 'ON/OFF' switch (2), the gauge will display 'StorEd' and return to the measurement mode.

6.7. Setting the Units

Either metric (mm) or imperial (inch) units can be selected.

- i Select 'UnitS' from the menu using the 'ON/OFF' button (2). *Use the navigation table on pg 12 as a guide.*
- ii Either 'UnitS=EUROPEAn' or 'UnitS=InchES' will be displayed depending on the current setting.
- iii Use the '+' (1) and '-' (3) buttons to select the required units between 'Euro' (metric) and 'Inch' (imperial).
- iv Press the 'ON/OFF' switch (2), the gauge will display 'StorEd' and return to the measurement mode.

6.8. Probe Selection

Note: Probe selection will only be shown in the menu when no probe or a compatible probe without IPR has been connected.

There are three different modes for probe selection: automatic, manual and no probe connected.

Automatic - When a Tritex probe with IPR is connected, the gauge will automatically identify the probe type and set the gauge accordingly. The following will scroll across the display depending on the probe connected:

ProbE=2.25 P13
 ProbE=2.25 P19
 ProbE=3.5 P13
 ProbE=5.0 P13
 ProbE=5.0 P6

Press the 'ON/OFF' button (2) to confirm, the gauge will display 'rEADY' and return to the measurement mode.

Manual - When a compatible probe other than a Tritex probe is fitted, the gauge will display 'SELEct=2.25 P13'. This is a prompt to select the correct probe setting for the probe that has been fitted. Use the '+' (1) and '-' (3) buttons to select from the following list:

SELEct=2.25 P13
 SELEct=2.25 P19
 SELEct=3.5 P13
 SELEct=5.0 P13
 SELEct=5.0 P6

Once selected, press the 'ON/OFF' button (2) to confirm, the gauge will display 'rEADY' and return to the measurement mode.

The probe setting can be changed in the menu as follows:

Note: This feature only shows in the menu if a compatible probe other than a Tritex probe with IPR is fitted.

- i Select 'SELEct=2.25 P13' (depending on the current setting) from the menu using the 'ON/OFF' button (2). *Use the navigation table on pg 12 as a guide.*
- ii Use the '+' (1) and '-' (3) buttons to select the required probe setting from the list above.
- iii Press the 'ON/OFF' switch (2), the gauge will display 'StorEd' and return to the measurement mode.

No Probe - If no probe is connected when the gauge is turned on the display will show 'no ProbE'. Either connect a suitable probe or simply press the 'ON/OFF' switch (2) to enter measurement mode. This will allow navigation of the menus without a probe fitted.

In this case, 'no ProbE' will appear in the menu.

6.9. Probe Sensitivity

Note: This feature only appears in the menu if a compatible probe other than a Tritex probe with IPR is fitted.

When compatible probes are connected, it is essential to first manually select the appropriate probe as per 6.8. above, and then to adjust the sensitivity to obtain the best performance for the probe. Sensitivity can be selected between 1 and 15. The sensitivity setting is specific to each probe setting. Therefore, if a different probe is selected then the sensitivity may need to be re-adjusted.

Warning: Adjusting the sensitivity to an incorrect setting could affect the performance of the gauge.

- i Select 'Sens= 8' (depending on the current setting) from the menu using the 'ON/OFF' button (2). *Use the navigation table on pg 12 as a guide.*
- ii Use the '+' (1) and '-' (3) buttons to select the required probe sensitivity.
- iii Press the 'ON/OFF' switch (2), the gauge will display 'StorEd' and return to the measurement mode.

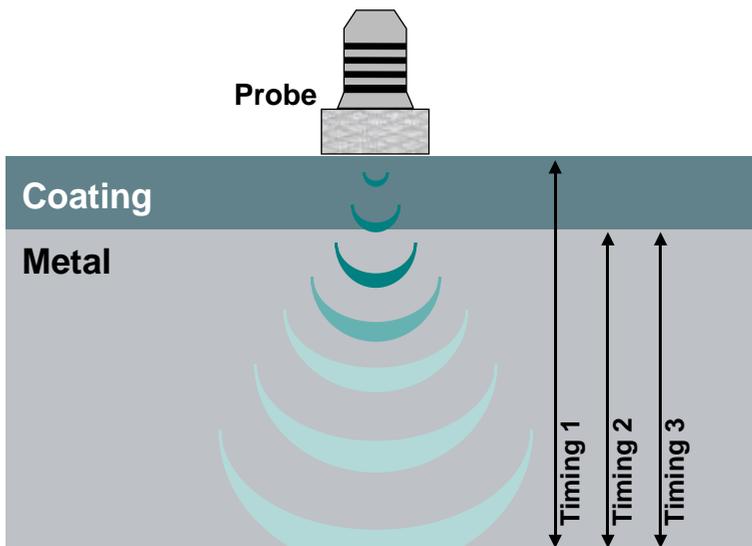
7. Using the MultigaUGE 5500

7.1. How Triple Echo Works

All Ultrasonic Thickness Gauges should be calibrated to the velocity of sound of the material being measured. Coatings have a different velocity of sound than metal and it is important they are not included in the measurement. Triple echo ensures all coatings are completely eliminated from the measurement.

How it works:

A transmitted ultrasound pulse travels through both the coating and the metal and reflects from the back wall. The returned echo then reverberates within the metal, with only a small portion of the echo travelling back through the coating each time. The timing between the small echoes gives us the timing of the echoes within the metal, which relate to the metal thickness. The returned echoes need not be consecutive as the gauge will interpret them automatically and calculate the thickness. A minimum of three echoes is checked each time. This is referred to as the **Automatic Measurement Verification System (AMVS)**.



7.2. Echo Strength Indicator

The gauge will display a series of flashing bars to indicate the strength of the returning echoes. The stronger the returning echoes are, the more bars will be displayed.

7.3. Precautions When Measuring

- Check that the material has parallel front and back walls.** If the front and back walls are not parallel, the ultrasound hitting the back wall will be deflected away from the face of the probe. The probe will therefore not receive any echoes back.
- The surface being measured should be free from dirt or debris.** It may be necessary to clean or brush the surface prior to taking measurements.
- Ensure plenty of ultrasonic gel is used between the probe and the material to eliminate any air pockets.** Air is the enemy of ultrasound and it is essential that couplant exists to form a path for the ultrasonic signal.
- A membrane should be correctly fitted to the probe.**
- Place the probe firmly on the surface being measured to make good contact.**
- Do not remove protective coatings.** The gauge is designed to ignore these.
- Ensure the coating is solidly adhered to the surface.** Triple echo will ignore coatings as long as they are solidly adhered to the surface. If the coating has become loose or delaminated then air pockets will exist.
- Remove debris from the probe face between measurements.**
- Sometimes it is necessary to rock the probe slightly and gently in order to obtain measurements.** This often helps the probe to receive echoes from the back wall.

- ❑ **The correct couplant should be used.** Although we recommend couplant specifically designed for taking measurements, other liquids can be used such as liquid soap, wallpaper paste, water and some hand cleansers. Grease is not a good alternative.

- ❑ **Ensure the coating is not layered or does not contain foreign objects in its construction.** Layered coatings cause reflections at the layer interface. This seriously weakens the strength of the ultrasound and may prevent it from travelling all the way through. The same applies to foreign objects which can deflect the ultrasound path or prevent the ultrasound from passing.

- ❑ **Some types of casting may cause problems for ultrasonic gauges.** Castings can contain foreign elements within their construction and they also have varying velocity of sound properties throughout their structure. This may result in inaccurate measurements due to the inherent inconsistencies in the material.

8. Help

8.1. Gauge fails to switch on

Advice	Action
Check the batteries are present and serviceable.	Replace with new batteries (see pg 6).
The 'ON/OFF' key may be defective.	Return the gauge to Tritex NDT (see pg 26).

8.2. Difficult to obtain readings

Advice	Action
Check the gauge against the 15 mm test block supplied.	If this works, the problem is with the material being measured (see pg 19).
Check the correct probe for the material being measured has been selected.	Select the correct probe (see pg 7).
Check the probe membrane is properly fitted with membrane oil applied and no trapped air present.	Refit or replace the membrane (see pg 9).
Check the probe, lead and gauge are all connected together correctly and securely.	Re-connect as necessary (see pg 5).
Check the serviceability of the probe and lead.	Contact Tritex NDT for replacement items (see pg 26).
Check the serviceability of the gauge.	Return the gauge to Tritex NDT (see pg 26).
Couplant not suitable.	Use only suitable couplant supplied with the kit (see pg 20).

8.3. Gauge displays up to three ascending bars

Advice	Action
Not all echoes received are equal. The gauge has Automatic Measurement Verification System (AMVS).	Move or rock the probe slightly until all echoes are received (see pg 19).

8.4. Standing readings are displayed when not measuring

Advice	Action
Excessive membrane oil under membrane.	Refit or replace the membrane (see pg 9).

8.5. Gauge measures correctly on steel test block but not on the material under test

Advice	Action
Check the material is not too thin for the frequency of the probe being measured.	Select the correct probe (see pg 7).
Check that the material has parallel front and back walls.	See pg 19 - Precautions When Measuring.
Ensure plenty of ultrasonic gel is used between the probe and the material to eliminate any air pockets.	See pg 19 - Precautions When Measuring.
Ensure the coating is solidly adhered to the surface.	See pg 19 - Precautions When Measuring.
Ensure the coating is not layered or contains foreign objects in its construction.	See pg 20 - Precautions When Measuring.
Some types of casting may cause problems for ultrasonic gauges.	See pg 20 - Precautions When Measuring.

9. General Information

9.1. Safety

Only use either alkaline, NiMH or NiCD 'AA' batteries. Do not mix different types of battery in the same gauge.

Do not submerge the gauge in water.

Do not open the gauge body other than to change the batteries. Always return the gauge for repair.

Never dispose of batteries in a fire. There is a serious risk of explosion and/or the release of highly toxic chemicals.

Do not expose to direct sunlight for extended periods of time.

9.2. RoHS

New legislation to help safeguard the environment has been introduced to ensure companies act responsibly. Tritex products are fully RoHS compliant which means that we do not use hazardous substances and materials at any stage of manufacture. Lead cadmium, mercury and other such materials used in electronic equipment are not present in Tritex products.

RoHS compliance is already law in the United Kingdom and European Union and will soon be adopted in other countries seeking to protect the planet for future generations.

At Tritex we are aware of our corporate social responsibility towards all our stakeholders. We take pride in our work and our environment.

9.3. WEEE Disposal Instructions

Do not dispose of this device with unsorted waste. Improper disposal may be harmful to the environment. Please refer to your local waste authority for information on return and collection schemes in your area. Otherwise, return the product to Tritex NDT for safe disposal.

9.4. Cleaning

Clean the gauge using a mild detergent, a damp (not wet) cloth, or an anti-static wipe. Never use abrasives, solvents or other cleaning products as this will damage the instrument. Do not soak the gauge with water or other liquids.

9.5. Warranty

Tritex products are guaranteed against defects in material and/or workmanship for a period of 3 years from date of delivery.

Any equipment that may be defective should be returned carriage paid direct to Tritex or to their approved local distributor who will at their discretion repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts, labour and return at no charge.

Repairs due to abuse of the equipment, accident, fair wear and tear and use of non approved third party hardware is not covered by this warranty. Probe warranty is limited to 1 year and batteries (dry cell or rechargeable) or other consumable items are not covered by this warranty.

No other warranty is expressed or implied, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

The customer should not attempt any repair as this will void the warranty.

Tritex shall not be liable for collateral or consequential damage of any kind from either the use or the interpretation of the results from the equipment.

9.6. Service & Repair

A full manufacturer's factory repair service is available from Tritex NDT. Priority is given to customer repairs so the gauge can be returned ready for action in the shortest possible time. The complete kit should be returned to Tritex direct or through your local agent.

Before you return your gauge

Check through the troubleshooting guide on page 21. If this does not solve the problem we can sometimes give advice over the phone.

When returning the gauge

If after troubleshooting, the gauge is still faulty, you will need to return your gauge for repair. Please package the **complete kit** in a suitable protective container and return to us at the address on page 26.

Please include your contact details including name, address, e-mail and phone number, along with a brief description of the problem.

10. Contact Information

Telephone: +44 (0) 1305 257160

Facsimile: +44 (0) 1305 259573

E-mail: Sales@tritexndt.com

Website: www.tritexndt.com

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