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TI-25LT Ultrasonic Thickness Gauge For Steel - Instruction Manual

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9.0 Warranty

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ELECTROMACTIC Equipment Co., Inc.
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Tel: 1-800-645-4330/ Tel: 516-295-4300/ Fax: 516-295-4399

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1.0 Introduction

The CHECK•LINE® TI-25LT Ultrasonic Thickness Gauge accurately measures the thickness of steel. This gauge uses the "pulse-echo" principle of ultrasonic testing where a short ultrasonic signal is transmitted from the probe. The signal travels through the measurement sample until it is reflected back towards the probe from the back side of the material. The elapsed time for the complete cycle is measured and converted to an accurate thickness reading.

The TI-25LT can be used to measure the extent of corrosion on the opposite, inaccessible side of the wall by using the "Subtractive Method." When the thickness of the original wall is known, subtracting the thickness reading obtained from the TI-25LT will determine the extent of corrosion at the point of probe placement. If the original wall thickness is not known, test readings should be made along a grid of equally-spaced points to obtain a profile of the thickness readings. The smallest thickness reading will locate the area of greatest concern.

The TI-25LT is factory-set to measure steel. As a "no cost" option, the TI-25LT can be factory set to measure on any other single material instead of steel. However, it can never be used for more than one material. If this capability is required, contact Electromatic to purchase the TI-25M upgrade explained below.

Easy upgrade to full TI-25M functionality (contact Electromatic for details). The TI-25M measures on all metals, ceramics, glass and most rigid plastics. It provides Single Reading and Scan modes, where the probe is dragged over a large measuring area. The minimum reading recorded during the "scan" is displayed.

2.0 Precautions

Do not use the standard probe in applications where material temperatures exceed 200 °F (100 °C) as the probe will be damaged. Special *High Temperature* Probes should be used. Consult factory.

Keep the gauge free of dust (especially metal powders, carbon, etc.) as they will damage the gauge. Use a damp cloth to clean the gauge after use. DO NOT USE CHECMICAL SOLVENTS OF ANY KIND.

8.0 Material Safety Data Sheet (MSDA)

Section 1— Product Identification

Product Name: TI-25M
Manufacturer: Electromatic Equpt. Co.
Generic Name: Ultrasonic Couplant
NFPA Hazardous Materials Identification System (est)
Health 0 Flammability 0 Reactivity 0

Section 2— Hazardous Ingredients

This material does not contain any ingredients having known health hazards in concentrations greater than 1%. This material does not contain any known or suspected carcinogens.

Section 3 — Physical Data (nominal)

Boiling Point: >220°F
Vapor Pressure: N/A
Specific Gravity: >1.0Z
pH: 7.35 – 7.9
Vapor Density: N/A
Freezing Point: <20°F
Evaporation Rate: N/A
Solubility in Water: complete
Acoustic Imp.: 1.726×10^6
Appearance and Odor: water white, opaque gel; bland odor

Section 4 — Fire and Explosive Hazard Data

Flash Point: none Upper Exposure Limit: none Lower Exposure Limit: none
Special Fire Fighting Procedures: N/A Extinguishing media: N/A
Unusual Fire and Explosion Hazards: none

Section 5 — Reactive Data

Stability: Stable Conditions to Avoid: none
Incompatibility (Materials to Avoid): none known
Hazardous Polymerization: will not occur
Hazardous Decomposition or Byproducts: none known

Section 6 —- Health Hazard and First Aid Data

Routes of Entry[1]:
Skin: not likely Ingestion: not normally Eyes: not normally Inhalation: no
Effects of Overexposure:
Acute: May cause temporary eye irritation Chronic: none expected

First Aid Procedures:
Skin: Remove with water if desired. Eyes: Flush with water for 15 minutes.
Ingestion: For large quantities, induce vomiting and call a physician Inhalation: N/A

Section 7 - Storage and Handling Information

Precautions to be taken in handling and storage: Store between 20 °F and 120 °F. Spills are slippery and should be cleaned up immediately. Steps to be taken in case material is released or spilled: Pick up excess for disposal. Clean with water. Waste disposal method: Dispose of in accordance with federal, state, and local regulations.

Section 8 — Control Measures

Respiratory Protection: not required Ventilation: not required
Protective Gloves: on individuals demonstrating sensitivity to TI-25M
Eye Protection: as required by working conditions Other Protective Equipment: not required

1. TI-25M contains only food grade and cosmetic grade ingredients.

7.0 Specifications

Range*	0.040–6.00" *(1.00–150.0 mm)* Other ranges available with optional probes.
Resolution	0.004" *(0.01 mm)*
Display	4 1⁄2 -Digit, 0.5" Backlit LCD
Velocity Range	.0787–.3937 in/µs *(2000–10,000 m/sec.)*
Probe	1⁄4", 5 MHz, actual wearface is 3⁄8" *(9.5mm)*
Probe Wearface	PEEK (Polyethylethylkeytone)
Cable	4 ft. *(1.2 m)* waterproof cable with non-polarized, quick-disconnect connectors. Optional lengths up to 50 ft. *(15 meters)*.
Temp. Limits	Ambient: –20 to 120 °F *(–30 to 50 °C)* Material: 0 to 200 °F (*–20 to 100 °C*) Special high temperature probes are optionally available.
Battery Type	Two AA batteries
Battery Life	200 hours
Weight	710 ounces *(280 g)*
Size	2.5 x 4.5 x 1.25" *(64 x 114 x 32 mm)*
Accessories Included	Probe/cable assembly, 4 oz. bottle of coupling fluid, NIST Calibration Certificate, 2 AA batteries, operating instructions, hard-plastic carrying case.
Warranty	Gauge: 5 years Probe: 90 days

**Measuring Range indicated is for steel. Actual range for other materials will vary based upon the material's sonic velocity and attenuation.*

3.0 Overview Of Gauge

3.1 Gauge

3.2 Contents Of Kit

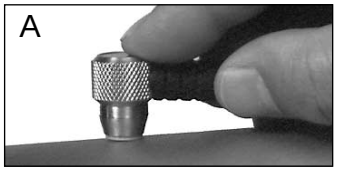
The TI-25LT is supplied as a complete kit with the following:

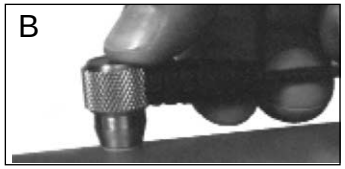
a. Gauge
b. Two (2) AA batteries (installed in gauge)
c. Probe/cable assembly
d. 4 oz. Bottle of coupling fluid
e. NIST-traceable calibration certificate
f. Operating instruction manual
g. Foam-filled carrying case

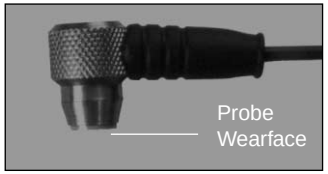
3.3 Probe

The probe transmits and receives the ultrasonic sound waves which the TI-25LT uses to calculate the thickness of the material being measured. The probe must be used correctly in order for the TI-25LT to produce accurate and reliable results.

A small amount of “coupling” fluid, commonly called “couplant” is used to insure that there are no air gaps between the probe and the material surface. Grasp the probe by the molded rubber grip and place it on top of the material surface. Apply moderate pressure to the top surface of the probe with your index finger (A) or thumb (B) to stabilize the probe and to keep the wearface seated flat against the measurement surface.



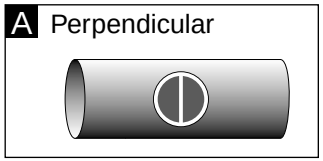


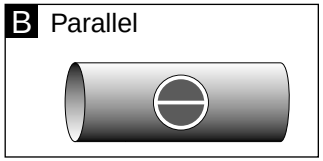


2. Remove the probe from the hot surface immediately after a “stable” reading is displayed. Even though the High Temperature Probes are constructed using materials which can withstand high temperatures, the probe can begin to heat up, through thermal expansion and other effects, adversely affecting the accuracy of the measurement.

6.2 Measurements Of Pipes Or Cylindrical Parts

When using the TI-25LT to measure the wall thickness of a pipe, the orientation of the probe is very important to obtain accurate readings.





Pipe diameter is greater than 4 inches (100 mm):

Position the probe so the centerline of the probe wearface is perpendicular to the long axis of the pipe as shown in illustration “A.”

Pipe diameter is less than 4 inches (100 mm):

Two measurements should be performed at the same location, one with the centerline of the probe perpendicular to the long axis and one parallel (illustration “B”).

The smaller (thinner) of the two measurements should be used as the actual wall thickness at the measurement location.

Additionally, on applications on pipe diameters less than 3 inches, we recommend using the optional V-Block fixture which helps maintain stable probe placement on the rounded measuring surface.

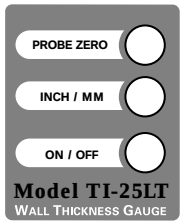
6.3 Measurements On Materials At High Temperatures

When it is necessary to measure wall thickness on surfaces that are in excess of 200 °F (100 °C), special-purpose high temperature probes should be used. These probes are built using special materials and techniques that allow them to withstand high temperatures without damage. Additionally, care must be taken when performing a “Probe Zero” or “Calibration To Known Thickness” using a High Temperature probe.

At such elevated temperatures, it is recommended that the user follow these procedures:

1. Perform a calibration procedure on a sample of known thickness (refer to section 6.3) with the material temperature at or near the temperature that will be encountered during measurement.

3.4 Keypad



The TI-25LT is supplied with a membrane keypad mounted on the front of the instrument body.

It consists of three keys which are described below.

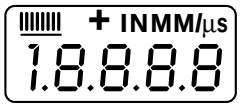
The **PROBE ZERO** key is used to “zero” the probe in a similar way as a micrometer is “zeroed” before use. If the tool is not zeroed correctly, the measurements will not be accurate.

The **INCH/MM** key is used to change the measuring units from inches to mm. Each time the key is pressed the units will change from one to the other.

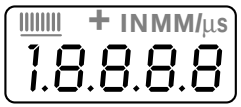
The **ON/OFF** key is used to turn the power on as well as turning the power off. If the Tl-25LT is idle for five minutes the gauge will automatically power off.

3.5 LCD Display

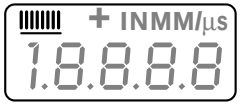
The backlit LCD Display provides the operator with important information as detailed below. .



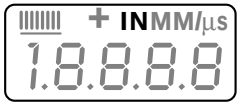
- Measurement values
- Units of measure
- Bar graph signal stability indicator



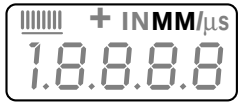
The numeric portion of the display consists of 4-digits and is used to display numeric values, as well as occasional simple words, to indicate the status of various settings. When the TI-25LT is displaying thickness measurements, the display will retain the last measured value, until a new measurement is performed.



The eight vertical bars shown form the Stability Indicator. When the TI-25LT is idle, only the left-most bar and underline will be illuminated. When a measurement is being performed, six or seven bars should be illuminated indicating that it is a stable measurement. If fewer than five bars are illuminated, the TI-25LT is having difficulty obtaining a stable and reliable measurement and the thickness value shown should be ignored, as it is most likely erroneous.



When the "IN" indicator is illuminated, the TI-25LT is displaying a wall thickness measurement in **INCH** units.



When the "MM" indicator is illuminated, the TI-25LT is displaying a wall thickness measurement in **MM** units.

3.6 Probe Zero Plate

When first connecting the probe supplied with the TI-25LT, the user should perform a "Probe Zero" as described in Section 4.3. The Probe Zero Test Plate is used for this task. It is located on the top edge of the gauge as shown in the photo below. It also serves as the battery compartment cover

Note: The thickness of this plate is not imporatnt, and it should not be used as a Calibration Test Plate. A precision 4-step Test Block is optionally available for this purpose.

6.0 MEASURING PROCEDURE

After performing the Probe Zero operation, the gauge is ready to take wall thickness measurements.

1. Turn on the power by pressing the **ON/OFF** key.
2. Plug the probe cable into the receptacle at the top of the gauge.
3. Place a small amount of coupling fluid on the surface to be measured.
4. Grasp the probe by the molded rubber grip and place it on top of the material surface. Apply moderate pressure to the top surface of the probe with your index finger or thumb to stabilize the probe and to keep the wearface seated flat against the measurement surface.
5. The gauge will display the thickness of the steel wall along with the Stability Indicator showing the relative stability of the reading.
6. Repeat steps #3 – #5 as required.

6.1 General Notes On Measurements

1. When the probe is removed from the sample after a measurement, the last reading will be retained on the display.
2. If fewer than five bars of the Stability Indicator are illuminated, the thickness reading displayed is most likely inaccurate.
3. Occasionally, a small film of couplant will be drawn out between the probe and the surface as the probe is removed. When this happens, the TI-25LT may perform a measurement that is larger or smaller than it should be. This phenomenon is obvious when one thickness value is observed while the probe is in contact with the material, and another value after the probe is removed.
4. The gauge will automatically power off after 5 minutes of non-use.
5. The following surface conditions can prevent accurate measurements (refer to section 4.6 *Preparation Of The Surface*):
    - Rough or heavily pitted surface
6. If two materials are press-fitted or laminated together, the gauge will only measure the thickness of the sample that contacts the probe.

5.0 QUICK START INSTRUCTIONS — STEEL THICKNESS

1. Turn on the power by pressing the **ON/OFF** key.
2. Plug the probe cable into the receptacle at the top of the gauge.
3. Place a drop of coupling fluid on the built-in Probe Zero Plate.
4. Grasp the probe and place it on top of the Probe Zero Plate. Apply moderate pressure to the top surface of the probe with your index finger or thumb to stabilize the probe and to keep the wearface seated flat against the measurement surface.
5. The display will show some thickness value and the Stability Indicator will have most of its bars illuminated.
6. While keeping the probe on the Probe Zero Plate, press the **PROBE ZERO** key. The display will show a value that can be recorded for future use.
7. Remove the probe from the Probe Zero Plate. The gauge is now ready to perform thickness readings on steel samples.
8. Place a small amount of coupling fluid on the steel surface to be measured and proceed as explained in step #4 above.
9. The gauge will display the thickness of the steel wall along with the Stability Indicator showing the relative stability of the reading. If fewer than five (5) bars are illuminated, the thickness reading displayed is most likely inaccurate.

Notes

a. When the probe is removed from the sample after a measurement, the last reading will be retained on the display.

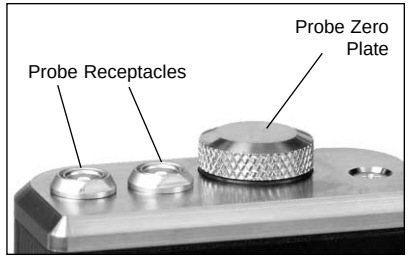
b. Occasionally, a small film of couplant will be drawn out between the probe and the surface as the probe is removed. When this happens, the TI-25LT may perform a measurement that is larger or smaller than it should be. This phenomenon is obvious when one thickness value is observed while the probe is in contact with the material, and another value after the probe is removed.

c. The gauge will automatically power off after 5 minutes of non-use.

3.7 Probe Connector Receptacle

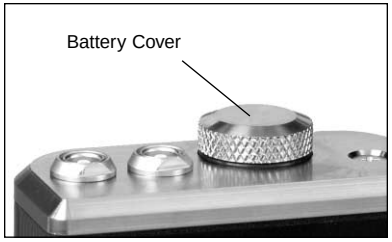
Located on the top edge of the TI-25LT housing are the receptacles for the probe and the probe zero plate.

The connectors for the probe are non-polarized so the connector at the end of the probe cable can be inserted into this receptacle in either orientation. Make sure the connector is “well seated” in the receptacle.



3.8 Battery Compartment (Changing The Battery)

The battery compartment is located under the probe zero test plate. To open the battery compartment, unscrew the probe zero plate by rotating it counterclockwise. The TI-25LT operates on two (2) AA Batteries (1.5 V). If desired, rechargeable batteries may be used.



The TI-25LT is shipped with the batteries installed. Insert batteries in the polarity indicated on the rear label.

Note: When the display elements begin to flash off and on repeatedly, the batteries are low and should be replaced.

4.0 Getting Started

4.1 Connecting The Probe

Grasp the connector located at the end of the probe cable and carefully insert the connector plugs into the receptacle located at the top edge of the gauge. Make sure the connector is fully inserted into the receptacle. **The orientation of the plugs does not matter as they are non-polarized.**

4.2 Turn On The Power

Press the **ON/OFF** key. All of the LCD Display elements will momentarily illuminate. The firmware revision will then be momentarily shown (for factory troubleshooting purposes only). Eventually the display will show “0.000” (or “0.00” if using metric units), indicating it is ready for use.

Note:
1. The gauge is turned off by pressing the **ON/OFF** key again.
2. The gauge will automatically power off after 5 minutes of non-use.
3. All settings will be retained in non-volatile memory.

4.3 “Zeroing” The Probe

The Probe Zero Plate is used to “zero” the probe for calibration purposes. Normally, this procedure is required only when the probe is connected to the instrument for the first time, but since this process takes less than 10 seconds, we recommend performing the Probe Zero function occasionally as described below.

1. Check that the probe face (wear surface) is clean and free of debris.
2. Place a small drop of the supplied coupling fluid on the built-in Probe Zero Plate located on the top of the gauge.
3. Press the probe firmly against the Plate.
4. The Stability Indicator on the LCD display should have six or seven bars illuminated and a value should be shown in the display.
5. While maintaining probe contact with the Test Plate, press the **PROBE ZERO** key. The display will show “Prb0” while the TI-25LT calculates its zero point.

Note: The value shown on the display can be recorded and used in the future to confirm that the gauge is functioning properly.

4.4 Changing Units — inches to mm

To change the measuring units from inch (factory setting) to mm, press the **INCH/MM** key. Each time the key is pressed, the units will change.

4.5 Checking Calibration With The Probe Zero Plate

Calibration can be checked using a sample of known thickness or using our SB4H or SB4L 4-step calibration block.

4.6 Preparation Of The Surface

The surface to be measured should be relatively clean and smooth, free of any small particulate, rust or scale. The presence of any of these conditions will prevent stable and reliable readings. Often, a wire brush, sandpaper or scraper will be helpful in cleaning the measurement surface. In situations where the surface is heavily corroded or pitted, a rotary sander, or grinding wheel will be necessary to properly prepare the surface for measurement. If the surface is still “rough” after preparation, using a more viscous couplant fluid similar to petroleum jelly or K-Y jelly will help obtain a stable, reliable measurement. This type of “thick” coupling fluid is a good choice when measuring on vertical surfaces or on the underside as it will help adhere the probe to the measurement surface while also acting as the coupling agent.

Extremely rough surfaces will prove most difficult to measure. These kinds of surfaces act on the sound beam like frosted glass acts on light; the beam becomes diffused and scattered in all directions.

Rough surfaces also contribute to excessive wear of the probe, The probe should be inspected regularly for signs of uneven wear on the probe surface (wearface). If this is detected, the probe should be returned to the factory for repair or replacement.