ULTRASONIC THICKNESS GAUGE MANUAL

1. Introduction

The intelligent and hand-held ultrasonic thickness gauge is controlled by a microprocessor, which can measure thickness and sound speed of various materials quickly, accurately and without damage by ultrasonic measurement. This instrument is capable of accurate measurement for different materials or parts in industrial production, as well as monitoring pipelines and pressure vessels of production equipment, and corrosion degree of various parts in use. It can also be widely used in manufacturing, metal processing, commodity inspection and other testing areas. Any material that allows ultrasonic to transmit at a constant speed and that is distinguishable from waves reflected from the back side is applicable to this instrument.

1.1. Application scope

The thickness of any good conductor for ultrasonic waves with top and bottom surfaces parallel to each other, like metal, plastic, ceramic and glass, can be measured with the instrument. For example: aluminum, copper, gold, resin, water, glycerin, etc. The internal particles of cast iron are too big for this instrument!

2. Attention

2.1. This gauge is equipped with Ni-MH rechargeable batteries. Please do not install non-rechargeable batteries.

2.2. Please keep the instrument away from flammable or explosive environment.

2.3. Please keep the instrument away from dangerous voltage in case of accidents.

2.4. Please keep the instrument away from strong impact, high temperature and water immersion.

2.5. Batteries should be taken out if not in use for a long time.

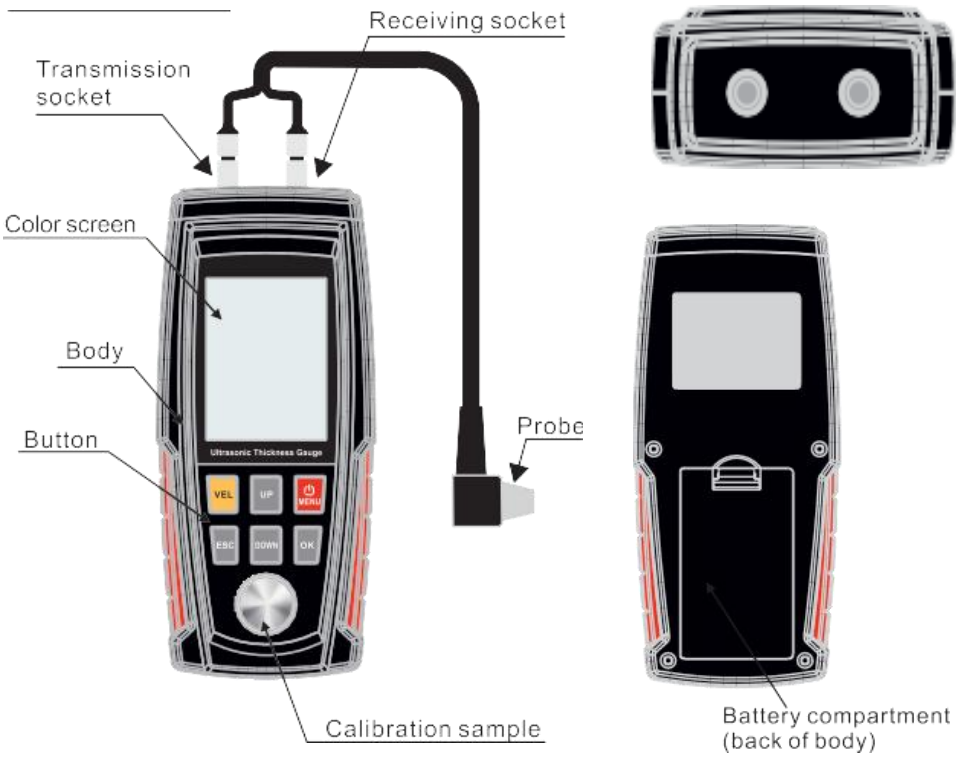
2.6. Please install batteries in correct direction. Please charge or replace batteries when the power is low.

2.7. Please do not disassemble the instrument or try to change internal parts.

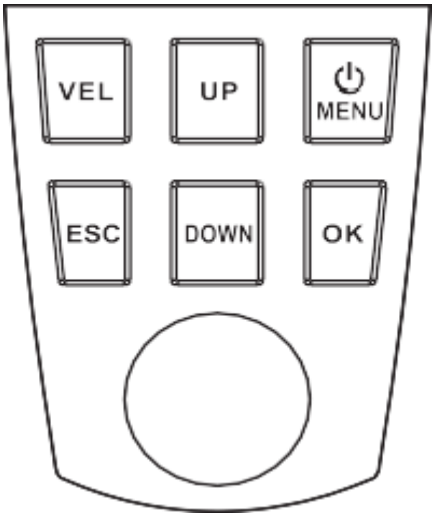
2.8. Alcohol and diluents are corrosive to case and screen, which can be cleaned with a little water.

3. Part name and display instruction

3.1 Part name



3.2 Button function instruction:



VEL: Sound speed adjustment button

UP: Switch button of selection/Adjustment

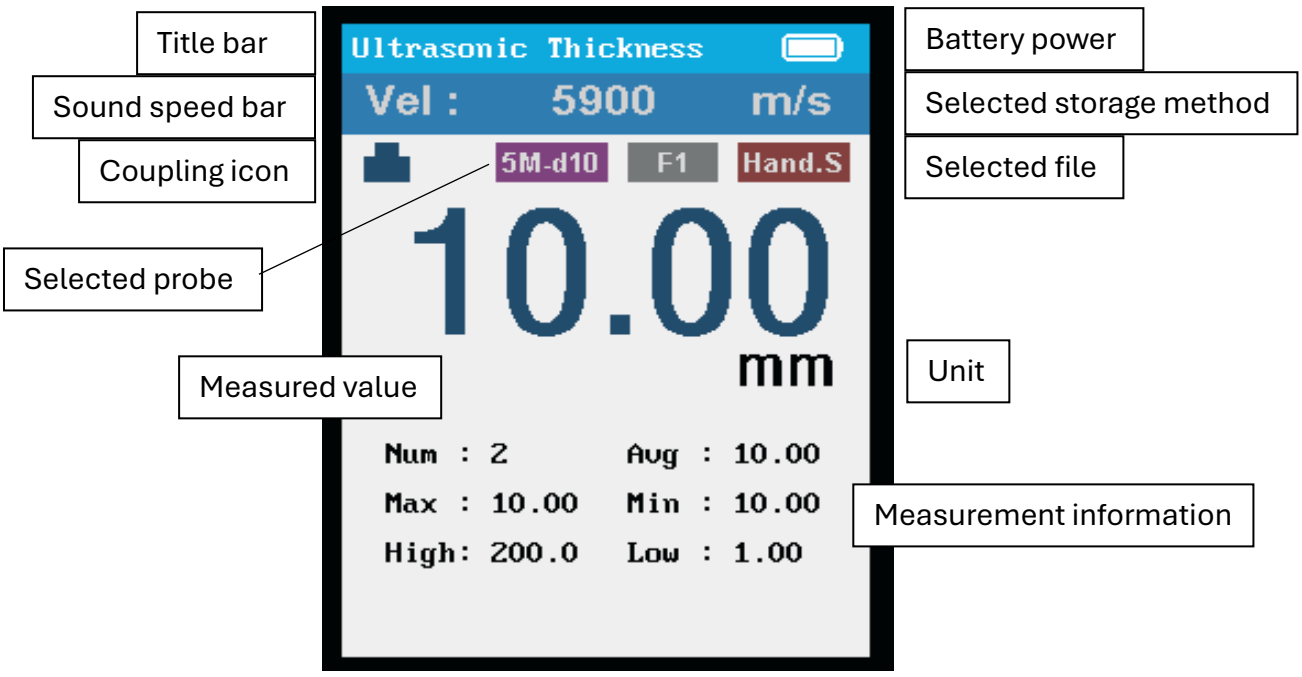
⏻/MENU: Power ON/Shutdown/Menu

ESC: Exit button

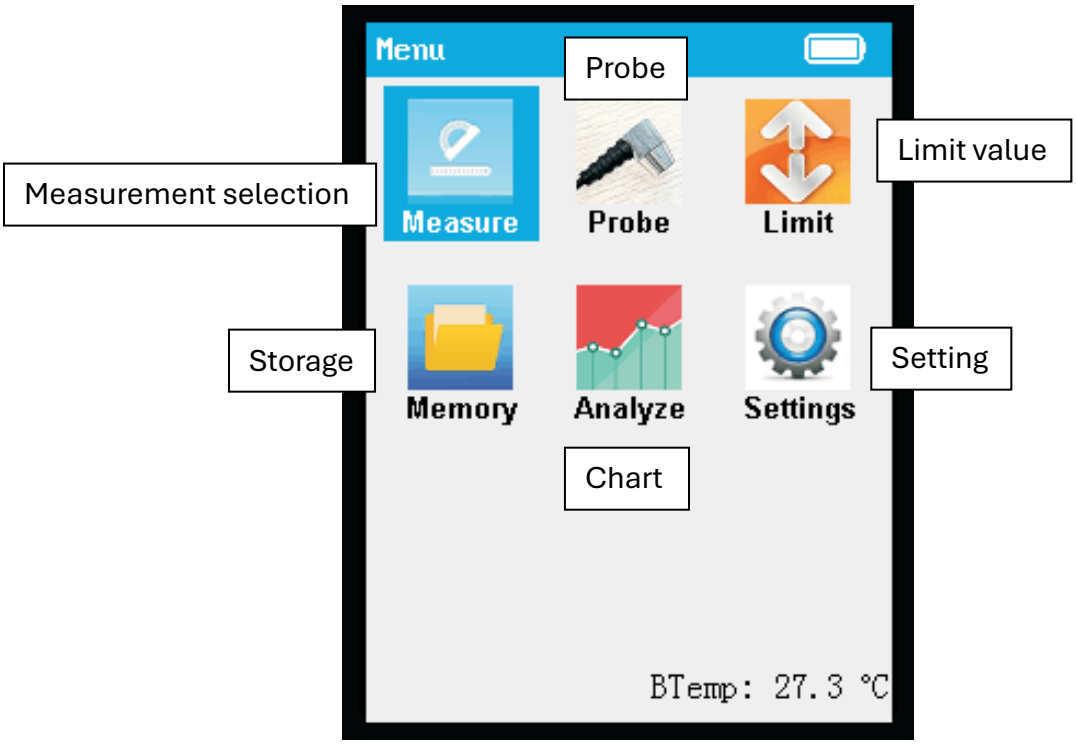
DOWN: Switch button of selection/Adjustment

OK: Confirmation button

3.3 Instruction of measurement interface display



3.4 Menu interface display instruction



4. Technical parameters

Feature	WT100A	WT130A
Measuring range	1.00–225.0 mm	1.00–300.0 mm
Data storage	500 readings	1500 readings
Probe selection	✗	✓
Working Frequency	5 MHz	5 MHz / 2.5 MHz
Measurement error	±(0.5% H + 0.05)mm	±(0.5% H + 0.05)mm
Resolution	0.01 mm (1.00–99.99 mm)0.1 mm (100–225 mm)	0.01 mm (1.00–99.99 mm)0.1 mm (100–300 mm)
Smallest measurable pipe diameter	Φ20 × 3 mm (Stahl)	Φ20 × 3 mm (Stahl)
Speed of Sound Adjustment Range	1000–9999 m/s	1000–9999 m/s
Operating Temperature	0–40 °C	0–40 °C
Battery	3 × 1.2 V Ni-MH-Akkus	3 × 1.2 V Ni-MH-Akkus
USB charging	5 V / 1 A	5 V / 1 A
Dimensions	65 × 146 × 30 mm	65 × 146 × 30 mm
Weight	130 g	130 g

Supported Measuring Probes

Probe	WT100A – Measuring Range	WT130A – Measuring Range
5M d10	1,0–225,0 mm	1,0–300,0 mm
5M d6	✗	1,0–50,0 mm
2,5 MHz	✗	1,2–300,0 mm
High Temperature Probe	✗	1,2–300,0 mm

Hinweise:

1. **H** in the error specification stands for the measured **material thickness**.
2. **Φ20 × 3 mm** means: minimum pipe diameter **20 mm** with a **wall thickness of 3 mm** (steel pipe).
3. **5M d10** = 5 MHz probe with **10 mm** crystal diameter.
4. **5M d6** = 5 MHz probe with **6 mm** crystal diameter.
5. **2.5 MHz** = low-frequency probe for highly damping or coarse-grained materials.

5. Operation preparation

5.1 Battery installation

First insert the probe into host probe socket, and install batteries in battery compartment, pay attention to the polar of batteries. Check battery power after powering on; if battery power is low, please charge them in time.

Note: Please do not install non-rechargeable battery.

5.2 Power on/off

Press the power button ⏻ to turn on the meter and go to the speed of sound indicator. Themeasurement can then be started (see figure). Press and hold the power button ⏻ to manually turn off the device.

Measurement interface of sound velocity

6 Measurement

6.1 Apply coupling agent evenly to the measured points on the surface of tested object.

6.2 Thickness can be measured gently pressing the probe on the object surface with coupling agent.

7 Main menu operation and function introduction

7.1 Operation of the Main Menu

a. Go to the main menu

On the measurement screen, press the MENU button to open the main menu.

b. Select menu item

Use the Up (▲) or Down (▼) button to select a menu item.

c. Open menu item

Press OK to open the selected menu item.

d. Leave menu

Press ESC to return to the previous menu.

7.2 Main Menu Features

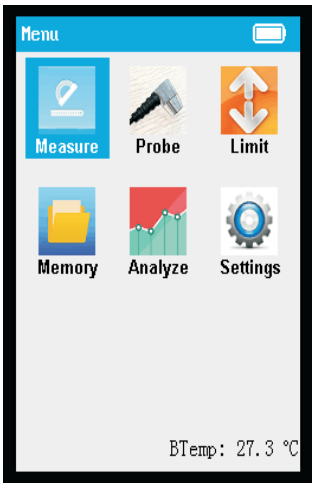
1) Measurement options

In this menu, the measurement settings are made:

1. Speed of sound (corresponds to the speed of sound display in the measurement screen)
2. Unit of measurement
3. Measurement resolution

2) Messsonde (Probe)

In this menu, select the probe used for the measurement (the selected probe will be displayed on the measurement screen).



3) Limit values (limit)

In this menu, the limit values for the measurement are set.

1. Set upper and lower limits.
2. Turn the audible alarm on or off if the limit values are exceeded or undercut.

4) Memory / Storage

This menu manages all storage functions.

1. Select the file in which to store readings (the selected file will be displayed on the measurement screen).
2. View saved measurement data of a file.
3. Delete data of the selected file.

5) Chart

8. Operate submenu

1. **Press** ESC → open the submenu.
2. Use ▲/▼ to navigate through the menu items.
3. Click **OK** to select a menu item.
4. Leave the menu again **with** ESC.

The menu items at the bottom of the display are:

1. **Save** – Save measured value.
2. **Clear** – Delete stored metrics.
3. **Cal** – Calibration.
4. **V.Cal** – Calibrate the speed of sound.

9. Calibration (Cal)

1. **Press ESC** .
2. **Select Cal** and press **OK**.

1. The speed of sound is automatically set to **5900 m/s** (standard for steel).
2. Place the measuring head with coupling gel on the calibration block.
3. During calibration, the five circles at the bottom of the display fill up.
4. After successful calibration, the instrument will automatically return to the measurement display.

10. Calibrate the speed of sound (V.Cal)

You use this function if you want to measure a material other than steel.

1. **Press ESC** .
2. **V.Cal**.
3. Use ▲/▼ to adjust the speed of sound.
4. Save with **OK** .

Settings

There you can change, among other things:

1. Language
2. Automatic shut-off
3. Tastenton
4. Display brightness
5. Color
6. Software version
7. Factory reset

11. Other Functions

The following menu provides access to additional instrument functions.

Probe Selection

Select the appropriate probe according to the installed probe type:

- **5M-D10**
- **5M-D6 (WT100A)**
- **2.5 MHz (WT130A)**
- **High Temperature (WT130A)**

File Labels

- **F1–F5 (WT100A)**
- **F1–F15 (WT130A)**

Storage Modes

- **Hand.S** – Manual Save
- **Auto.S** – Automatic Save

Menu Functions

Measurement

- Sound Velocity – Select a material or manually enter the sound velocity.
- Unit – Select the measurement unit.
- Resolution – Select the display resolution.

Probe

- Select the installed probe type.

Limit Values

- Set upper and lower alarm limits.
- Enable or disable limit alarms.

Storage

- Select File
- View File
- Delete File

Chart

- View stored measurement graphs and data.

Settings

- Language (Chinese / English)
- Auto Power-Off (2, 5, 10, 30 minutes, or Never)
- Key Beep On/Off
- Backlight On/Off
- Display Color (Blue, Orange, Green, Purple, Gray)
- Software Version
- Restore Factory Settings

12. Measurement Technology

12.1 Surface Preparation

Before taking measurements, remove all dust, dirt, rust, paint, coatings, and other contaminants from the test surface.

12.2 Rough Surfaces

Very rough surfaces may cause inaccurate readings or prevent measurements altogether.

If necessary, improve the surface by:

- Sanding
- Grinding
- Polishing
- Filing
- Using a high-viscosity couplant

12.3 Machined Surfaces

Grooves or machining marks created by turning, milling, or planing may affect measurement accuracy.

For best results:

- Position the probe either parallel or perpendicular to the machining grooves.
- Test different probe orientations and use the most stable reading.

12.4 Measuring Cylindrical Surfaces

When measuring pipes, tubes, tanks, or other curved surfaces:

- Adjust the probe position according to the diameter.
- Apply sufficient couplant.
- Move the probe slowly across the surface.
- Record the smallest stable reading.

General guideline:

- **Large diameter:** Hold the probe perpendicular to the pipe axis.
- **Small diameter:** Hold the probe either parallel or perpendicular to the pipe axis.

The minimum stable reading represents the true wall thickness.

12.5 Measuring Complex Shapes

For elbows and other curved components:

- Measure in at least two directions.
- Position the probe both parallel and perpendicular to the axis.
- Use the smaller reading as the actual thickness.

12.6 Non-Parallel Surfaces

For accurate ultrasonic transmission, the contact surface should be parallel to the measurement surface.

Otherwise, unstable readings or measurement failure may occur.

12.7 Temperature Effects

Ultrasonic sound velocity changes with temperature.

When measuring hot materials:

- Perform calibration at the same temperature whenever possible.
- Apply temperature compensation if necessary.

For steel, elevated temperatures generally reduce the measured value.

12.8 Materials with High Attenuation

Materials containing:

- Fibers
- Large grains
- Pores
- Coarse particles

may scatter or absorb ultrasonic energy, causing unstable or missing readings.

Such materials may not be suitable for measurement with this instrument.

12.9 Reference Samples

Calibration should be performed using a reference sample with known thickness or known sound velocity.

The instrument is supplied with a **4.0 mm steel calibration block**.

Refer to the calibration procedure described in Section 9.

13. Avoiding Measurement Errors

13.1 Thin Materials

If the material thickness is below the probe's minimum measuring range, inaccurate readings may occur.

Possible errors include:

- Double reflection
- Pulse overlap

If in doubt, compare the measurement with a known reference sample.

13.2 Rust and Corrosion

Rust, pitting, and corrosion can cause unstable or incorrect readings.

When corrosion is present:

- Measure from several positions.
- Change the probe orientation.
- Compare multiple readings.

13.3 Incorrect Material Selection

If the instrument is calibrated for one material but used on another without changing the sound velocity, measurement errors will occur.

Always verify that the correct material or sound velocity has been selected before measuring.

13.4 Probe Wear

The probe face is made from acrylic resin.

Over time it may become worn, reducing measurement sensitivity.

If necessary:

- Polish the probe surface using fine abrasive paper (approximately 500 grit) or a whetstone.
- Ensure the probe face remains flat and smooth.

Replace the probe if stable measurements cannot be restored.

13. Preventing Measurement Errors

13.5 Laminated and Composite Materials

Ultrasonic thickness gauges cannot accurately measure laminated or composite materials if there are air gaps between the layers. Since ultrasonic waves cannot travel reliably through these discontinuities, measurements based on reflected sound waves may be inaccurate or impossible.

13.6 Oxide Layers on Metal Surfaces

Some metals, such as aluminum, develop dense oxide layers on their surfaces. These oxide layers are firmly bonded to the base material and may not be visually distinguishable.

Because ultrasonic sound travels at different speeds through oxide layers and the base metal, measurement errors may occur.

When measuring oxidized materials, it is recommended to calibrate the instrument using a reference sample made from the same material.

13.7 Couplant Selection and Use

A couplant is required to transmit ultrasonic energy efficiently between the probe and the test material.

Using an unsuitable couplant or applying it incorrectly may result in unstable or inaccurate measurements.

General Guidelines

- Apply only a thin, even layer of couplant.
- On high-temperature materials, apply the couplant to the probe instead of the workpiece.
- Remove excess couplant after measurements are completed.

Choosing the Correct Couplant

For smooth surfaces, use low-viscosity couplants, such as:

- Standard ultrasonic gel
- Light machine oil

For rough, vertical, overhead, or aluminum surfaces, use higher-viscosity couplants, such as:

- Glycerin
- Grease
- Coupling paste

Various commercial ultrasonic couplants are suitable for use with this instrument.

14. Maintenance and Warranty

14.1 Probe Care

The probe face is made of acrylic resin and should be handled carefully.

Avoid dragging the probe across rough surfaces, as this may damage the probe face.

When measuring rough materials:

- Lift and reposition the probe instead of sliding it.
- For temperatures above **60°C (140°F)**, use a high-temperature probe.
- Clean oil, dirt, and debris from both the probe cable and probe after use to prevent premature wear.

Cleaning the Instrument

Clean the housing using a soft cloth lightly dampened with water.

Do **not** use alcohol, solvents, or aggressive cleaning agents, as they may damage the enclosure or display window.

Cleaning Reference Blocks

After calibration:

- Remove all couplant from the calibration block.
- Do not leave fingerprints or moisture on the reference block.
- If stored for long periods, apply a light coating of anti-rust oil to steel reference blocks.
- Before reuse, wipe the oil off completely.

General Precautions

Avoid:

- Mechanical shock
- Excessive humidity
- Dust contamination
- Direct impact

14.2 Maintenance

If any of the following problems occur, contact your authorized service center:

- The instrument cannot obtain measurements.
- The display does not operate correctly.
- Measurement errors remain excessive after calibration.
- The keypad does not respond correctly.

14.3 Service

This ultrasonic thickness gauge is a precision electronic instrument.

Do **not** disassemble or repair the instrument yourself.

All repairs and maintenance should be performed by qualified service personnel.

15. User Information

15.1 Warranty

Please complete the warranty registration card immediately after purchasing the instrument.

If a manufacturing defect occurs during the warranty period, provide the following:

- Purchase invoice
- Warranty card (or a copy)

The manufacturer will repair or replace defective products according to the warranty terms.

The standard warranty period is **one year** from the date of purchase.

Warranty Does Not Cover

The warranty does not apply to damage resulting from:

- Unauthorized disassembly or repair
- Improper transportation or storage
- Incorrect operation
- Failure to follow the user manual
- Missing or altered warranty documentation

After the warranty period expires, repairs may still be available for a service charge.

15.2 Items Not Covered by Warranty

The following consumable or wearable parts are excluded from warranty coverage:

- Display
- Battery
- Probe
- Calibration block
- Instrument case
- Couplant

16. Sound Velocity Table

Material	Velocity (m/s)
Aluminum	6320
Zinc	4170
Silver	3600
Gold	3240
Tin	3230
Steel (Carbon)	5900
Brass	4640

Material	Velocity (m/s)
Copper	4700
Stainless Steel (SUS)	5790
Acrylic Resin	2730
Water (20°C)	1480
Glycerin	1920
Soluble Glass	2350
Acetate Resin	2670
Phosphor Bronze	3530
Turpentine	4430
Glass	5440
Incoloy Alloy	5720
Magnesium	6310
Monel Alloy	6020
Nickel	5630
Steel 4330 (Mild)	5850
Steel 330	5660
Titanium	6070
Zirconium	4650
Nylon	2620

This version has been rewritten in fluent, technical English and is suitable for inclusion in a professional user manual.