

Ultrasonic Thickness Meter

Instruction Manual

ET2044



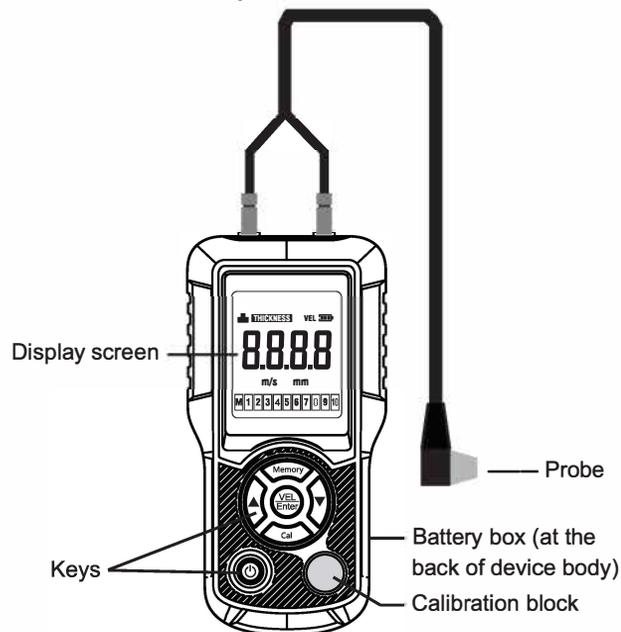
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Introduction to the product

This is a type of smart ultrasonic thickness meter which can measure thickness and sound speed of many types of materials such as metal, plastic, ceramic, glass and other good conductors of ultrasonic waves.

Structure description



Key description

Memory: enter/exit query state of thickness value

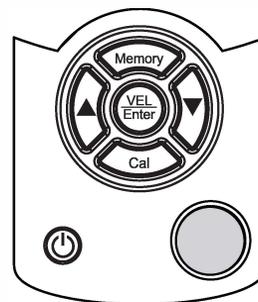
Cal: calibration key

▼: Shift key

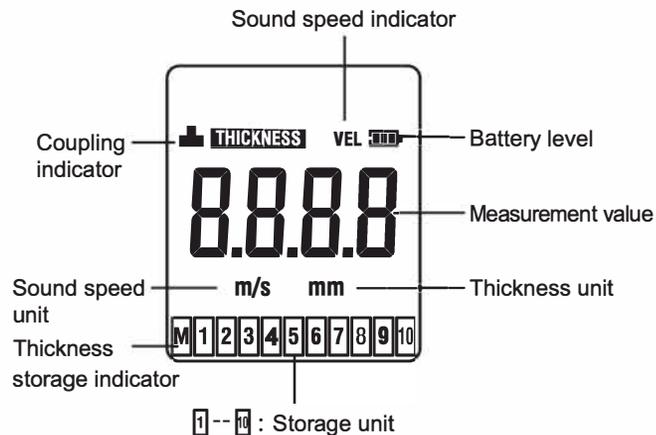
⏻: Power on/off key

▲: Plus key

VEL
Enter: Sound speed key/enter key



Display description



Use of the product

Prompt: when measurements are being made, other key operations are invalid (except the power key).

1. Power on/off

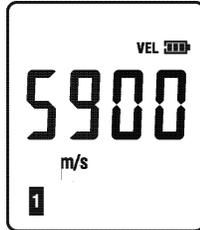
Press the "⏻" key to power on and the back light turns on automatically. Hold down "⏻" key for three seconds to power off.

2. Calibration operation

The instrument is calibrated properly before delivery. Users may carry out recalibration if necessary. After power on, hold down "Cal" key to enter calibration mode. Apply the ultrasonic coupling agent on the calibration block of the instrument and place the probe on the center of the standard block. Take off the probe after the reading is stable and press "VEL/Enter" key to complete the calibration.

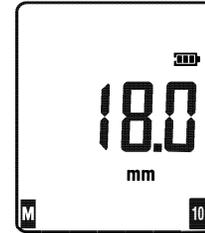
3. Selection and adjustment of sound speed

The sound speed of objects to be measured should be selected before measurement of thickness. Press "VEL/Enter" key to enter sound speed display interface. Press "▲" key or "▼" key to select the sound speed value of the material. If it is necessary to change sound speed value, press "VEL/Enter" key to enter sound speed adjustment state and press "▲" key or "▼" key to adjust it to the desired value.



4. Storage of thickness value

Press "Memory" key and the indicator begins flashing. Press "▲" key or "▼" key to select storage unit (1-10). Then press "Memory" key again after selection. The thickness value in subsequent measurement will be stored in the unit automatically. Every new value will overwrite the previous one.



The currently selected storage unit

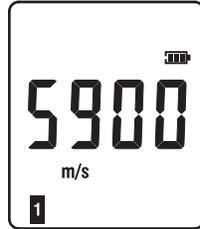
5. Measurement of thickness

The material thickness may be measured with use of the known sound speed of material. Select sound speed before measurement and apply coupling agent at the points to be measured. Make the probe touch it slightly and press it against the points to be measured. At the moment, the screen displays coupling indicator "■". If the symbol flashes or does not display, it indicates bad coupling. With removal of the probe, the indicator disappears.



6. Measurement of sound speed

The sound speed may be measured with use of the material speed in turn. Measure the thickness of material accurately with use of vernier caliper or micrometer. Apply coupling agents on the points to be measured of the material and couple the probe with materials. Remove probe after the reading becomes stable. Press “▼” key to select the number to be adjusted and press “▲” key to increase the number by 1 (circulate between 0-9). Then adjust the displayed readings to known thickness of the material. At the moment, press “ $\frac{VEL}{EMER}$ ” key. The sound speed displayed on the screen is the sound speed of the material. At the same time, the sound speed will be saved into current storage unit automatically.



7. Check the stored thickness value

Press “Memory” key and the “M” indicator begins flashing. At the moment, press “▲” key or “▼” key to check thickness value from unit 1 to unit 10. Press “Memory” key again to return current reading picture of thickness readings.

Factor of measurement error

1. Super-thin materials

When the thickness of materials to be measured is close to the lower limit of the probe, the phenomenon of double refraction may occur sometimes. The measurement result is two times of the actual thickness of materials. Another type of phenomenon causing error is called “pulse envelope and circulated jump”. It causes the measurement result to be larger than the actual thickness. In order

to get reliable measurement value, measurement and check should be made for measurement of critical materials.

2. Rusty materials

The material with rust on the surface and irregular materials may cause repeated change of readings and even without readings at the time of measurement.

3. Selection and use of coupling agents

Coupling agents are the substances that transfer ultrasonic energy. Improper selection and use of coupling agents will increase error of measurement or result in that measurement is not made. Before measurement, use a proper amount of coupling agent to apply it on the points to be measured of the objects evenly. When the measurement temperature is too high, it is applied at the bottom surface of the probe.

When materials with smooth surface are measured, it is suitable to select coupling agents with low viscosity. Coupling agents with high viscosity should be selected for material with coarse surfaces.

4. Mistaken of sound speed selection

Inconformity between the selected sound speed and measured materials will result in mistaken measurement result. When abnormal readings occur, pay attention to correct selection of sound speed and adjust the sound speed value if necessary.

5. Wear of the probe

The probe surface is made of acrylic resin. Long-term use may increase coarseness and reduce sensitivity. Users may use 500# sandpaper to polish the probe surface or replace it with new probe.

6. Materials with unparallel surfaces

If the upper and lower surfaces of the measured materials are not two parallel surfaces, it is impossible to obtain correct measurement result or display readings.

7. Influence of temperature

Temperature may produce certain influence on transmission speed of ultrasonic wave so as to affect measurement result of thickness.

Sound speed may be adjusted again to remove the effect.

8. Composite material

Ultrasonic wave cannot transfer with uniform velocity in composite materials.

Therefore, ultrasonic wave instrument is not suitable to measure composite materials.

Care and maintenance

1. Cleaning of enclosure: use dry cloth to wipe the enclosure of the instrument at the time of cleaning. Don't use wet cloth or corrosive cleaning agents.

2. Protection of the probe: Don't slide the probe with excessive force when measurement on surface of coarse material to prevent the probe from being damaged. Don't use the probe to measure objects with surface temperature over 60°C. After use every time, the coupling agents and dirt on the probe should be cleaned away.

3. Cleaning of calibration block: after use, please clean coupling agents and dirt on the probe completely. If it will not be used for a long time, some anti-rust oil may be applied on it. The anti-rust oil should be removed complete for use next time.

4. Replacement of battery: the battery should be replaced in time if the battery level is low. Pay attention to the polarity when installing new batteries. Don't install reversely.

If the product is out of use for a long time, please take out the battery to prevent corrosion to battery box and pole piece due to battery leakage.

5. Don't store the product in a damp area.

Table of material sound speed

The following is sound speed table of some materials and only for reference.

Material name	Sound speed m/s	Material name	Sound speed m/s
Gold	3251	Iron, steel	5900
Zinc	4216	Steel 4330	5850
Silver	3600	Steel 330	5660
Tin	3327	SUS	5790
Titanium	6070	Ceramic	5842
Tungsten	5334	Glass	5664
Zirconium	4650	Nylon	2620
Nickel	5630	Turpentine	4430
Magnesium	5791	Quartz glass	5640
Aluminum	6300	Organic glass	2692
Copper	4700	Acrylic resin	2730

Product parameters

Display mode: Four-digit LCD display.

Working frequency of the probe: 5MH

Range: 1.2~225mm (steel)

Resolution ratio: 0.1mm

Measurement accuracy: $\pm(1\%H+0.1)$ mm, H is the object thickness.

Lower measurement limit of pipes: $\Phi 20 \times 3$ mm

Sound speed adjustment scope: 1000~9999m/s

Measuring sound speed with known thickness: Measurement scope: 1000~9999m/s; when thickness of measured objects is ≤ 20 mm, the precision of sound speed measurement is ± 1 mm/ $H \times 100\%$; when the object thickness is > 20 mm, precision of sound speed measurement is $\pm 5\%$.

Power supply: 3 x 1.5V AA alkaline batteries

Working temperature: 0~40 ℃

Relative humidity: < 90%RH

Storage temperature: -10~50 ℃

Workpiece temperature: < 60 ℃

Working current: < 100mA

Product size: 152mm×75mm×32mm

Accessories: probe, coupling agents, instruction for use, color box