UT Thickness Gauge

DC-4000

Instruction Manual



CONTENTS

1. GENERAL DESCRIPTION ..... - 1 -
2. STANDARD DELIVERY ..... - 1 -
3. TECHNICAL SPECIFICATIONS ..... - 2 -
4. OVERVIEW ..... - 2 -
5. KEYPAD FUNCTIONS ..... - 3 -
6. DISPLAY SCREEN ..... - 5 -
7. QUICK STARTUP GUIDE ..... - 8 -
8. MENU ..... - 10 -
8.1 MEA. (MEASURMENT) ..... - 10 -
8.1.1 T-E Mode: ..... - 10 -
1 .Standard Measurement: ..... - 10 -
2. Minimum Measurement: ..... - 11 -
3. Difference mode: ..... - 11 -
4. Average mode: ..... - 12 -
5. Limitation Mode ..... - 13 -
8.1.2 E-E Mode ..... - 14 -
8.2 SET. ..... - 14 -
8.2.1 Velocity rate ..... - 15 -
1. Materials ..... - 15 -
2. Velocity input ..... - 16 -
3. Velocity measurement ..... - 16 -
4. Velocity storage ..... - 17 -
8.2.2 Resolution ..... - 18 -
8.2.3 Probe Calibration ..... - 18 -
8.2.4 Measurement rate ..... - 19 -
8.2.5 Auto measurement ..... - 20 -
8.2.6 Manual measurement ..... - 20 -
8.2.7 Rectification ..... - 23 -
8.2.8 A-SCAN custom setting ..... - 24 -
8.2.9 B-SCAN display range ..... - 25 -
8.3 MEM. ..... - 26 -
8.3.1 Set a new file ..... - 26 -
8.3.2 Memory Read ..... - 26 -
8.3.3 Delete a file ..... - 27 -
8.3.4 Delete all files ..... - 27 -
8.4 FUN. ..... - 28 -
8.4.1 Swich off mode ..... - 28 -
8.4.2 Languages ..... - 28 -
8.4.3 Contrast ..... - 28 -
8.4.4 Default ..... - 29 -
9. MEASURING TECHNOLOGY ..... - 29 -
10. MAINTENANCE AND PRECAUTIONS ..... - 30 -
APPENDIX : SOUND VELOCITY MEASUREMENT CHART ..... - 31 -

1. General Description

The Model DC-4000 is a visual A / B scan ultrasonic thickness gauge. It is capable of measuring the thickness of various materials with accuracy as high as ± 0.01 mm or ± 0.001 inches.

It is a Multi-Mode thickness gauge that has the ability to measure the thickness through painted or coated surfaces. This unit can measure the thickness of metallic and non-metallic materials such as steel, aluminum, titanium, plastics, ceramics, glass and any other good ultrasonic wave conductor. With the particular probe, DC-4000 can measure some composite materials, such as fiberglass.

The DC-4000 comes with following features:

- Large colorful TFT display
- Automatic probe recognition,
- Automatic probe zero calibration
- Various optional probe from 1MHz- 10MHz
- Automatically locates the detection point if the measurement is out of the viewable display area.
- Allow user to adjust the range of GAIN, RANGE, DELAY, GATE, BLANK, E-BLANK in manual-measurement mode.
- Limitation setting, alarm with sound and display.
- Multi-language
- Memory of 100 files X 100 data, transfer data to PC without software, available for any windows operating systems.
- Measurement screen automatic frozen, which make it easy to analyze the data for the user.

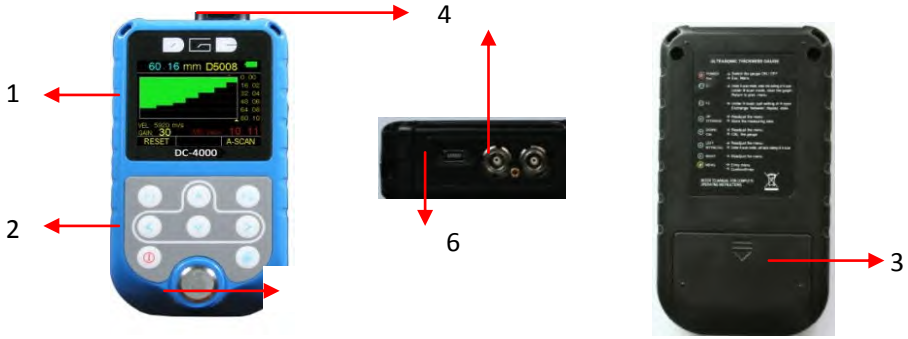
2. Standard Delivery

- Main Unit
- Echo-Echo transducer (D5301)
- 75ML Couplant
- Build-in calibration block (Thickness=4mm, Velocity = 5920m/s)
- USB Cable
- Carrying case
- Operating manual
- Calibration Certificate

3. Technical Specifications

Measurement range	E-E: 3.00mm～25.00mm T-E: 0.65mm～400.00mm
Resolution	0.01mm(0.001inch), 0.1mm (0.01inch)
Optional probes	E-E:D5301(5MHz), T-E:D5008(5MHz), D7006 (7.5MHz), D7004(10MHz), D2012 (2.5MHz) D1025 (1MHz), D5113(5MHz,High-Temp.)
Velocity range	1000m/s～9999m/s
Measurement rate	2 /s and 10/s in fast mode
Average mode	2 to 9 times average measurement
Limited setting	With Low-high indication and alarm
Measuring Units	mm / inch
Memory	Memory of 10,000 readings in 100 files
Data output	USB to PC without software
Display	320×240 TFT Color LCD
Battery	2 x AA Batteries
Operating	-20℃～+50℃
Measuring temp.	-20℃～+350℃(according to transducers)
Dimensions	133mm（L）×75mm（W）×29mm（H）
Weight	0.26kg (including batteries)

4. Overview



1. LCD Screen 2. KeyPad 3. Battery Pack
4. Transducer port 5. Standard Test Block 6. USB port

5. Keypad Functions



On & Off Key

Function 1 It is used to power the unit either **ON** or **OFF**.

Function 2 Pressing this key to escape the menu setting and return back to the main measurement screen.

Menu Key

Function 1 It is used to enter the menu and confirm the selection.

Function 2 It is as a shortcut key in A-scan mode. After finish one A-scan measurement (keeping the Parameters field in highlight), press this key to store the current set-up parameters into the CUSTOM SETTING.

F1 Key

Function 1 In A-scan manual mode, it is a toggle button mainly used to set up the parameters **RANGE, GAIN, DELAY, GATE, BLANK** by adjusting the key .

Function 2 In B-scan mode, press this key to clear current gragh And ready for next measurement.

F2 Key

Function 1 Press this key to toggle between display view options- A-Scan, B-SCAN and DIGITS.

Function 2 In A-scan mode, press this key to save current custom setup that has been modified or created by the user.



UP key

Function 1 It is used to navigate the menus and increase values while setting the parameters.

Function 2 In measurement mode, press this key to store the current measurement reading.



DOWN key

Function 1 It is used to navigate the menus and decrease values while setting the parameters.

Function 2 In the measurement mode, it is used as the calibration Key. Put the probe in the air, press this key to complete the calibration.



LEFT Key

Function 1 It is used to navigate the menus and decrease values while setting the parameters.

Function 2 In A-SCAN mode, press this key to enter CUSTOM SETTING screen to open a setup that has been saved before.

Function 3 In B-Scan mode, press this key to control the thickness reading indicator(the small yellow triangle).



RIGHT Key

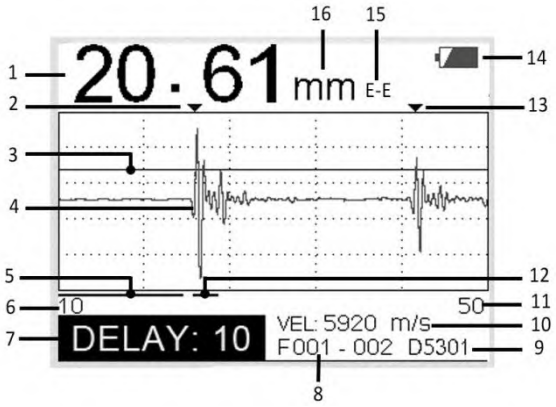
Function 1 It is used to navigate the menus and increase values while setting the parameters.

Function 2 In DIGIS and A-SCAN mode, the readout will be changed between mm to inch by pressing this key.

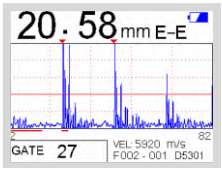
Function 3 In B-Scan mode, press this key to control the thickness reading indicator(the small yellow triangle).

6. Display Screen

A-SCAN MODE



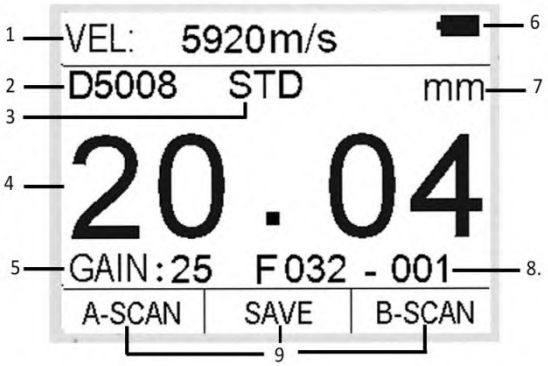
Full wave



Half+ wave

1. **Thickness reading -** Digital readout of thickness. Display with white color means in testing, with blue color means frozen.
2. **The 1st back wall indicator -** The Red▼ indicates the first back wall
3. **Gate indicator -** The red line can be adjusted up or down.
4. **Full waveform -** Display with green color means in testing, with blue color means In frozen)
5. **Blank indicator -** The length of Red line changes with the BLANK number adjusted.
6. **Delay value indicator**
7. **Parameters field -** Gain, Delay, Blank, E-blank, Range adjustable
8. **Memory location -** Files 100 X 100 data can be stored
9. **Transducer model -** The transducer automatically recognizes and display
10. **Velocity**
11. **End of Range indicator**
12. **E-blank indicator -** The length of Pink line changes with E- BLANK number adjusted.
13. **The 2nd back wall indicator -**The Purple▼indicates the second back wall
14. **Power life**
15. **Measuring mode**
16. **Measuring unit-** millimeters or inches

BIG DIGITS MODE



1. Velocity

2. Transducer model - The transducer automatically recognizes and display

3. Measuring mode

4. Thickness Reading - Digital readout of thickness. Display with white color means in testing, with blue color means frozen.

5. Gain value - Can be adjusted from 10-50

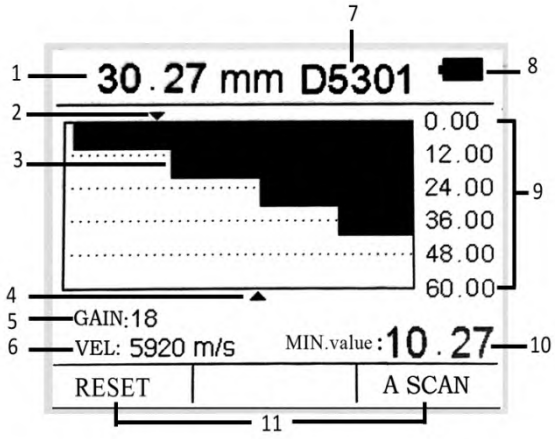
6. Power life

7. Measuring unit - millimeters or inches

8. Memory location - Files 100 X 100 data can be stored

9. Hot menu indicators - Press the corresponding button, easy to converts the display or function.

B-SCAN MODE



1. Thickness reading - Digital readout of thickness. Display with white color means in testing, with blue color means frozen.

2. Min. value indicator - Indicates where the minimum is located.

3. B scan graphic

4. Thickness reading indicator - Indicates where the current thickness reading is Located.

5. Gain value - Can be adjusted from 10-50.

6. Velocity

7. Transducer model - The transducer automatically recognizes and display.

8. Power life

9. B scan display range - Displays the range set in the menu and auto divides into 5 equal parts.

10. Min. value reading - Displays the minimum value of workpiece.

11. Hot menu indicators - Press the corresponding button, easy to converts the display or function.

7. Quick startup guide

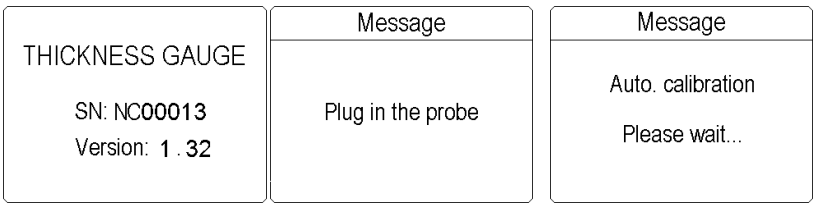
Step one: Selecting the Transducer and Probe zero & calibration

The first step in using DC-4000 is to select the transducer type according to frequency and diameter. The optional transducers and its specification are listed below:

Type	Freq. (MHz)	Dia. (mm)	Meas. Rang (mm)	Working Temp.	Application
D5301	5.0	10	E-E 3.0～25 T-E 1.44～200	<60℃	Used in the measurement through the coating (E-E)and normal measurement (T-E)
D1025	1.0	20	3.0～200 5.0～40 (For fiberglass)	<60℃	Used in the measurement of composite materials, such as fiberglass.
D5008	5.0	8	0.8～300	<60℃	Used in many common measurements
D7006	7.5	6	0.65～50	<60℃	Used in the measurement of thin wall thickness and small curvature surface.
D7004	10.0	4	0.65～20	<60℃	Used in the measurement of thin wall thickness and small curvature surface.
D2012	2.0	14	2.0～400	<60℃	Used in the measurement of coarse particles such as cast iron.
D5113	5.0	13	3.0～200	<350℃	Used in the thickness measurement when the temperature is less than 350℃.

Plug in the suitable transducer; turn the DC-4000 on using the  Key. The gauge does an auto calibration of the transducer, thus eliminating the need for an on-block zero. After turning on the gauge, the screen flashes the Series No. and software version, and then, it comes into the measurement mode directly.

If user turning on the unit without the transducer, screen will remind to "Plug in the probe". At this moment, please insert a transducer into the socket, the gauge directly comes into the measurement mode after Auto calibration.



Note: *Please use the standard transducer offered. Otherwise the unit does not work normally and displaying "Error".*

If user feel the thickness reading is incorrect during the measurement, please put the probe in the air, and press  for zero calibration at any time.

Note: *For Auto calibration, Make sure the transducer is not coupled to the test piece when the gauge is first turned on and that there is no couplant on the end of the transducer. The transducer should also be at the room temperature, clean without any noticeable wear.*

Step Two: Treatment of the measured surface

When the surface to be measured is too rough or rusty heavily, please perform the treatment according to the following methods:

1. Clean the measured surface by grinding, polishing or filing, etc. or use coupling agent with high viscosity for that.
2. Use coupling agents on the workpiece surface to be measured.
3. Take multiple measurements around the same testing point.

Step Three: Setting velocity

Sound velocity plays an important role in measurement. Different material is of different sound velocity. When the sound velocity is incorrect, it will cause wrong measured results. There are 3 ways to set the material's sound velocity, which are:

1. Directly select preset material velocity. Please refer to 8.2.1.2 on page 3.
2. Input the new velocity which is not preset into the menu. Please refer to 8.2.1.3 on page 4.
3. Get the accurate sound velocity of the workpiece which the thickness is known. Please refer to 8.2.1.4 on page 4.

Step Four: Measurement

The DC-4000 is now ready to measure. There are four different measurement view options, A-Scan RF+, A-Scan HALF+, B-Scan and DIGITS, each with a specific purpose.

A-Scan RF+: It shows both the positive and the negative peaks.

A-Scan HALF +: It shows the positive.

B-Scan: It displays a time based cross section view of test material.

DIGITS: It is a basic digital thickness gauge look and feel. The color and larger digits make it much easier for the operator to monitor the thickness readings.

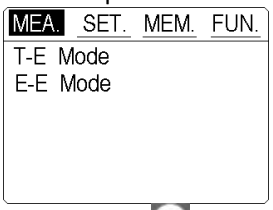
User can toggle between the different view mode options by pressing 

.

8. MENU

8.1 MEA. (Measurement)

DC-4000 provides two measurement modes, T-E mode and E-E mode.

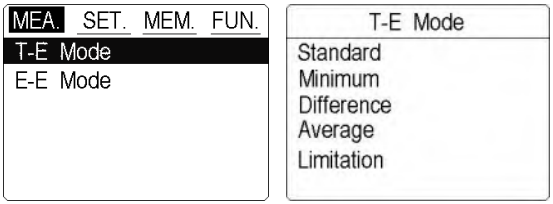


1) Press the key to illuminate **MEA.**

2) Press or to select T-E or E-E mode, Press to confirm.

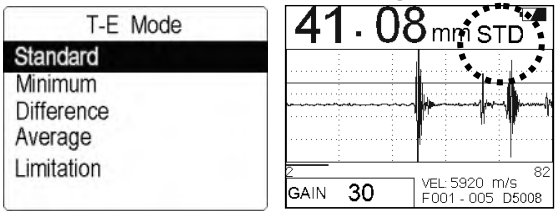
8.1.1 T-E Mode:

When T-E mode is selected, all probes are available. And measurement modes of Standard, Minimum, Difference, Average and limitation can be selected.



1 .Standard Measurement:

With this function, DC-4000 displays the current measurement value, satisfied with the normal measuring needs.



The following pages outline how to enable and set up this feature.

1) Press the key to illuminate **MEA.**

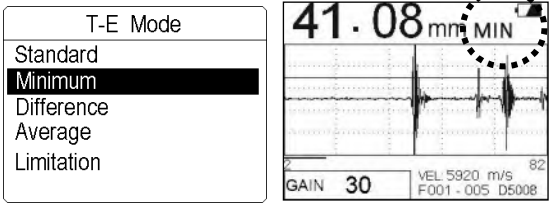
2) Use keys to scroll through the sub menu items until **Standard** is highlighted. Press the key to confirm.

3) Press the key to exit setting and DC-4000 is now ready to perform measurements.

2. Minimum Measurement:

When taking measurements, DC-4000 displays the smallest thickness reading it found. It is suitable for testing the curvature surface or needs to get the minimum value which is widely used in the measurement of pipeline.

Note: it is not recommended to use this function when measuring cast iron or alloy materials.



The following pages outline how to enable and set up this feature.

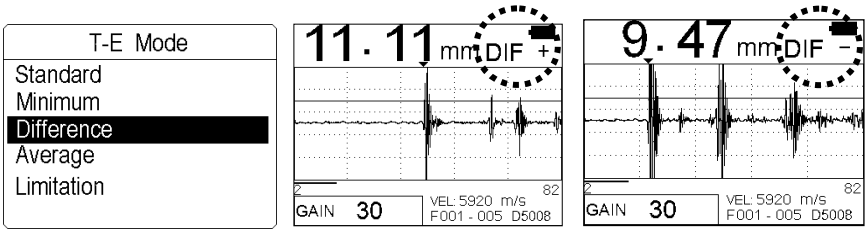
1) Press the key to illuminate **MEA.**

2) Use keys to scroll through the sub menu items until **Minimum** is highlighted. Press the key to confirm.

3) Press the key to exit setting and DC-4000 is now ready to perform measurements.

3. Difference mode:

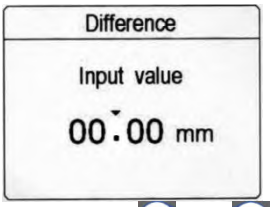
In the quality Control environment, it is sometimes necessary to know the difference between a nominal (target) thickness value and an actual thickness value. With the Difference mode enabled, DC-4000 will display the positive (+)or negative(-) difference from an entered nominal value.



The following pages outline how to enable and set up this feature.

1) Press the key to illuminate **MEA.**

2) Use keys to scroll through the sub menu items until **Difference** is highlighted. Press the key to confirm. The Display shows as follows:



3) Press the  or  key to move the cursor,

4) Press the  or  key to change the numbers and Dot position. The value could be set as 0.000, 00.00 and 000.00. The 1st and the last position can be set numbers 1-9 as a circle. The 3rd positions can be set numbers 1-9 and dot as a circle.

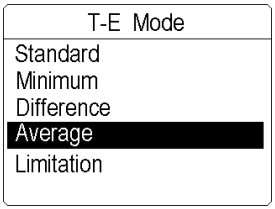
5) Press the  key to confirm.

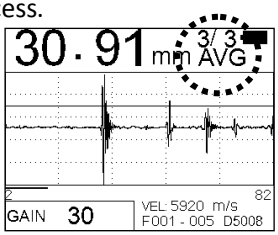
6) Press the  key to exit setting and DC-4000 is now ready to perform measurements.

Note: *500.0 is the Max. value can be set. If User sets the value exceeding the max. value, the unit will correct it as 500.0 automatically.*

4. Average mode:

With this function, DC-4000 displays the average value of 2 to 9 measured points. It can help user to check the surface planeness of flat board and their manufacturing process.





The following pages outline how to enable and set up this feature:

1) Press the  key to illuminate **MEA.**

2) Use     keys to scroll through the sub menu items until **Average** is highlighted. Press the  key to confirm. The Display shows as follows:



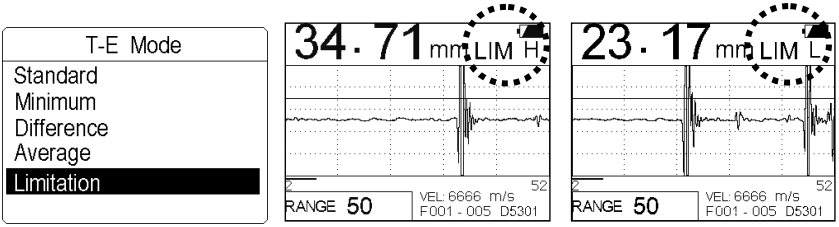
3) Press the  or  key to change the numbers among 2 to 9,

4) Press the  key to confirm.

5) Press the  key to exit setting and DC-4000 is now ready to perform measurements.

5. Limitation Mode

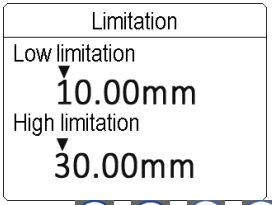
This function allows the user to set an audible and visual (Hi/Lo) parameter when measurements. If the measurement falls below or above the HI/LO limits, set by the user, the red H or green L will be displayed and the beeper sounded. This improves the speed and efficiency of the inspection process by eliminating constant viewing of the actual reading displayed.



The following pages outline how to enable and set up this feature:

1) Press the  key into **MEA.**

2) Use  keys to scroll through the sub menu items until **Limitation** is highlighted. Press the  key to confirm. The display shows as follows:

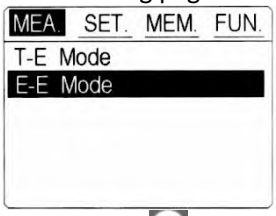


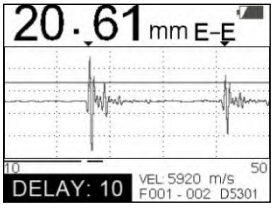
3) Use  keys to set the low / high limitation. The value could be set as 0.000, 00.00 and 000.00. The 1st and the last position can be set numbers 1-9 as a circle. The 3rd positions can be set numbers 1-9 and dot as a circle. Press the  key to confirm.

4) Press the  key to exit setting and DC-4000 is now ready to perform measurements.

8.1.2 E-E Mode

The E-E (echo-echo) mode allows the user to measure the thickness of metals that have been previously coated or painted on the surface. This enables the user to determine the thickness of the metal without having to remove the paint. When E-E mode is selected, only probe D5301 is available. The following pages outline how to enable and set up this feature:

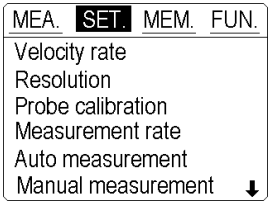


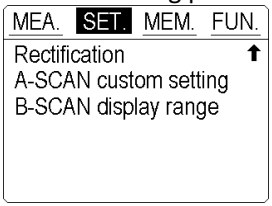


1) Press the key to illuminate **MEA.**
2) Use keys to scroll through the sub menu items until **E-E** is highlighted. Press the key to confirm.
3) Press the key to exit setting and DC-4000 is now ready to perform measurements.

8.2 SET.

This function allows user to set following parameters of measurement.

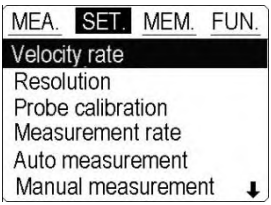


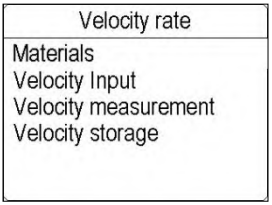


The following pages outline how to enable and set up these parameters.

8.2.1 Velocity rate

Sound velocity plays an important role in measurement. Different types of material have different inherent sound velocities. If the gauge is not set to the correct sound velocity, all of the measurements the gauge makes will be erroneous by some fixed percentage.





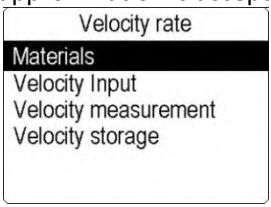
If the name or sound-velocity of the material to be measured is known, the user could select material name directly in the menu **Materials.** Or input the known velocity in the menu **Velocity Input.**

And the user could measure the sound velocity by using the function **Velocity measurement** If the sound-velocity of the material to be measured is unknown, but the exact thickness of which is know.

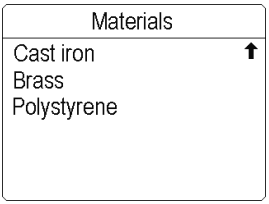
1. Materials

The DC-4000 presets 9 common materials' sound velocity. They are: aluminum, titanium, steel, stainless steel, glass, copper, cast iron, brass, polystyrene.

The user may opt to choose such basic material type from the menu. It's important to note that these velocities will not always be an exact representation of the material being tested. Use these values only if a close approximation is acceptable.





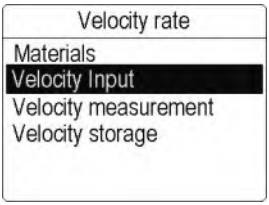


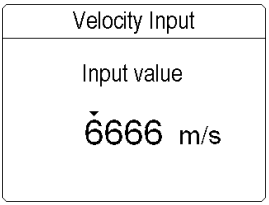
The following pages outline how to enable and set up this feature:

1) Press the key to illuminate **SET-Velocity rate-Materials,**
2) Use keys to scroll through the sub menu items until The target material is highlighted. Press the key to confirm.
3) Press the key to exit setting and DC-4000 is now ready to perform measurements.

2. Velocity input

If the material velocity is known, the user may wish to simply enter the velocity number into the DC-4000, rather than have the DC-4000 calculate the velocity value on using a know thickness. And DC-4000 also can store 4 new velocities as custom.





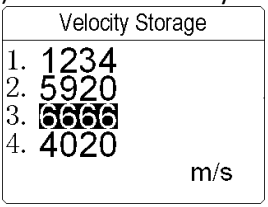
The following pages outline how to enter the velocity:

1) Press the key to illuminate **SET-Velocity rate,**

2) Use keys to scroll through the sub menu items until **VELOCITY INPUT** is highlighted. Press the key to confirm.

3) Press the or key to move the cursor, Press the or Key to change the numbers,

4) Press the key to confirm and store it into **Velocity Storage,**



5) Press the or key to Illuminate the place where want to store, Press the key to confirm.

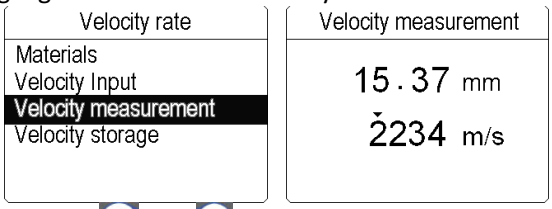
6) Press the key to exit setting and DC-4000 is now ready to perform measurements.

3. Velocity measurement

Sometimes the sound velocity of a material is not known. In this case a sample with a known thickness can be used to determine the sound velocity. It would be very handy to carry a set of mechanical calipers to use in conjunction with the DC-4000 in the field.

The following steps outline how to enable and set up this feature:

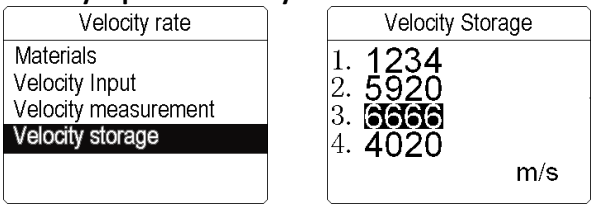
1) Physically measure an exact sample of the material or a location directly On the material to be measured using a set of calipers or a digital micrometer.
2) Apply a drop of couplant on the transducer and place the transducer in steady contact with the sample or actual test material.
3) The display should show a thickness reading (probably incorrect).
4) Having achieved a stable reading, remove the transducer. (If the Displayed thickness changes from the value shown while the transducer Was coupled, repeat step 3.)
5) Press the key to illuminate **SET,** Use keys to scroll through the sub menu items until **Velocity Measurement** is highlighted. Press the key to confirm.



6) Press the or key to move the cursor, press the or key to adjust the displayed velocity up or down, until the thickness value displayed matches the thickness of the sample piece. And now the displaying sound velocity value is accurate.
7) Press the key to confirm and store it into **Velocity Storage,**
8) Press the or key to Illuminate the target place, Press the key to confirm.
9) Press the key to exit setting and DC-4000 is now ready to perform measurements.

4. Velocity storage

It allows user to store 4 new Velocities as custom and use it in future measurement. User can get the custom velocities by the features of **Velocity input** or **Velocity measurement**.



The following steps outline how to enable and set up this feature:

1) Press the key to illuminate **SET-VELOCITY RATE**

2) Use keys to scroll through the sub menu items until **Velocity storage** is highlighted. Press the key to confirm.

3) Press key to illuminate the target velocity, Press to confim.

4) Press to exit and DC-4000 is now ready to perform measurements.

8.2.2 Resolution

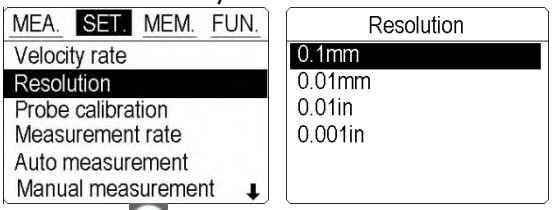
User can select the displayed resolution. When 0.01mm or 0.001 inch be selected, the workpiece surface to be measured should be smooth for the purpose of getting an accurate value.

The following pages outline how to enable and set up this feature:

1) Press the key to illuminate **SET.**

2) Use keys to scroll through the sub menu items until **Resolution** is highlighted. Press the key to confirm.

3) Press key to select resolution and unit. Press to confirm.



4) Press the key to exit setting and DC-4000 is now ready to perform measurements. ***Notice:*** *It is recommended to use 0.1 mm or 0.01in when probe D5113 or D2012 is selected.*

8.2.3 Probe Calibration

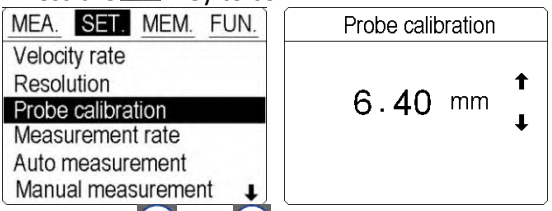
It causes error during the primary stage of usage or operate for long time. User should make probe calibration during following three aspects are happened.

1. The probe itself or the temperature variation,
2. System error caused by the match between the unit and the transducer,
3. Calculation error caused by the sound velocity set in the unit is different from that of the actual material.

This feature requires a sample piece of the specific material to be measured, the exact thickness of which is known. E.g. from having been measured by some other means. Or to use the build-in standard test block (4MM) comes with DC-4000.

The following steps outline how to enable and set up this feature:

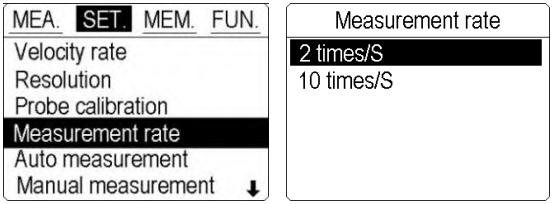
1) Apply a drop of couplant on the transducer and place the transducer in steady contact with the sample or standard test block.
2) Having achieved a stable reading, remove the transducer.
3) Press the key to illuminate **SET,** Use keys to Scroll through the sub menu items until **Probe calibration** is highlighted. Press the key to confirm.



4) Press the or key to adjust the displayed reading up or down, until the thickness value displayed matches the thickness of the test block or sample piece. Press the key to confirm.
5) Press the key to exit setting, Test the block or sample piece again to verify the result.

8.2.4 Measurement rate

The DC-4000 performs measurement of 2 times/second and 10 times / second. 2 times/second is quite adequate for single measurements. And 10 times/second is recommended to measure the high temperature surfaces.

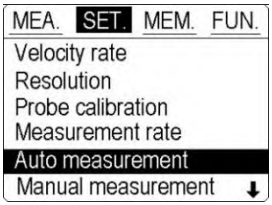


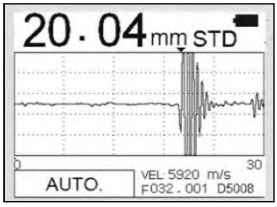
The following steps outline how to enable and set up this feature:

1) Press the key to illuminate **SET**
2) Use keys to scroll through the sub menu items until **Measurement rate** is highlighted.
3) Press the or key to select **2 times/S** or **10 times/S**. Press the key to confirm.
4) Press the key to exit setting and DC-4000 is now ready to perform measurements.

8.2.5 Auto measurement

This feature is recommended to measure some basic materials. All parameters are preset according to the different transducers. For A-scan mode, it is a convenient way to let DC-4000 find the detection point and bring the waveform signal into view automatically.





The following steps outline how to enable and set up this feature:

1) Press the key to illuminate **SET**
2) Use keys to scroll through the sub menu items until **Auto measurement** is highlighted. Press the key to confirm.
3) Press the key to confirm.
4) Press the key to return to the measurement screen and began Taking readings. There is **Auto** displayed on the left down corner of screen.

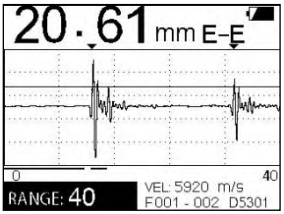
8.2.6 Manual measurement

This feature allows user to make fine adjustment of RANGE, GAIN, DELAY, GATE, BLANK, and E-BLANK manually in A-SCAN mode. They can be set through toggle the HOT MENUS what is displayed at the lower left side of the screen.

And once the above mentioned parameters are set, it will remain the same for B-SCAN and DIGITS display.

Range

The range refers to the overall viewable range being displayed on the screen. Make change the range of display, shorten or enlarge it, finally serve User conveniently.



The following steps outline how to enable and adjust the RANGE.

1) Press F1 once to illuminate **RANGE.**

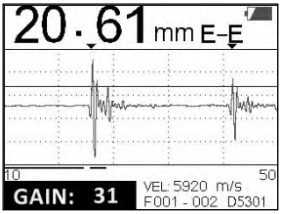
2) Use keys (+1), (-1), (-coarse adjustment), (+ coarse adjustment)to adjust value.

Gain

The gain can be adjusted over a wide range. The setting of the gain is crucial in order to obtain valid reading during the measurement process. Too much gain may result in erroneous measurements, by detecting on noise rather than the actual material back wall itself. Too little gain may result in detection on an undesirable section of the waveform.

The gain will also be represented in both the B-SCAN and DIGITS views.

The following steps outline how to enable and adjust the GAIN.



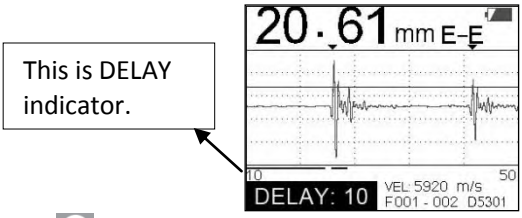
1) Press F1 once to illuminate **GAIN.**

2) Use keys (+1), (-1), (-coarse adjustment), (+ coarse adjustment)to adjust value.

Delay

The starting DELAY is the value displayed on the bottom lower left side of the display in both RF+ and HALF+ views. It is the minimum thickness value that can be viewed on the display.

The following steps outline how to enable and adjust the DELAY.



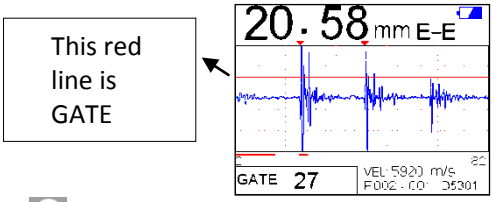
1) Press F1 once to illuminate **DELAY.**

2) Use keys (+1), (-1), (-coarse adjustment), (+ coarse adjustment)to adjust value.

Gate

GATE is used in both T-E and E-E modes. The purpose of GATE is to force DC-4000 to measure the useful echo wave.

The following steps outline how to enable and adjust the GATE.



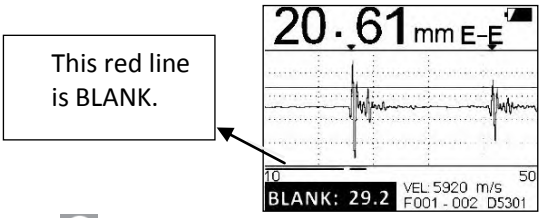
1) Press F1 once to illuminate **GATE.**

2) Use keys (+1), (-1), (-coarse adjustment), (+ coarse adjustment)to adjust value.

Blank

BLANK is used in T-E mode. Make change of Blank to conceal those useless echoes that influence measuring result. When making changes, the red line at the left bottom conner changes accordingly. User could take it as for reference and achieve the best measuring effect.

The following steps outline how to enable and adjust the BLANK.



1) Press F1 once to illuminate **BLANK.**

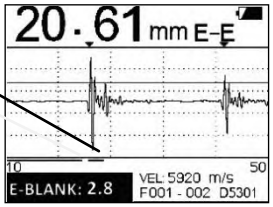
2) Use keys (+1), (-1), (-coarse adjustment), (+ coarse adjustment)to adjust value.

E-Blank

E-BLANK is used in E-E mode. Make change of E-Blank to conceal useless echoes from the first useful echo to the range setting by User, so that User could achieve good test result. When making changes, the pink line changes accordingly, User could take it as for reference and achieve the best measuring effect.

The following steps outline how to enable and adjust the E-BLANK.

This Pink line is E-BLANK



Saving the setting

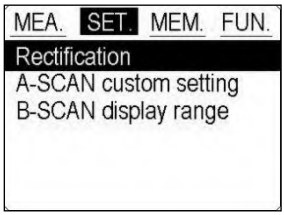
Once all the parameters are set, there is two ways to save the setting.

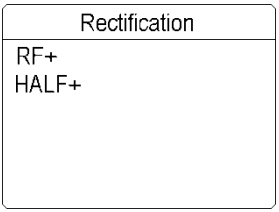
1) The user can Press F2 to store this setting into the current location. When turn on the gauge next time, this setting will be displayed.

2) Or the user can Press to store this setting into the **A-SCAN CUSTOM SETTING** for further use while measuring the same workpiece.

8.2.7 Rectification

DC-4000 supply two display views of A-Scan. RF+ mode shows both the positive and the negative peaks. HALF+ mode shows the upper of complete waveform only.





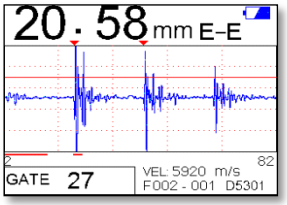
The following steps outline how to select the RECTIFICATION.

1) Press the key to illuminate **SET**

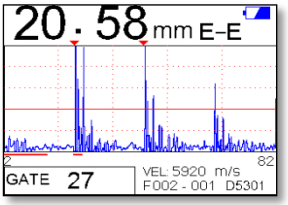
2) Use keys to scroll through the sub menu items until **RECTIFICATION** is highlighted. Press the key to confirm.

3) Press key to select RF+ or HALF+,

4) Press to confirm and return to the measurement screen and bigan taking readings.



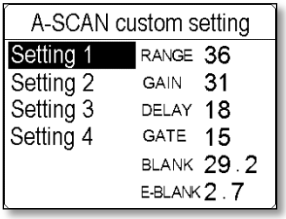
RF+



HALF+

8.2.8 A-SCAN custom setting

DC-4000 can store 4 A-SCAN custom settings. This feature saves a great deal of time and knowledge for future inspection of the same job or project. Also it eliminates error between two or more users during the setup and calibration process.

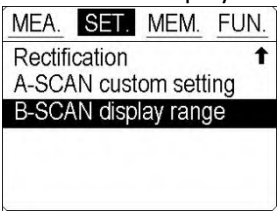


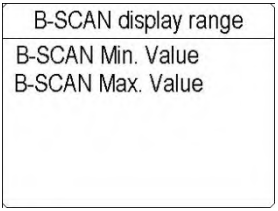
The following steps outline how to open/store an A-SCAN CUSTOM SETTING.

1. Opening a custom setting.
   1) Press the key to illuminate **SET**
   2) Use keys to scroll through the sub menu items until **A-SCAN CUSTOM SETTING** is highlighted. Press the key to confirm.
   3) Press key to select target setting.
   4) Press to confirm and return to the measurement screen and Began taking readings.
2. Store a custom setting
   Once the DC-4000 parameters and features have be adjusted for an application, the user can Press to save this setting to any one of 4 custom setting locations.

8.2.9 B-SCAN display range

It's important to note that the measurement range of B-scan on the display be set wide enough, so that the Maximum thickness of the material can be viewed on the display.



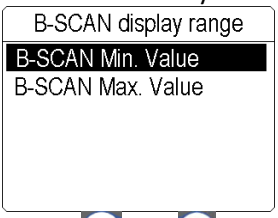


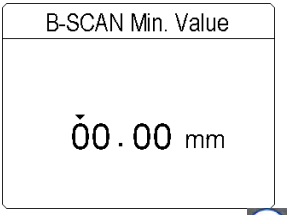
The following steps outline how to set the B-SCAN DISPLAY RANGE.

1) Press the key to illuminate **SET**

2) Use keys to scroll through the sub menu items until **B-SCAN DISPLAY RANGE** is highlighted. Press the key to confirm.

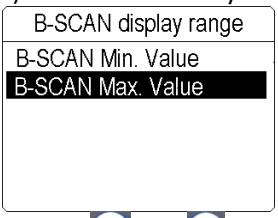
3) Press key to select **B-SCAN MIN.VALUE**,

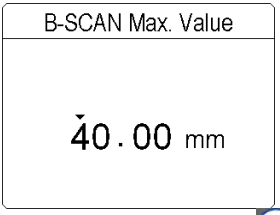




4) Press or to move the cursor, press or to change numbers, Press to confirm.

5) Press key to select **B-SCAN Max.VALUE**,



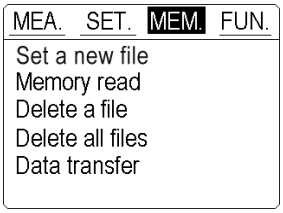


6) Press or to move the cursor, press or to change numbers, Press to confirm.

7) Press again to return to the measurement screen. Then Press twice go to B-SCAN interface.

8.3 MEM.

The gauge has a memory capacity of 10,000 measurements in 100 files. The current memory location will be displayed on the screen as F000-000 in both A-scan and DIGIS mode. The files are numbered from 1-100, and measurement number will be followed automatically from 001.
This feature allows user to complete following function:



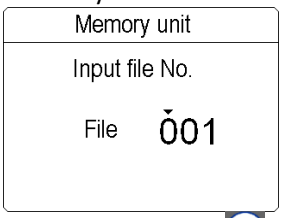
8.3.1 Set a new file

The following steps outline how to set a **new memory file.**

1) Press the key to illuminate **MEM.**

2) Use keys to scroll through the sub menu items until **set a new File** Is highlighted. Press the key to confirm.





3) Press or to move the cursor, Press or set the file Number (001-100 can be set), Press to confirm.

4) Press to return to the measurement screen.

NOTE: After taking every measurement, press key to store this reading with a location number.

8.3.2 Memory Read

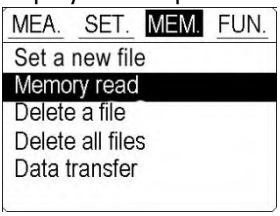
It is sometimes necessary to go back and view the stored readings. The following procedures outline how to read memory.

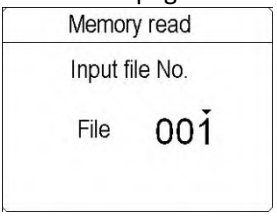
1) Press the key to illuminate **MEM.**

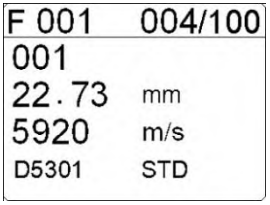
2) Use keys to scroll through the sub menu items until **Memory read** is highlighted. Press the key to confirm.

3) Press to move the cursor, Press to set the target File

Number. Press to confirm. All stored readings in this file will be Displayed. And press or to page forward or backward.





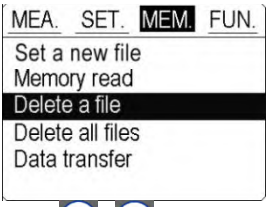


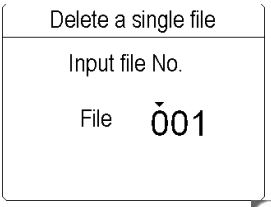
8.3.3 Delete a file

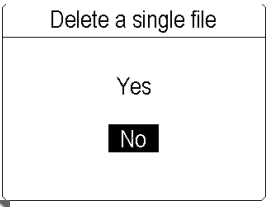
1) Press the key to illuminate **MEM.**

2) Use keys to scroll through the sub menu items until **Delete a file** Is highlighted. Press the key to confirm.

3) Press to move the cursor, Press to set the target File Number. Press to confirm.







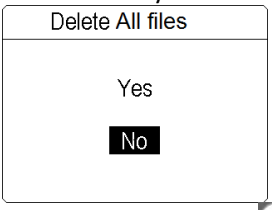
4) Use keys to select YES or NO, press key to confirm.

8.3.4 Delete all files

1) Press the key to illuminate **MEM.**

2) Use keys to scroll through the sub menu items until **Delete all files** is highlighted. Press the key to confirm.





3) Use keys to select YES or NO,press key to confirm.

8.3.5 Data Transfer

The data can be transferred to PC using USB cable. Then User could copy them into DOC. ,TXT. Or Excel for further analysis. Procedure is as follows:

1) Press the key to illuminate **MEM.**

2) Use  keys to scroll through the sub menu items until **Data transfer** Is highlighted. Press the  key to confirm.

3) Connect the DC-4000 with PC using the cable which comes with the standard delivery; then a new disk will be shown on the PC.

4) Open the new disk, double click DATA File and all files stored in DC-4000 will be shown as .TXT document.

5) Double click one file to open it, user could copy the data into Word, Excel For further analysis.

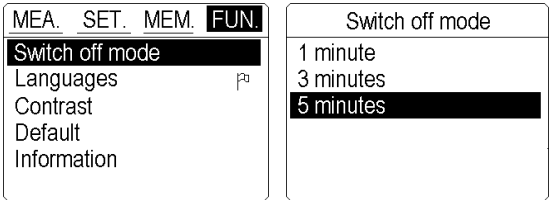
8.4 FUN.

It allows user to adjust follwing functions:



8.4.1 Swich off mode

Auto shut down after 1 Min. 3 Min. 5 Min. can be selectable.



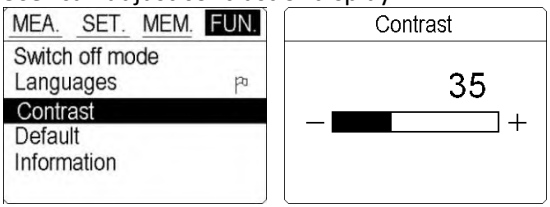
8.4.2 Languages

The gauge provides muti-languages for selection.



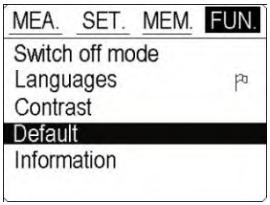
8.4.3 Contrast

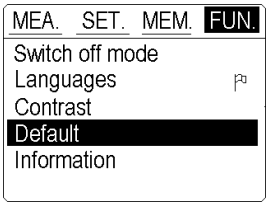
User can adjust contrast of display.

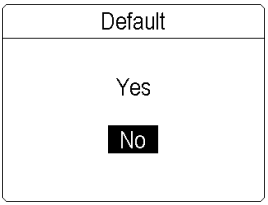


8.4.4 Default

During the usage, when User can not ensure why the problems comes out and with some questions on setting, he can use this function to make the parameters to restore the factory status to eliminate any abnormal because of the parameters setting.

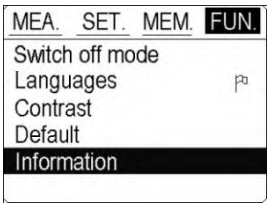


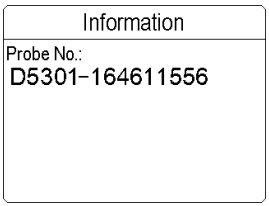




8.4.5 Information

The screen displays the Transducer Number.





9. Measuring technology

9.1 Measuring methods

The unit provides many measuring methods.

1. Single point measuring method: use the probe to measure any point Of the workpiece to be measured and the displayed value is the thickness.
2. Two point measuring method: Perform two measurements on the Same point of the measured surface, in the second measurement, Splitting plane of the probe should be 90 degree, take the minimum as The thickness value.
3. Multiple point measurement method: perform several measurements In a circle about 30mm in diameter and take the minimum value as the thickness value.
4. Continuous measurement methods: apply the single point Measurement method, and take measurements continuously along the designated route, the intervals should be less than 5mm, and take the minimum value as the workpiece's thickness.

9.2 Pipeline measurement method

During the measurement, make the probe's crosstalk interlayer plate be perpendicular or parallel to the axial line of the pipeline. For a pipeline with larger diameter, the probe's crosstalk interlayer plate should be perpendicular to the axial line of the pipeline, but for pipeline with small diameter, User should perform measurements making the crosstalk being both parallel and perpendicular to the axial line of the pipeline and take the minimum readout as the thickness value.

10. Maintenance and precautions

10.1 Power check

When the power is low, the low battery indicator will appear, at this moment User should replace the battery in time, or it will affect the measuring accuracy. The backlight cannot be switched on for a long time, because it is a big consumer of electricity.

Note: if the unit did not used for a long time, please take out of the battery to avoid leakage to damage the unit.

10.2 Precautions

10.2.1 General precautions

The unit should avoid strong vibration, do not let it in an excessively humid environment, plug in or out the probe should hold the jacket to avoid the core wire of the probe damaged.

10.2.2 Precaution during the measuring

1. During the measurement, only the measuring icon appears and displayed stable, it can be regarded as a good measurement.
2. If there are large quantity coupling agents attached on the measured surface, when taking away the probe, it will cause error, so when the measurement is completed, please move the probe away from the measured surface quickly.
3. If the probe wears out, it will cause the displayed value unstable, please replace the probe.

APPENDIX : Sound Velocity Measurement Chart

Material	Sound Velocity	
	M/s	Inch/μS
Air	330	0.013
Aluminum	6300	0.250
Alumina Oxide	9900	0.390
Beryllium	12900	0.510
Boron Carbide	11000	0.430
Brass	4300	0.170
Cadmium	2800	0.110
Copper	4700	0.180
Glass(crown)	5300	0.210
Glycerin	1900	0.075
Gold	3200	0.130
Ice	4000	0.160
Inconel	5700	0.220
Iron	5900	0.230
Iron (cast)	4600	0.180
Lead	2200	0.085
Magnesium	5800	0.230
Mercury	1400	0.057
Molybdenum	6300	0.250
Polyurethane	1900	0.0700
Polythylene	1900	0.070
Polystyrene	2400	0.0930
Quartz	5800	0.230
Rubber, Butyl	1800	0.070
Silver	3600	0.140
Steel, Mild	5920	0.233
Steel, Stainless	5800	0.228
Teflon	1400	0.060
Tin	3300	0.130
Titanium	6100	0.240
Tungsten	5200	0.200
Uranium	3400	0.130
Water	1480	0.584
Zinc	4200	0.170