

Ultrasonic Thickness gauge

DC3000 v7.04

Instruction Manual



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1. General Description

The DC3000 Ultrasonic Thickness Gauge is our new and improved readout unit with automatic probe recognition, automatic zeroing and a larger, more easily read LCD. It is a Multi-Mode thickness gauge that has the ability to measure through painted or coated surfaces and eliminate the thickness of the paint using a dual element style transducer in echo-echo mode. This instrument can measure with very high resolution (0.01 mm or 0.001 inches) the thickness of metallic and non-metallic materials such as steel, aluminum, titanium, plastics, ceramics, glass and any other good ultrasonic wave conductor. The DC3020 accurately displays readings in either inches or millimeters.

2. Technical Specifications

Measurement range	T-E : 0.65mm~400.00mm E-E: 4.00mm~25.00mm
Resolution	0.01mm(0.001"), 0.1mm (0.01")
Velocity range	1000m/s~9999m/s
Measurement rate	4 /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
Display	128×64 LCD with back light
Battery	2 x AAA Batteries
Operating	-20°C ~+50°C
Measuring temp.	-20°C ~+350°C (according to the probes)
Dimensions	116mm (L) ×64mm (W) ×27mm (H)
Weight	0.22kg (including batteries)

3. Standard Delivery

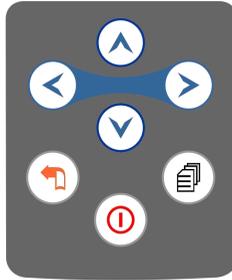
- Main Unit
- Standard 5MHz transducer (D5301)
- 4 oz Couplant
- Two AAA batteries
- Build-in calibration block
- Carrying case
- Operating manual
- Certificate

4. Overview the Display Unit



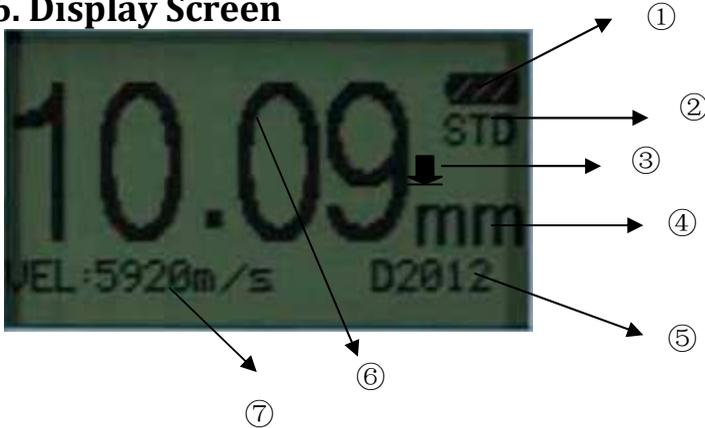
1. LCD Screen
2. Key Pad
3. Battery Pack
4. Transducer port
5. Standard Test Block

5. Keypad Functions



Key		Function
	- On/ Off Key - Esc. Menu	Press this key to switch on or off . Press this Key to Escape the Menu.
	- Menu Key - Confirm Key	Press This Key to the operation Menu. Press this Key to confirm the selection.
	- Return Key - Storage Key	Press this key to previous menu Press this key to store the measurement. (Under the measurement)
	- Up arrow Key - Backlight Key	Achieve switch among the menu options in the menu operation Press this key to switch on or off the backlight
	- Down arrow Key - Calibration Key	Achieve switch among the menu options in the menu operation. Put the probe in the air, press this key to complete the calibration. (Under the measurement)
	- Left arrow key	Achieve switch among the menu options in the menu operation. (under the measurement)
	-Right arrow key	Achieve switch among the menu options in the menu operation. (under the measurement)

6. Display Screen



- ①  Battery Life
- ② Current measurement mode
- ③  Measuring Symbol
- ④ Measuring Unit
- ⑤ Current Transducer model
- ⑥ Measurement Value
- ⑦ Current Velocity

7. Preparation before measurement

【7.1】 Preparation of the instrument

For the newly purchased instrument, please check the instrument and its accessory according to the “3 standard delivery”. If you find it is not the same as the table listed, please contact the manufacture in time. If the instrument is damaged, please do not use it and contact the manufacture as soon as possible.

【7.2】 Selection of the Probe

Users can select the suitable probe according to the thickness of the workpiece to be measured.

Type	Freq.	Meas. rang	Temp.
D 5301	5.0MHz	E-E 4.0~25mm T-E 1.44~200mm	<60℃
D5008	5.0MHz	0.8~300mm	<60℃
D5113	5.0MHz	3.0~200mm	<350℃
D7006	7.5MHz	0.7~50mm	<60℃
D7004	10.0MHz	0.65~20mm	<60℃
D2012	2.0MHz	2.0~400mm	<60℃

Type	Application
D 5301	Used in the thickness measurement through the coating (E-E)and normal measurement (T-E)
D5008	Used common in many measurements, for example when the measuring surface is flat or with huge curvature, or the thickness of the workpiece is large than 50mm.
D5113	Used in the thickness measurement when the temperature is less than 350℃
D7006	Used in the measurement of thin wall thickness and small curvature surface.
D7004	Used in the measurement of thin wall thickness and small curvature surface.
D2012	Used in the measurement of coarse particles such as cast iron.

【7.3】 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

8. Basic Gauge Operations

【8.1】 Switch on

Select the probe and insert it into the probe socket and then press  to switch on the instrument, the screen displays: the Series No. and the version number.

If you did not insert the probe before switching on the instrument, the screen will prompt you that “Plug in the probe”, at this moment insert the probe into the socket and waiting to go to the measuring status.

Note: Please use the standard provided probe, otherwise the instrument will does not work normally and displaying “Error”.

【8.2】 Probe Zero

The gauge does an automatic zeroing of the transducer thus eliminating the need for an on-block zero. And then the gauge came into the measurement mode directly.

Important: Please make sure the transducer is not coupled to the test piece when the gauge is first turned on and that there is no coolant on the end of the transducer. The transducer should also be at the room temperature, clean without any noticeable wear.

【8.3】 Backlight

Press  to turn on / off the backlight.(Under the measurent state)

【8.4】 Parameters setting

【8.4.1】 Measurement Mode

There are 3 measuring modes provided, T-E mode , E-E mode and Scan Mode. Users can select different measuring modes according to their requirements and measuring environments.

Press  into the measurement mode setting

Press  or  to select desired measurement mode

Press  to confirm selection,

Press  to Esc. Menu and into the measurement.

8.4.1.1 T-E Mode:

When the T-E mode is selected, all probes are available, and users can select following measuring modes:

Stand. Measurement:

Display the current value, satisfied with the normal measuring needs.

Min. Measurement:

Among one measurement, display the point. It is suitable for testing the curvature surface or needs to get the minimum value which is widely used in the thickness measurement of pipeline.

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

Differ. mode:

Display the accurate differential value between the measured value and reference value set by the users, suitable for quality check to identifying the qualified products, whose thickness is in the admissible error.

Average mode:

Provides the average value of 2 to 9 measured points and display it suitable for testing the flat surface.

Limitation setting:

Set the upper and lower limit, when the measured thickness exceeds the preset limit, it will display and give alarm, this measurement mode is more widely used than differential mode.

8.4.1.2 E-E Mode:

When the E-E mode is selected, only probe D5301 is available. This function allows you to make measurement between two consecutive back wall echoes. Therefore, a good usage of the E-E option is for measuring through coatings to measure only the true metal thickness.

8.4.1.3 SCAN:

It is available for measuring the thickness of test piece with high temperature surface. The gauge will alarm for each fast measurement. And will display the all measured thickness upon the complete measurement finished.

[[8.4.2]] Setting

8.4.2.1 Velocity Rate

Sound velocity played 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 two ways to select the material's sound velocity, which are Velocity selection and Velocity measurement.

8.4.2.1.1 Velocity Selection

The Velocity selection gives the sound velocity of 9 different materials which can be select by yourself. The 9 materials are: aluminum, titanium, steel, stainless steel, glass, copper, brass, polystyrene, cast iron.

Press  into "VEL. SETTING" state

Press  or  to detect.

Press  to confirm.

Note: the 9 values are just the theoretic values, if users want to get accurate measurements , please refer to the " Velocity measurement" and get the more accurate sound velocity.

8.4.2.1.2 Velocity measurement

When the sound velocity of 9 materials is not satisfied with the requirements of the users, there is a sound velocity table which give the sound velocity of various materials in the appendix. Use this table to set the correct sound velocity. The usage is as follows:

Press  key into the menu- "SETTING"- "Vel. Rate"- "Vel measurement",

Press  or  to move the arrow, press  or  to put the new velocity,

Press  into “Vel. Custom”,

Press  or  to select the place where you want to store,

Press  to confirm.

Because the workpiece is made from various materials and even the same material with different content and processing technology, the sound velocity will be changed and this change will cause the measuring error. If the error is not enough to influence the measuring accuracy, it can be neglect, otherwise it is necessary to get the accurate sound velocity of the workpiece to be measured. The “velocity measurement” can be used, the usage is as follows:

Select T-E mode, Velocity can be neglect, and directly measure the sample which thickness is known.

Press  key into the menu- “SETTING”-“Vel. Rate”-“Vel measurement”,

Press  or  to move the arrow, press  or  to up and down the value of velocity to determine the thickness as the same as the value of sample that is measured,

Press  into “Vel. Custom”,

Press  or  to select the place where you want to store,

Press  to confirm.

8.4.2.1.3 Velocity custom

This function allows user to store 4 new velocity Rate.

8.4.2.2 Resolution

Users can select the displayed resolution. When selecting the high accuracy, the workpiece surface to be measured should be smooth, for the purpose of getting a accurate value.

Press  key into “Resolution”,

Press  or  to select resolution and unit.

1. 0.1 mm
2. 0.01 mm
3. 0.01 in
4. 0.001 in

Press  key to enter/confirm

Note: when probe D5113 and D2012 is selected, it is recommended to use 0.1 mm and 0.01in.

8.4.2.3 Calibration

It will cause error during the primary stage of usage and operating, this caused by the following three aspects:

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

In order to eliminate the possible error, please use following calibration method:

Press  into menu

Press  or  into “Calibration”

Measure the test piece with known thickness. Do not move the probe away from the workpiece.

Pressing  or  to adjust the measured value as the same as the value of sample that is measured and then press , the gauge will

[[8.4.3]] Function

Press  into the menu, press  or  into “FUNCTION”, the screen will display:

1. Switch off mode
2. Gain setting
3. Contrast
4. Default
5. Information

Press  or  into the selected item, press  to confirm.

8.4.3.1 Power off

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

8.4.3.2 Gain adjustment

Press  into the “Gain adjustment”, the screen will display:

1. High
2. Medium
3. Low
4. Automatic

Press  or  to select desired item

Press  to confirm.

In the user's measuring environment, both different materials and the same material with different status will have different effects on the accurate and stable measuring. So for different measured objects and different measuring environment, users should adjust the work status of the instrument to meet more measurements.

For many materials and measuring conditions, auto gain adjustment can be used, but for some special measurement, adjusting the instrument's working status is necessary. There are four different working modes: Auto, Low, medium and high.

Auto: match different probe and meets almost all the measuring requirements.

Low: Suitable for high scattering and small attenuation materials,

Medium: Suitable for many measurements,

High: Suitable for high attenuation material

8.4.3.3 Contrast

User can adjust contrast of display.

8.4.3.4 Default

During the usage, when users 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.

8.4.3.5 Information

The screen displays the Supplier info., version number and Transducer Number.

9. Measuring technology

【9.1】 Measuring methods

The instrument 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, users 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 users should replace the battery in time, or it will affect the measuring accuracy. The backlight can not be switched on for a long time, because it is a big consumer of electricity.

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

【10.2】 Precautions

【10.2.1】 General precautions

The instrument 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 1: Sound Velocity Measurement Chart

Material	Sound Velocity	
	Inch/ μ S	M/s
Air	0.013	330
Aluminum	0.250	6300
Alumina Oxide	0.390	9900
Beryllium	0.510	12900
Boron Carbide	0.430	11000
Brass	0.170	4300
Cadmium	0.110	2800
Copper	0.180	4700
Glass(crown)	0.210	5300
Glycerin	0.075	1900
Gold	0.130	3200
Ice	0.160	4000
Inconel	0.220	5700
Iron	0.230	5900
Iron (cast)	0.180	4600
Lead	0.085	2200
Magnesium	0.230	5800
Mercury	0.057	1400
Molybdenum	0.250	6300