Ultrasonic Thickness Gauge DC-3000C Series

Instruction Manual



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1. General Description

The Ultrasonic Thickness Gauge DC-3000C/DC-3020C 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 probe 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 DC-3000C/DC-3020C accurately displays readings in either inches or millimeters.

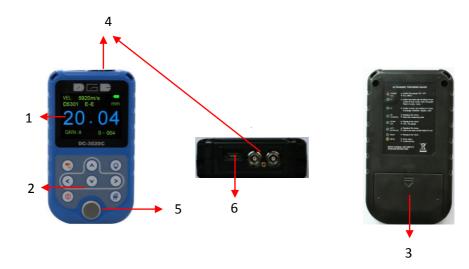
2. Technical Specifications

Measurement range	T-E: 0.65mm~400.00mm E-E: 3.00mm~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		
Memory (DC-3020C)	Memory of 5,200 readings with location number		
Data output (DC-3020C)	USB to PC		
Display	320×240 TFT Color LCD		
Battery	2 x AA Batteries		
Operating temp.	-20°C∼+50°C		
Measuring temp.	-20°C ~+350°C (according to the probes)		
Dimensions	133mm (L) ×75mm (W) ×29mm (H)		
Weight	0.26kg (including batteries)		

3. Standard Delivery

- -- Main Unit
- -- Standard 5MHZ probe D5301
- -- 75ML Couplant
- -- Build-in calibration block
- -- Cable (DC-3020C)
- -- Carrying case
- --Operating manual
- --Certificate

4. Overview the Display Unit



- 1. LCD Screen
- 2. Key Pad
- 3. Battery Pack
- 4. Probe connector
- 5. Standard Test Block
- 6. USB connector

5. Keypad Functions



Key		Function		
- On/ Off Key		P ress this key to switch on or off .		
	- Esc. Menu	P ress this Key to Escape the Menu.		
a	- Menu Key	P ress This Key to enter the Menu.		
- Confirm Key		P ress this Key to confirm the selection.		
4	- Return Key	P ress this key to previous menu (DC-3000C)		
- Storage Key		P ress this key to store current data(DC-3020C)		
	-Contrast -Adjustment	P ress this key to enter menu of Contrast and make adjustment		
△	- Up arrow Key	A chieve switch among the menu options in the menu operation		
	-Down arrow Key	A chieve switch among the menu options in the menu operation.		
V	- Calibration Key	P ut the probe in the air, press this key to complete the manual calibration. (Under the measurement)		
	- Left arrow key	A chieve switch among the menu options in the menu operation. (under the measurement)		
menu		A chieve switch among the menu options in the		
		menu operation(under the measurement)		
		R esolution setting between mm and inch		

6. Display Screen



①Measurement Value

When it is under measurement condition, measurement value is in WHITE color. When users remove the probe, measurement value is frozen on the LCD and it is in BLUE color.

- ②Current Velocity
- ③Current Probe model
- 4 Gain setting
- ⑤ Battery Life
- ⑥Resolution
- ®Current memory location (DC-3020C)

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.

Туре	Freq.	Meas. rang	Temp.	Application
D5301	5.0MHz	E-E 3.0~25mm T-E 1.44~200mm	<60 ℃	Used in the thickness measurement through the coating (E-E)and normal measurement (T-E)
D5008	5.0MHz	0.80~300mm	<60℃	Used common in many measurements
D7006	7.5MHz	0.65∼50mm	<60℃	Used in the measurement of thin wall thickness and small curvature surface.
D7004	10.0MHz	0.65~20mm	<60℃	Used in the measurement of thin wall thickness and small curvature surface.
D2012	2.0MHz	2.0~400mm	<60°C	Used in the measurement of coarse particles such as cast iron.
D5113	5.0MHz	2.0~200mm	<350℃	Used in the thickness measurement when the temperature is less than 350°C

[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 gauge. The screen displays the Series No. and the version No. 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.

Notice: 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 probe thus eliminating the need for an on-block zero. And then the gauge came into the measurement mode directly.

Notice: Please make sure the probe 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 probe. The probe should also be at the room temperature, clean without any noticeable wear.

[8.3] Contrast

Press to easily enter into the contrast adjustment menu. (Under the measurement state)

Press or to make fine adjustment

Press or to make rough adjustment

[8.4] Measurement mode

There are 2 measuring modes provided, T-E mode and E-E 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 T-E Mode:

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

Standard Measurement:

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

Minimum 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.

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

Difference mode: (DC-3020C)

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 admissive error.

Average mode: (DC-3020C)

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

Limitation setting: (DC-3020C)

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.

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 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 (Max. 1mm) to measure only the true metal thickness.

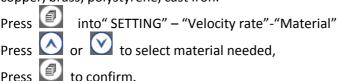
[8.5] Setting

8.5.1 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.

8.5.1.1 Materials

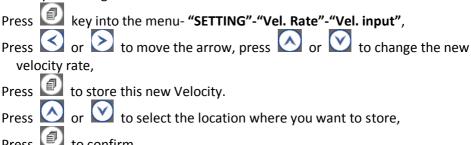
The gauge gives the sound velocity of 9 different materials which can be select by yourself. The 9 materials are: aluminum, titanium, steel, stainless steel, glass, copper, brass, polystyrene, cast iron.



Notice: 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.

8.5.1.2 Velocity input

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



8.5.1.3 Velocity measurement

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 change the value of velocity to determine the thickness as the same as the value of sample that is measured,

Press to store this new velocity,

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

Press to confirm.

8.5.1.4 Velocity storage

This function allows user to store 4 new velocities Rate.

8.5.2 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. 0.00<u>1</u> in

Press key to enter/confirm.

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

8.5.3 Probe 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:

Measure the test piece with known thickness. Get a measurement value,

Press into menu-"SETTING"-"PROBE CALIBRATION",

Press or to adjust the measured value as the same as the value of sample that is measured, Press to confirm.

Notice: Please notice that calibration range is within ± 0.25 mm. If it is out of range, which means users should replace a new probe.

【8.6】Memory (DC-3020C)

Press into the menu, and then go into "Memory", the screen will display

1 Memory unit 2 Memory read 3 Delete memory 4 Data transfer

Press or into the selected item, press to confirm.

8.6.1 Memory unit

The gauge has a memory capacity of 5,200 measurements. The memory location was composed by alphabet A-Z + location number. There are maximum 200 test results in each alphabet. Users could set an Alphabet freely to store the test result.

Press into the menu- "Memory"-"Memory unit",

Press or to select Alphabet A-Z which you want. Press to confirm

Press key to store each test result with a location number after take away the probe from the workpiece each time.

Notice: Users cannot set location number; it begins as 000 and plus 1 automatically after users store each test result.

8.6.2 Memory Read

Press into menu-"Memory"-"Memory read" (Under the measurement)

Press or to select desired Alphabet. Then the desired group of value

can be readable by pressing or

8.6.3 Delete Memory

Press into the menu- "Memory"-"Delete memory"

Press or wo to select "Yes" or "No". Press again to confirm the delete.

8.6.4 Date Transfer

into the menu-"Memory"-"Data transfer"

- to confirm.
- ③Then connect PC with a cable in standard delivery. Meanwhile, LCD of main unit shows "Please keep the gauge and the PC connected" and new disk is auto identified by PC. If it is completed, users double click U disk, then Alphabet shows on the screen of PC;
- (4) Click each Alphabet, users could check the data stored in the form of .TXT or copy to Word or Excel for further analysis.

[8.7] Function

Press into the menu - "FUNCTION", screen shows:

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

Press or into the selected item, press to confirm.

8.7.1 Switch off mode

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

8.7.2 Gain setting

Press into the "Gain adjustment", the screen will display:

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

Press or to select desired item

Press Uto 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

8.7.3 Language

The gauge provides English, Spanish, Portuguese, Japanese and Czech language for selection.

8.7.4 Contrast

User can adjust contrast of display.

Press or to make fine adjustment

Press or to make rough adjustment

8.7.5 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.

8.7.6 Information

The screen displays the version number and Probe Number.

9. Measuring technology

[9.1] Measuring methods

The instrument provides many measuring methods.

- Single point measuring method: use the probe to measure any point of the workpiece to be measured and the displayed value is the thickness.
- ②Two 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.
- ③Multiple 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 cannot 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.
- ②If 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.
- ③If the probe wears out, it will cause the displayed value unstable, please replace the probe.

APPENDIX: SOUND VELOCITY MEASUREMENT CHART

Material	Sound Velocity		
Iviaterial	M/s	Inch/μS	
Air	330	0.013	
Aluminum	6300	0.250	
Alumina Oxide	9900	0.390	
Beryllium	12900	0.510	
oron Carbide	11000	0.430	
rass	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	
Polythylene	1900	0.070	
Polystyrene	2400	0.0930	
Polyurethane	1900	0.0700	
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	