Ultrasonic Thickness Gauge

DC-3000 series

Instruction Manual



V.7.11

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1. General Description

The Ultrasonic Thickness Gauge DC-3000/DC-3020 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-3000/DC-3020 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 (DC3020)	Memory of 5000 readings with location number
Data output (DC3020)	USB to PC
Display	128×64 LCD with back light
Battery	2 x AAA Batteries
Operating	-20℃～+50℃
Measuring temp.	-20℃～+350℃(according to the probes)
Dimensions	116mm（L）×64mm（W）×27mm（H）
Weight	0.22kg (including batteries)

3. Standard Delivery

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

4. Overview the Display Unit



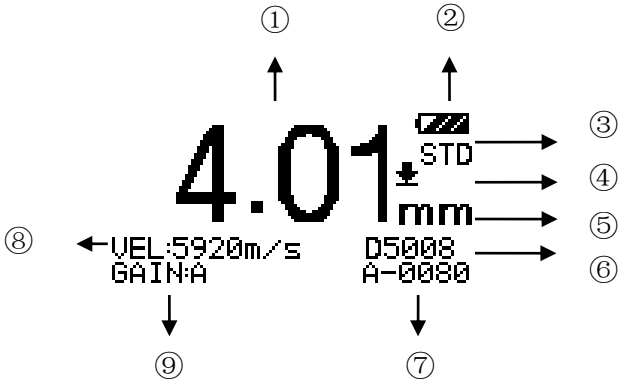
1. LCD Screen
2. Key Pad
3. Battery Pack
4. Probe port
5. Standard Test Block

5. Keypad Functions



Key		Function
	- On/ Off Key	Press this key to switch on or off .
	- Esc. Menu	Press this Key to Escape the Menu.
	- Menu Key	Press This Key to enter the Menu.
	- Confirm Key	Press this Key to confirm the selection.
	- Return Key	Press this key to previous menu (DC3000)
	- Storage Key	Press this key to store current data(DC3020)
	- Up arrow Key	Achieve switch among the menu options in the menu operation
	- Backlight Key	Press this key to switch on or off the backlight
	-Down arrow Key	Achieve switch among the menu options in the menu operation.
	- Calibration Key	Put the probe in the air, press this key to complete the manual 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 Measurement Value
② Battery Life
③ Measurement Mode
④ Measuring Symbol
⑤ Resolution
⑥ Current Probe model
⑦ Current memory location (DC3020)
⑧ Current Velocity
⑨ Gain setting

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 user finds 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.
D5301	5.0MHz	E-E 3.0～25mm T-E 1.44～200mm	<50℃
D5008	5.0MHz	0.8～300mm	<50℃
D5113	5.0MHz	2.0～200mm	<350℃
D7006	7.5MHz	0.65～50mm	<50℃
D7004	10.0MHz	0.65～20mm	<50℃
D2012	2.0MHz	2.0～400mm	<50℃

Type	Application
D5301	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 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 coolant on the end of the probe. The probe should also be at the room temperature, clean without any noticeable wear.

【8.3】Backlight

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

【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 measurement mode setting

Press  or  to select desired measurement mode

Press  to confirm,

Press  to Esc. Menu and into measurement state.

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:

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-3020)

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-3020)

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

Limitation setting: (DC-3020)

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.

8.4.1.2 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 (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 users. The 9 materials are: aluminum, titanium, steel, stainless steel, glass, copper, cast iron, brass and polystyrene.

Press  into“ SETTING” – “Velocity rate”-“Material”

Press  or  to select material needed,

Press  to confirm.

Notice: *Velocities for 9 materials are just theoretic values. If users want to get accurate measurements, please refer to “Velocity measurement” and get the more accurate sound velocity.*

8.5.1.2 Velocity input

Sound velocities 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. Take this table to set correct sound velocity reference.

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

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

Press  to store this new Velocity.

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

Press  to confirm.

8.5.1.3 Velocity measurement

Owing to workpiece that 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  to store this new velocity,

Press  or  to select location where you want to store,

Press  to confirm.

8.5.1.4 Velocity storage

This function allows users 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 an accurate value.

Press  key into “Resolution”,

Press  or  to set resolution and unit.

1. 0.1 mm

2. 0.01 mm

3. 0.01 in

4. 0.001 in

Press  key to enter/confirm

Notice: *When probe D5113 and D2012 is selected, it is recommended to set 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 between instrument and 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 and get a measurement value,

Press  into menu-“SETTING”-“PROBE CALIBRATION”,

Pressing  or  to adjust the measured value as the same as the value of sample that is measured,

Press  to confirm.

【8.6】Memory (DC-3020)

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

1 Memory unit

2 Memory read

3 Delete memory

Press  or  into the selected item, press  to confirm.

8.6.1 Memory unit

The gauge has a memory capacity of 5,200 test results. The memory location was composed by alphabet A-Z and there are maximum 200 test results in each alphabet. You can select an Alphabet freely for beginning to store the value and the next number will be followed automatically.

Press  into the menu- “Memory”-“Memory unit”,

Press  or  to select Alphabet A-Z which you want

Press  to confirm.

After taking every measurement, press  key to store the value with a location number.

8.6.2 Memory Read

Press  into the menu- “Memory”-“Memory Read” (Under the measurement),

Press  and  to select desired Alphabet. Then the desired group of value can be readable by pressing  and .

8.6.3 Delete Memory

Press  into the menu- “Memory”- “Delete Memory” (Under the measurement), Press  and  to select “Yes” or “No”. Press  again to confirm the delete.

8.6.4 Date Transfer

- Turn on the main unit and Keep the gauge under measurement interface,

-Then connect with PC with a cable in standard delivery. Meanwhile, new disk is auto identified and remind users to open U disk

- When users open U disk, Alphabet with data shows on the screen; otherwise not show here,

- Click an Alphabet users want to transfer, data is stored in .TXT; check the data 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

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

8.7.2 Gain setting

Press  into the “Gain setting”, screen shows:

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

Press  or  to select desired item

Press  to confirm.

Under 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 and Czech language for selection.

8.7.4 Contrast
User can adjust contrast of display.

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
Screen shows the version number and Probe 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 cannot be switched on for a long time, because it is a big consumer of electricity.

Notice: 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	
	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