Ultrasonic Thickness Gauge

DC-2000C series

Instruction Manual

V. 7.11

CONTENTS

1. General Description

The DC-2000C / DC-2020C Ultrasonic Thickness Gauge is our new and improved basic readout unit with automatic probe recognition, automatic zeroing and a larger, more easily read LCD with backlight. 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-2000C series accurately displays readings in either inches or millimeters.

2. Technical Specifications

Measurement range	：	0.65mm～400.0mm
Resolution	：	0.01mm(0.001″), 0.1mm (0.01″)
Accuracy	:	0.65mm～9.99mm ±0.04mm
		10.00mm～99.99mm ±(0.1%H+0.04) mm
		100.0mm～400.0mm ±0.3%H
Zero calibration	：	Auto
Velocity range	：	1000m/s～9999m/s
Measurement rate	：	4 / s and 10 / s in the fast mode
Memory	:	5,200 group (DC-2020C)
Display	：	128×64 LCD with backlight
Battery	：	2 x AAA Batteries
Operating temp.	：	-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 1PC
-- Standard 5MHZ probe D5008 1PC
-- Couplant 75ML
-- AAA batteries (Do not apply)
-- Build-in calibration block with 4mm
-- Cable (DC-2020C)
-- Carrying case 1PC
-- Operation manual
-- Certificate

4. Overview the Display Unit

1. LCD Screen 2. Key Pad 3. Battery Pack
4. Probe socket 5. Test block with 4mm

Notice: This test Block is not for calibration, just for checking if the instrument works correctly.

5. Keypad Functions

DC-2000C

	On/ Off Key	Press this key to switch on or off the instrument.
	Esc. Menu	Press this Key to Escape the Menu.
	Menu Key	Press This Key to go to the operation Menu.
	Confirm Key	Press this Key to confirm the selection.
	Up Arrow	Achieve switch among the menu options in the menu operation
	Backlight Key	Press this key to switch on or off the backlight. (Under the measurement)
	Down Arrow	Achieve switch among the menu options in the menu operation.
	Calibration	Put the probe in the air, press this key to complete the calibration.(Under the measurement)

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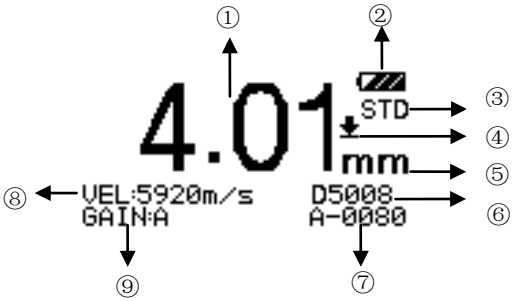
	On/ Off Key **Esc. Menu**	Press this key to switch on or off the instrument. Press this Key to Escape the Menu.
	Menu Key **Confirm Key**	Press This Key to go to the operation Menu. Press this Key to confirm the selection.
	Up Arrow **Backlight Key**	Achieve switch among the menu options in the menu operation Press this key to switch on or off the backlight. (Under the measurement)
	Down Arrow **Calibration**	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 **Storage**	Achieve switch among the menu options in the menu operation. Press this key to store the every measurement. (Under the measurement)
	Right Arrow **Read data**	Achieve switch among the menu options in the menu operation. Press this key to read the data stored.(Under the measurement)

6. Display Screen



① Measurement Value
② Battery Life
③ Measurement Mode
④ Measuring Symbol
⑤ Unit
⑥ Current Probe model
⑦ Current memory location (DC-2020C)
⑧ Current Velocity
⑨ Current Gain setting

7. Preparation before measurement

【7.1】Preparation of the instrument

For the newly purchased instrument, please check the instrument and its accessories according to the standard delivery table in chapter 3. 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.	Application
D5008	5.0MHz	0.8～300mm	<60℃	The probe is used common in many measurements, for example when the measuring surface is flat or with huge curvature, or the thickness of the workpiece to be measured is large than 50mm.
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℃	Used in the measurement of coarse particles such as cast iron.
D5113	5.0MHz	2.0～200mm	<350℃	Used in the measurement when the temperature is less than 350℃. And High – Temp. couplant must be required to use together.

【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 work piece surface to be measured.
3. Take multiple measurements around the same testing point.

8. Basic 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 than “Please insert the probe”, at this moment insert the probe into the socket and waiting to go to the measuring status.

Notice: Please use the standard probe provided, 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. Switch on the instrument, then the gauge came into the measurement mode directly.

If customer feel the measurement value is incorrect during the measurement, please put the probe in the air, and preess  for zero calibration ay any time.

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】Backlight

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

【8.4】Parameters setting

〖8.4.1〗 Measurement

There are six measuring modes provided. Users can select different measuring modes according to their requirements and measuring environments.

- Press  into **1. Measurment**
- Press  or  to select desired measurment mode.
- Press  to confirm,
- Press  to Esc. Menu and into measurment state.

8.4.1.1 Standard measurement:

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

8.4.1.2 Minimum value measurement:

Among one measurement, display the minimum value of the current measured 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

8.4.1.3 Difference measurement: (DC-2020C)

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 or not.

8.4.1.4 Average mode: (DC-2020C)

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

8.4.1.5 Limitation setting: (DC-2020C)

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.

8.4.1.6 Scan: (DC-2020C)

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

〖8.4.2〗 Velocity Rate

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,
2. Input the new velocity which is not preset into the menu,
3. Get the accurate sound velocity of the workpiece which the thickness is known.

8.4.2.1 Materials

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

- Press  into“ ⑴**Materials**”,

- Select one material by pressing  or  ,

- Press  to confirm.

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

8.4.2.2 Velocity Input

Sound velocities of 9 materials is not satisfied with the requirements of 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 for reference.

- Press  into“ **⑵VEL. input**”,

- Press  to move the “black arrow”, Press  to change the value.

- Press  to confirm, screen shows 4 locations to store this new velocity, press  to select one, press  to confirm.

- Press  to Esc. Menu and into the measurment.

This new velocity will be stored. And it can be found from **“2. Velocity rate”- “⑷Vel. Storage”** for further use.

8.4.2.3 Velocity measurement

Owing to the workpiece that is made from various materials and even the same material with different content and processing technology, the sound velocity changes and this change causes 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.

Measuring the workpiece which thickness is known (Using any velocity), get one measurement value,

- Press  key into **“⑶Vel. measurement”**

-Press  or  to change the velocity value to determine the thickness as the same as the value of sample that is measured.

-Press  key to confirm. Screen shows 4 locations to store this new

velocity, press  to select one, press  to confirm.

- Press  to Esc. Menu and into the measurment.

This new velocity will be stored. And it can be found from **"2. Velocity rate"- "⑷Vel. Storage"** for further use.

8.4.2.4 Velocity Storage

DC-2000 series provides 4 locations to store new velocities.

〖8.4.3〗 Resolution

- 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

〖8.4.4〗 Probe Calibration

It will cause error during the primary stage of usage and operating. If this caused by the probe itself, please use following calibration method:

- Measure the test piece with known thickness.

- Press  into**"4.Probe calibration"**

- Press  or  into "Calibration"

- Adjust the measured value by pressing  or  and make the test value equal to the actual thickness of test piece.

- Press  to confirm.

The gauge will return to the Measurement mode.

〖8.4.5〗 Memory (DC-2020C)

- Press  into the menu **"5. Memory"**
- The screen shows:
  1. Memory Unit
  2. Delete Memory
  3. Data transfer
- Press  or  into the selected item, press  to confirm.

8.4.5.1 Memory unit

The gauge has a memory capacity of 5,200 test results. The memory is 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 **"5. Memory"-"⑴Memory unit"**
- Press  or  to set one alphabet from A-Z as the current file; then press  to confirm.
- Press  to Esc. Menu and into the measurment.
- 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 0000 and plus 1automatically after users store each test result.

8.4.5.2 Memory Read

- Press  (Under the measurement) into the "Memory Read" function,

-Press  and  to set desired Alphabet, Press  and  to select location number. Then the desired test result can be readable.

8.4.5.3 Delete Memory

- Press  into the menu **"5. Memory"-"⑵Delete Memory"**

- Press  to confirm,

- Press  or  to select "Yes" or "No"

- Press  to confirm the delete.

8.4.5.4 Data Transfer

- Turn on the main unit and Keep the gauge under measurement interface,
- Then 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,
- If it is completed, users double click U disk, then Alphabet shows on the screen of PC;
- Click each Alphabet, users could check the data stored in the form of .TXT or copy to Word or Excel for further analysis.

〖8.4.6〗Function

- Press  into the menu "**6. 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.

8.4.6.1 Switch off mode

-Press  into the menu **“6.Function”- “⑴Switch off mode”**

- Select Auto shut down after 1 Min. 3 Min. 5 Min.

- Press  to confirm**.**

8.4.6.2 Gain setting

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 meet 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

- Press  into the Menu**“ 6.Function”-“⑵Gain setting”,**

screen shows:

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

- Press  or  to select desired item

- Press  to confirm.

8.4.6.3 Languages

- Press  into the Menu **"6.Function"- "(3) language"**

- Select desired language

- Press  to confirm**.**

8.4.6.4 Contrast

- Press  into the Menu **"6.Function"- "(4) Contrast"**

- Press  or  to adjust the Contrast from 1-6.

- Press  to confirm. The default number is 4.

8.4.6.5 Default

- Press  into the Menu **"6.Function" - "(5)Default"**

- Press  to confirm. The gauge will recover the default parameter.

8.4.6.6 Information

- Press  into the Menu **"6.Function" – "(6)Information".**

- The screen displays the version number and Probe Number.

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
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