Ultrasonic Thickness Gauge

DC2020C

Instruction Manual

V. 7.11

CONTENTS

1. General Description

The DC2020C Ultrasonic Thickness Gauge is our new and improved basic readout unit with automatic probe recognition, automatic zeroing and a larger, more easily read LCD. 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 DC2020C 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～500.0mm ±0.3%H
Zero calibration	:	Auto
Velocity range	:	1000m/s～9999m/s
Measurement rate	:	4 / s and 10 / s in the fast mode
Memory	:	5000 group
Display	:	128×64 LCD with back light
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 transducer (D5008) 1PC
-- Couplant 75ML
-- AAA batteries (Do not apply)
-- Build-in calibration block with 4mm
-- Data View and cable
-- Carrying case 1PC
-- Operating manual
-- Certificate

4. Overview the Display Unit

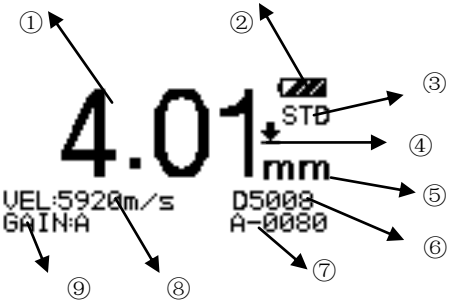
1. LCD Screen 2. Key Pad 3. Battery Pack
4. Probe socket 5. Test block with 4mm

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

5. Keypad Functions

	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)
	Left Arrow	Achieve switch among the menu options in the menu operation.
	Storage	Press this key to store the every measurement. (Under the measurement)
	Right Arrow	Achieve switch among the menu options in the menu operation.
	Read data	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 Transducer model
⑦ Current memory location
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 accessory according to the standard delivery table in chapter 3. 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.	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	2.0～500mm	<60℃	Used in the measurement of coarse particles such as cast iron.
D5113	5.0MHz	3.0～100mm	<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 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 than “Please insert the probe”, at this moment insert the probe into the socket and waiting to go to the measuring status.

Important: 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. 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.

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 couplant 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

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 selection,
- Press  to Esc. Menu and into the measurment.

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.

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

8.4.1.3 Difference measurement:

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.

8.4.1.4 Average mode:

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:

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:

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 yourself. The 9 materials are: aluminum, titanium, steel, stainless steel, glass, copper, brass, polystyrene and nylon.

- Press  into“ ⑴**Materials**”,
- Select one material by pressing  or  ,
- Press  to confirm.

Important: The 9 values are just the 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

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

- Press  into" **⑵VEL. input**",

- Press  to move the "black arrow", Press  to change the value.

- Press  to confirm,screen will display 4 places for selection one 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 the further use.

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

- Press  key into **"⑶Vel. measurement"**

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

- Press  key to confirm. Screen will display 4 places for selection one 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 the further use.

8.4.2.4 Velocity Storage

DC2020C provides 4 spaces for storing the new velocities.

〖8.4.3〗 Resolution

- 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

〖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 acuter thickness of test piece.

- Press  to confirm.

The gauge will return to the Measurement mode.

〖8.4.5〗 Memory

- Press  into the menu **“5. Memory”**

- The screen will display:

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 5000 measurements. The memory location was composed by alphabet A-Z + 0000-4999. You can select an Alphabet freely for beginning to store the value and the next number will be followed automatically.

- Press  into the menu **“5. Memory”-“⑴Memory unit”**

- Press  or  to select one alphabet from A-Z as the current memory location. Then press  to confirm.

- Press  to Esc. Menu and into the measurment.

- Press  key to store the every measurement value with a location number after take away the probe from the work piece each time.

Important: You cannot select the number after the alphabet, it is given by the tester automatically.

8.4.5.2 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.

8.4.5.3 Data Transfer

- Successfully install the “Data View” on the CD come with the standard delivery,
- Keep the gauge and the PC connected,
- Press  into the menu **“5. Memory”-“⑶Data transfer”**
- Press  to confirm,

The data can be transferred to PC and can be stored as DOC. ,TXT. Or Excel.

8.4.5.4 Memory Read

- Press  (Under the measurement) into the “Memory Read” function,
- Press  and  to select desired Alphabet, Press  and  to select location number. Then the desired group of value can be readable beginning from the initial number.

〖8.4.6〗Function

- Press  into the menu "**6. Function**", the screen will display:

1. Switch off Mode
2. Gain adjustment
3. Languages
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"- "(1)Switch off mode"**

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

- Press  to confirm**.**

8.4.6.2 Gain adjustment

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

- Press  into the Menu**“ 6.Function”-“⑵Gain adjustment”,** the screen will display:

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”- “⑶ languages”**

- Select desired language

- Press  to confirm**.**

8.4.6.4 Contrast

- - Press  into the Menu **“6.Function”- “⑷ 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” - “⑸Default”**

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

8.4.6.6 Information

- Press  into the Menu **"6.Function" – "⑹Information".**

- The screen displays the version number and Transducer 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