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ISU-800DWL
ULTRASONIC THICKNESS GAGE (ADVANCED TYPE) OPERATION MANUAL

PLEASE SCAN QR CODE TO WATCH THE OPERATION VIDEO OF PRODUCTS.

VIDEO

Overview

The Thickness Gauge is a digital ultrasonic thickness gauge. Based on the same operating principles as SONAR it is capable of measuring the thickness of various materials with accuracy as high as 0.001 millimeters, or 0.0001inches. It is suitable for a variety of metallic and non-metallic materials.

Precaution

This instrument is a precision measuring instrument, which should be used strictly according to the manual. The store of this instrument shall be avoiding collision, moisture, etc.

1. Cleaning of test block
Since it is necessary to apply coupling agent when using test block, please ensure remove the residual couplant or other stains on the surface of the test block in time.

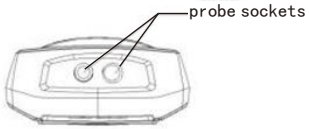
2.Shell cleaning
Alcohol and diluent can corrode the shell, please wipe it lightly.

3. Protection of probe
The probe is sensitive to the rub on rough surfaces, so it should be lightly pressed during use. When measuring the rough surface, please avoid sliding the surface of probe on it.
When measuring at room temperature, the temperature of the tested surface shall not exceed 60 ℃, or else the probe cannot be used any more.
When measuring high temperature surface, the touch time shall not exceed 3 seconds. After the measurement, please wait for the probe to cool down before starting the next measurement.
The oil and dust adhered to probe and cable should be removed in time after operation.

4. Battery
When the low voltage indication sign appears, the instrument should be charged in time and operated according to following steps:
4.1 Connect the instrument with its own 5V standard charger through USB data cable, then plug the charger in power supply to charge.
4.2 The red light indicates charging, the green light indicates that the battery is fully charged, and the charging should be disconnected in time.
Note: The instrument uses 3.7V lithium ion rechargeable battery, which can be charged at any time. In order to improve the service life of the battery, you should also try to avoid using up the battery power completely.

Structure

◆Main views



◆Button functions

Power on/off

Confirm

Backlight

Menu

Memory

Velocity

Calibration

Direction: Up

Direction: Down

Technical parameters

◆Specification of main unit

Probe Type	S15-P06, G5M-P10, G5M-P08, G7M-P06, G2M-P12, H3M-P12, S2M-P14
Measuring Range	according to the probe, see Probe Parameters
Accuracy	according to the probe, see Probe Parameters
Probe Frequency	according to the probe, see Probe Parameters
Resolution	0.001mm / 0.0001inch
Measurement Mode	P-E, I-E, E-E, AUTO
Measuring Period	2~4 times per second
Sound Velocity Range	1 ~ 19999m/s
Calibration Mode	Probe Calibration / 2-Point Calibration
Velocity Measure	Indirect
Measure Settings	16 gain stages / 7 echo stages adjustable
Measuring Mode	Single point, Scan, Max / Min Capture, Differential, Alarm
Display	FSTN LCD Display with backlight
Display Content	Measuring Mode, Thickness, Sound velocity, Stability Status, Effective echo numbers, Battery Info, etc.
Storage	1000 measurements (5 fils, 200 measurements per file) including thickness, sound velocity, measuring time, etc.
Communication	Wireless & Mini-USB interface, virtual serial port protocol, support online measurement
Power Supply	3.7V Li-Ion chargeable battery
Working Hours	80 hours (close backlight and Bluetooth)
Charging time	3~4 hours
Power off	Timeout power off, low battery power off
Temperature	Usage: -10 ~ 50 °C, Storage: -30 ~ 60 °C
Size	157x78x37mm
Shell Material	ABS
Weight	About 260g

◆Specification of probes

Code	Type	Frequency	Diameter (Ød)	Measuring range	Minimum size of pipes (DIA x WT)	Accuracy	Working temperature	Application
ISU-S15-P06 (Included)	single crystal	15MHz	8mm	0.15~28mm	Ø10x1.5mm Ø15x0.35mm	echo numbers ≥3: 0.02mm/0.3%H* (take the larger one) other: 0.05mm/0.5%H* (take the larger one)	-10~60°C	high precision or thin workpieces
ISU-S15-P06-CB (optional)**	–	–	5mm	0.15~10mm	Ø10x1.5mm Ø15x0.35mm			high precision irregular surface
ISU-S15-P06-CB1 (optional)**	–	–	8mm	0.3~38mm	–			high precision thick workpieces
ISU-S2M-P14 (optional)	single crystal	2MHz	19mm	30~2000mm	–	0.5%H*	-10~310°C	ultra-thick workpieces
ISU-G5M-P10 (optional)	double crystal	5MHz	13mm	0.8~300mm	Ø25x3mm	±0.04mm (range: <10mm) ±H/333mm* (range: ≥10mm)	-10~60°C	normal workpieces
ISU-G5M-P08 (optional)	double crystal	5MHz	11mm	0.8~225mm	Ø20x1.2mm			curved surface and normal workpieces
ISU-G7M-P06 (optional)	double crystal	7.5MHz	9mm	0.8~50mm	Ø15x1.2mm			curved surface and small workpieces
ISU-G2M-P12 (optional)	double crystal	2MHz	17mm	3~700mm	Ø30x4mm	0.05mm/0.5%H* (take the larger one)		castings and thick workpieces
ISU-H3M-P12 (optional)	double crystal	3MHz	15mm	2~200mm	Ø25x3mm	0.05mm/0.5%H* (take the larger one)	-10~310°C	workpieces with high temperature

*H is the measured thickness in mm

**They are delay blockers, suitable for probe ISU-S15-P06

Notice: Measuring range and Minimum size of pipes are defined based on 45# steel

Measuring and Operation

1. The Probe

The probe is the "business end" of the gauge. It transmits and receives ultrasonic sound waves that the gauge uses to calculate the thickness of the material being measured. The probe connects with the gauge via the attached cable, and two coaxial connectors.
The probe must be used correctly in order to get accurate and reliable result.

On the bottom view of the double crystal probe, two semicircles of the wearface are visible, as is the barrier separating them. One of the semicircles is responsible for conducting ultrasonic sound into the material being measured, and the other semicircle is responsible for conducting the echoed sound back into the probe.

For single crystal probe with delay block, the delay block is fastened to the probe with a screw ring. A drop of couplant is applied between the delay block and probe body. The probe body contains one crystal element that is responsible for conducting ultrasonic sound into and back from the material being measured.

When the probe is placed against the material being measured, it is the area directly beneath the center of the wearface that is being measured.

Press against the top with the thumb or index finger to hold the probe in place. Moderate pressure is sufficient, as it is only necessary to keep the probe stationary, and the wearface seated flat against the surface of the material being measured.

2. Condition and Preparation of Surfaces

In any ultrasonic measurement scenario, the shape and roughness of the test surface are of paramount importance. Rough, uneven surfaces may limit the penetration of ultrasound through the material,

and result in unstable, and therefore unreliable measurements.

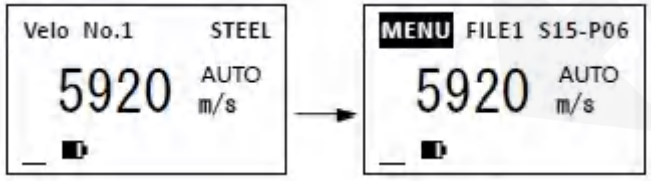
The surface to be measured should be clean, and free of any small particulate matter, rust, or scale. The presence of such obstructions will prevent the probe from seating properly against the surface.

Extremely rough surfaces, such as the pebble-like finish of some cast iron, will prove most difficult to measure. These kinds of surfaces act on the sound beam like frosted glass on light, the beam becomes diffused and scattered in all directions.
In addition to posing obstacles to measurement, rough surfaces contribute to excessive wear of the probe, particularly in situations where the probe is "scrubbed" along the surface. Probes should be inspected on a regular basis, for signs of uneven wear of the wearface. If the wearface is worn on one side more than another, the sound beam penetrating the test material may no longer be perpendicular to the material surface. In this case, it will be difficult to exactly locate tiny irregularities in the material being measured, as the focus of the soundbeam no longer lies directly beneath the probe.

3. Parameter Settings

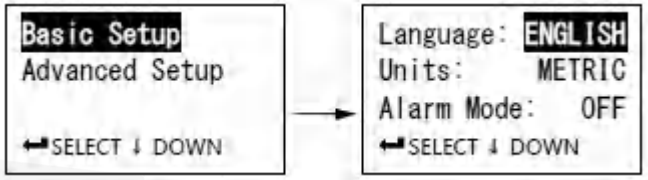
Parameter setting of the thickness gauge includes Basic Setup and Advanced Setup, and the setting steps are as follows:

a. Press the menu key to enter the menu bar interface.



b. Press the confirm key to enter main setup menu

c. Press the key or to select Basic Setup or Advanced Setup option, and press the confirm key to enter the menu.

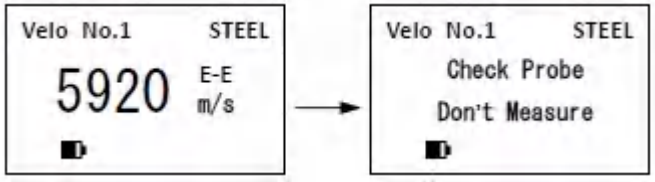


d. Press the key or to select parameter options, and press the confirm key to switch parameter settings or enter the submenu.

4. Measuring preparation

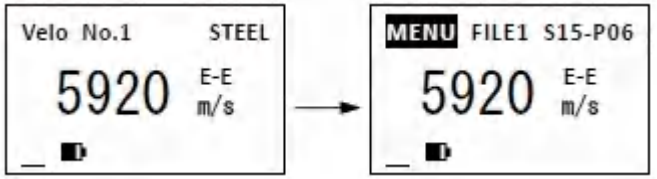
a. Connect the probe to the gauge according to the color mark on the top of the gauge and the plug of the cable

b. Press the power key to power up the gauge, the gauge enter velocity interface, and automatically check the probe parameters. During the detection, do not make any measurement, nor apply couplant to the probe, and keep the probe surface clean



c. Set probe type:

Press the menu key to select menu tab.



Press the menu key twice to shift the curser to probe tab, and press the direction key or to switch the probe type.

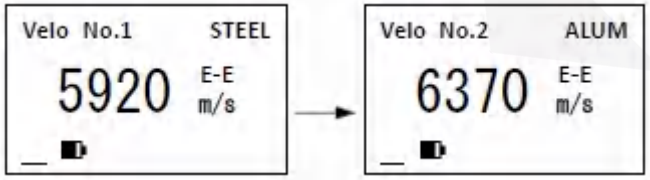
Notice: Probe type must be correct, otherwise measuring result is unreliable. After the probe type changes, the gauge will recheck the probe parameters.

5. Check Probe Parameters

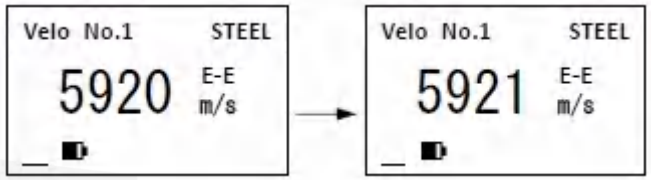
This gauge has the function of automatically checking probe parameters. The parameters will be used for gain setting, real-time temperature compensation, coupling judgment, etc. Therefore, the wrong probe parameters will cause the measurement error. Probe parameters will be automatically checked when the gauge power on or the probe is changed or the probe type is reset. When checking parameters, the screen shows "Check Probe, Don't Measure", make sure there is no couplant on the probe surface and do not use the probe for measurement. If couplant is attached to the surface of the probe, or the probe is used for measurement, the probe parameters will be identified incorrectly and the gauge cannot be measured normally. In this case, remove couplant on the probe surface, and then long press the key CAL to recheck the probe parameters.

6. Adjust sound velocity

Press the velocity key VEL to enter the sound velocity adjustment interface, and the current sound velocity will be shown on the screen. Press the velocity key VEL to switch the sound velocity from eight sets.



Press the key ▲ or ▼ to adjust the velocity of each set.



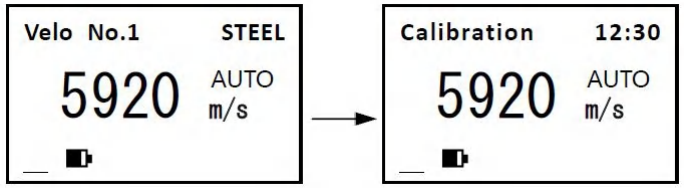
To achieve the most accurate measurements, it is generally advisable to always calibrate the gauge to a sample piece of known thickness. Material composition (and thus, its sound velocity) sometimes varies from lot to lot and from manufacturer to manufacturer. Calibration to a sample of known thickness will ensure that the tool is set as closely as possible to the sound velocity of the material to be measured.

7. ProbeCalibration

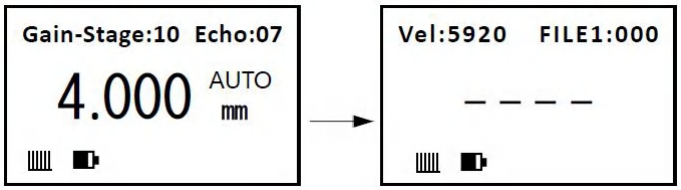
1) Single element transducer

The probe has been calibrated when delivery, it is unnecessary to calibrate the probe if the probe type is set correctly. The probe needs to be recalibrated as follows after the probe is replaced:

a. Change measurement mode to AUTO. Press the calibration key CAL to switch the sound velocity to calibration velocity while the measuring is not performed, and the calibration velocity will be shown on the screen.



b. Apply couplant to the probe disc, and press the probe against the probe disc, making sure that the probe sits flat against the surface of the probe disc. After the test, the gauge will start to calibrate the probe automatically, and the progress bar will be shown on the screen.

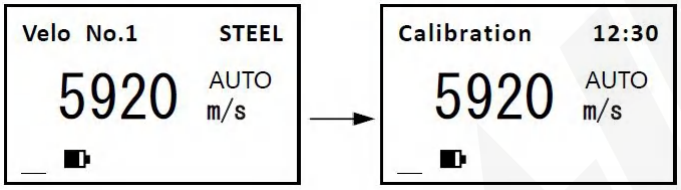


c. The calibration is successful if it is returned to the measurement interface automatically. Otherwise, the display of "xxxx" indicates that probe calibration failed, and tries to do probe calibration again.

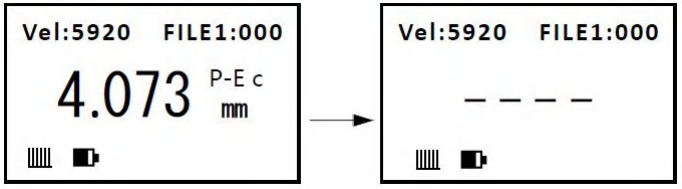
2) Dual element transducer

The probe has been calibrated when delivery, it is unnecessary to calibrate the probe if the probe type is set correctly. The probe needs to be recalibrated as follows after the probe is replaced or switch the two plugs of the probe connector:

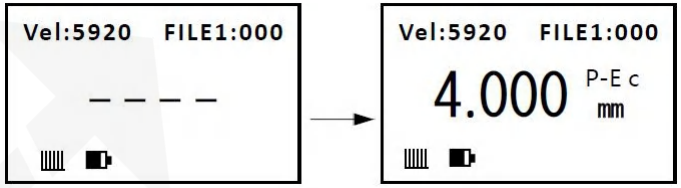
a. Press the calibration key CAL to switch the sound velocity to calibration velocity while the measuring is not performed, and the calibration velocity will be shown on the screen.



b. Apply couplant to the probe disc, and press the probe against the probe disc, making sure that the probe sits flat against the surface of the probe disc. After the test, the gauge will start to calibrate the probe automatically, and the progress bar will be shown on the screen.



c. The calibration is successful if it is returned to the measurement interface automatically. Otherwise, the display of "xxxx" indicates that probe calibration failed, and tries to do probe calibration again.



8. Making measurements

In order for the probe to do its job, there must be no air gaps between the wear-face and the surface of the material being measured. This is accomplished with the use of a "coupling" fluid, commonly called "couplant". This fluid serves to "couple", or transfer, the ultrasonic sound waves from the probe, into the material, and back again.

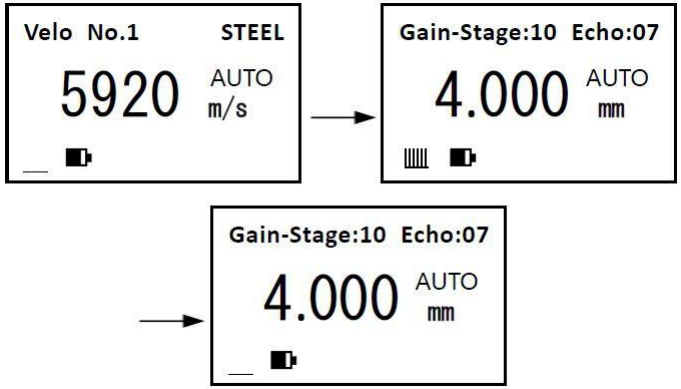
Before attempting to make a measurement, a small amount of couplant should be applied to the surface of the material being measured. Typically, a single droplet of couplant is sufficient.

After applying couplant, press the probe (wearface down) firmly against the area to be measured. The Stability Indicator should have five or six bars darkened, and a number should appear in the display. If the gauge has been properly "zeroed" (see part 3.7) and set to the correct sound velocity (see part 3.5), the number in the display will indicate the actual thickness of the material directly beneath the probe.

If the Stability Indicator has fewer than four bars darkened, or the numbers on the display seem erratic, first check to make sure that there is an adequate film of couplant beneath the probe, and that the probe is seated flat against the material. If the condition persists, it may be necessary to select a different probe (size or frequency) for the material being measured.

While the probe is in contact with the material that is being measured,

the gauge will perform two to four measurements every second, updating its display as it does so. When the probe is removed from the surface, the display will hold the last measurement made.

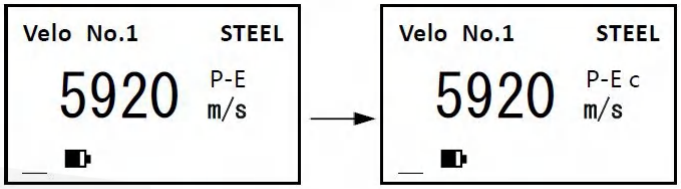


Occasionally, a small film of couplant will be drawn out between the probe and the surface as the probe is removed. When this happens, the gauge may perform a measurement through this couplant film, resulting in a measurement that is larger or smaller than it should be. This phenomenon is obvious when one thickness value is observed while the probe is in place, and another value is observed after the probe is removed. To avoid this phenomenon, you can press the memory key to freeze the thickness value before the probe is removed.

9. Real-Time Temperature Compensation

The variation of the sound velocity of probe delay line varies with temperature will cause the measurement error. Real-Time temperature compensation technology is designed to eliminate this measurement error. So, it is unnecessary to calibrate the probe after delivery calibration.

Real-Time temperature compensation technology only works on P-E, I-E(for single crystal probe).When Real-Time temperature compensation is complete, the indicator flag"c"will be displayed behind measurement indicator.

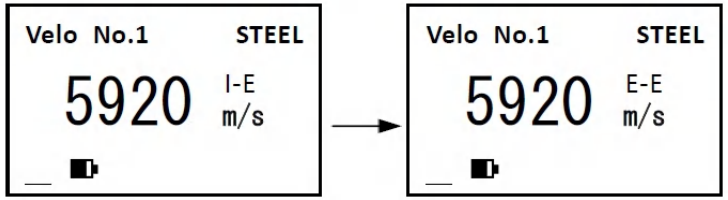


Compensating Compensation completed

During the use of the gauge, if the probe is not measured and the couplant is attached to the surface for a longtime, a compensating error may be caused, and the real-time temperature compensation cannot be completed automatically in a short time. In this case, remove couplant on the probe surface, and then long press the key CAL to recheck the probe parameters.

10. Measurement Mode

This gauge support normal measurement (P-E), Thru-Paint measurement for bottom material thickness (I-E, E-E, AUTO). The measurement mode can be switched by press the key on the velocity interface or thickness interface.



1) Normal Measurement

it can be processed in P-E mode for double crystal probe, and I-E mode for single crystal probe.

2) Thru-Paint Measurement for bottom material thickness

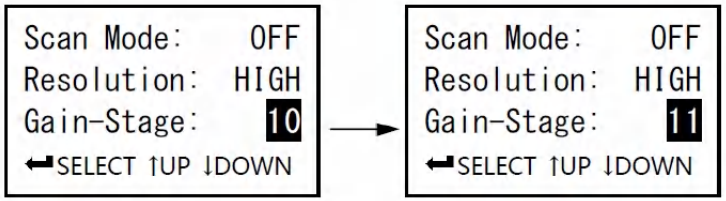
it can be processed in I-E mode for double crystal probe, and E-E & AUTO mode for single crystal probe.

In this mode, the gauge just measures the time interval of ultrasonic wave propagation in bottom material.

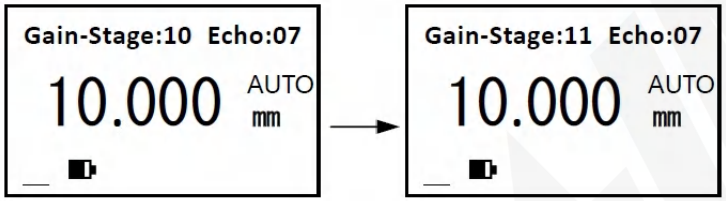
For I-E mode, the gauge calculates time interval between the delay line echo and the first back-wall echo.
For E-E mode, the gauge calculates time interval between the back-wall echoes.
For AUTO mode, the gauge calculates time interval between the delay line echo and back-wall echoes.

11. Setting Gain Stage

The gain stage can be adjusted from 1 to 16 in Basic Setup menu:



Notice: The gain stage will be set to the default value when the probe frequency or diameter is changed.
The gain stage can be quickly set by press the key or on the thickness interface.

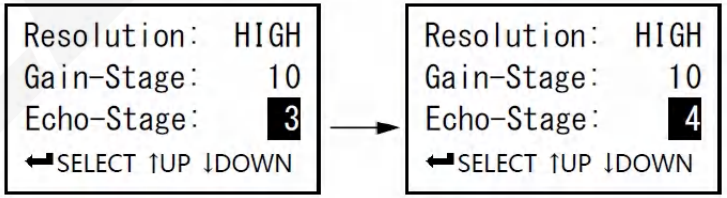


Generally speaking, increasing the gain stage can increase the measurement range, but for the workpiece with loose internal structure or internal defects (such as cast iron, cast steel, glass fiber, rubber, etc.), too high gain stage will lead to the detection of noise signal, resulting in measurement error.
During measurement, if the value is significantly higher than the actual thickness when measuring a very thin workpiece (close to the lower range) or a curved workpiece, or the probe is not coupled during measurement, you can try to increase the gain stage. You can

also try increasing the gain stage if the probe is poorly coupled or uncoupled when measuring thicker workpieces. If the reading is significantly smaller than the actual thickness when measuring a thick workpiece, it may be that a defect in the workpiece has been detected, and you can try to lower the gain stage.
Specially, when measuring aluminum workpiece, there are many internal noise signals, so the gain stage should be appropriately reduced. When measuring plastic workpiece, the signal attenuation is very serious, and the gain stage should be appropriately increased.

12. Setting Echo Stage

The echo stage can be adjusted from 1 to 7 in Basic Setup menu:



The excitation energy of the probe can be improved or reduced by increasing or decreasing the echo stage. Each type of probe has its corresponding optimal excitation energy. The echo stage can be adjusted appropriately according to the material, thickness and shape of the measured workpiece during thickness measurement to achieve the best measurement effect.

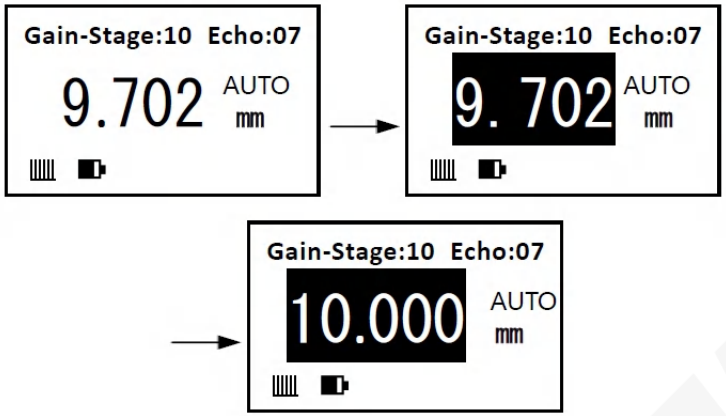
13. Calibration to a known thickness (indirect sound velocity measurements)

This procedure requires a sample piece of the specific material to be measured, the exact thickness of which is known, e.g. from having been measured by some other means.
a. Perform a zero calibration (see part 7)
b. Apply couplant to the sample piece.
c. Press the probe against the sample piece, making sure that the

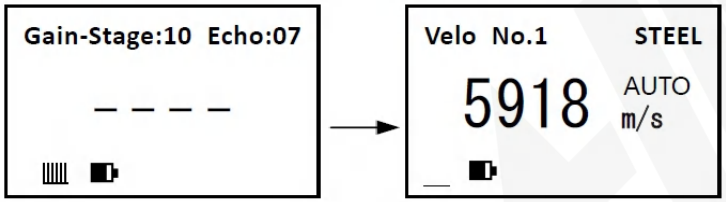
probe sits flat against the surface of the sample. The display should show some (probably incorrect) thickness value, and the Stability Indicator should have nearly all its bars on.

d. Having achieved a stable reading, and press the memory key to freeze the thickness value before removing the probe.

e. Press the direction key or to adjust the displayed thickness to the correct value of the sample piece.



f. Press the velocity key to calculate the sound velocity.

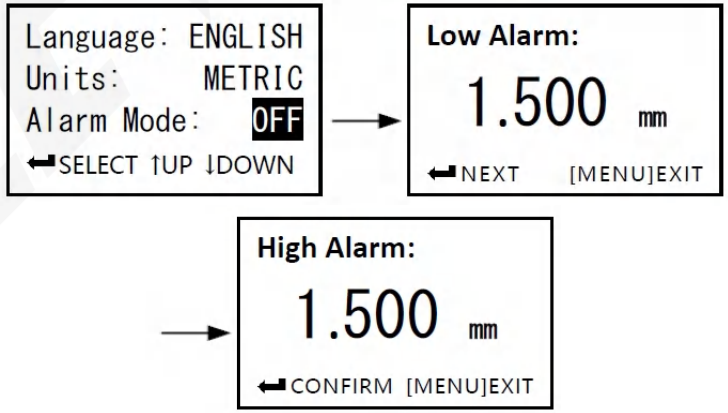


Notice: Differential mode should be turned off while measuring sound velocity. If the failure icon "xxxx" shown on the screen after calculating the sound velocity, it means that the sound velocity calculation failed by the reason of "sound velocity out of limit" or "measurement unstable".

14. Alarm Mode

The Alarm Mode feature of the gauge allows the user to set an audible and visual parameter when taking measurements. If the measurement less than a low alarm value or greater than a high alarm value, set by the user, the alarm indicator will be flashed and the beeper sounded. This improves the speed and efficiency of the inspection process by eliminating constant viewing of the actual reading displayed.

The alarm mode can be enabled in Basic Setup menu, and the alarm indicator will be shown on status bar.



also try increasing the gain stage if the probe is poorly coupled or uncoupled when measuring thicker workpieces. If the reading is significantly smaller than the actual thickness when measuring a thick workpiece, it may be that a defect in the workpiece has been detected, and you can try to lower the gain stage.

Specially, when measuring aluminum workpiece, there are many internal noise signals, so the gain stage should be appropriately reduced. When measuring plastic workpiece, the signal attenuation is very serious, and the gain stage should be appropriately increased.

15. Differential Mode

In the Quality Control environment, it is sometimes necessary to know the difference between a nominal (target) thickness value and an actual thickness value. This feature is also included in the gauge. With the Differential Mode enabled, the gauge will display the positive or negative difference from an entered nominal value. The differential mode can be enabled in Basic Setup menu, and the differential indicator ± will be shown on status bar.

In Differential Mode, the differential indicator will be changed to + if the actual thickness value is greater than the target value. Otherwise, the differential indicator will be changed to - if the actual thickness value is less than the target value. And the thickness value shown on the screen is the absolute value between the actual thickness value and the target value.

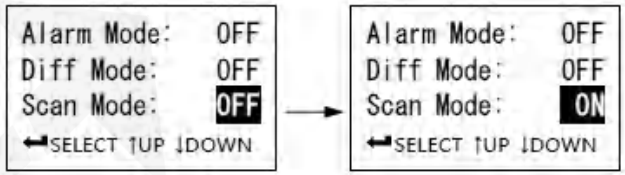
16. Scan Mode

While the gauge excels at making single point measurements, it is sometimes desirable to examine a larger region, searching for the thinnest point. The gauge includes a feature, called Scan Mode, which allows it to do just that.

In normal operation, the gauge performs and displays four measurements every second, which is quite adequate for single measurements. In Scan Mode, however, the tool performs ten measurements every second. While the probe is in contact with the material being measured, the gauge is keeping track of the lowest measurement it finds. The probe may be "scrubbed" across a surface, and any brief interruptions in the signal will be ignored. The smallest measurement will be shown on the top line of the screen

while measurement performing. When the probe loses contact with the surface for more than ten second, the capture procedure complete, and the gauge will display the smallest measurement on the main screen.

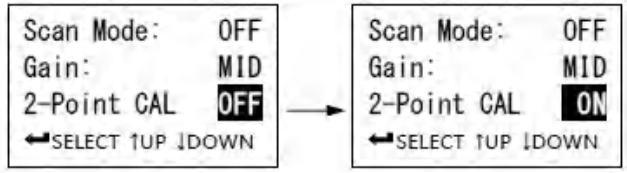
The scan mode can be enabled in Basic Setup menu.



In Scan Mode, the scan indicator MIN will be shown on statue bar. When the probe loses contact with the surface, the scan indicator will flash for about ten seconds until the capture procedure complete or the probe contact with the surface again.

17. 2-PointCalibration

2-Point Calibration can be enabled in Basic Setup, and the 2-Point indicator "CAL" will be shown on status bar.

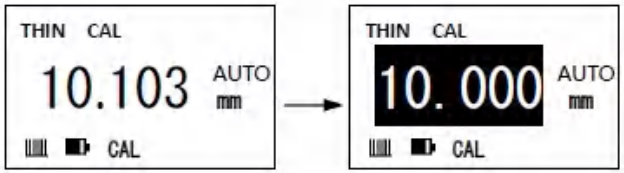


This procedure requires that the operator has two known thickness points on the test piece that are representative of the range to be measured. Follow the steps below to complete the calibration:

a. Perform a measurement to change the screen to thickness display interface.

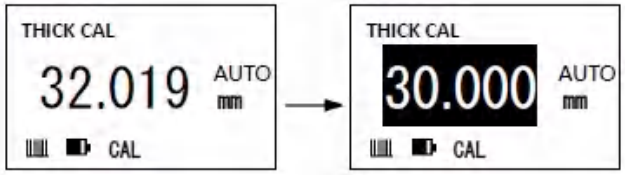
b. Press the confirm key ↵ to enter thin thickness calibration interface, and perform a measurement on the thin testpiece.

c. Press the memory key to freeze the thickness value, and then use the direction key ▲ or ▼ to adjust the thickness to correct value.



d. Press the confirm key to enter thick thickness calibration interface, and perform a measurement on the thick test piece.

e. Press the memory key to freeze the thickness value, and then use the direction key or to adjust the thickness to correct value.



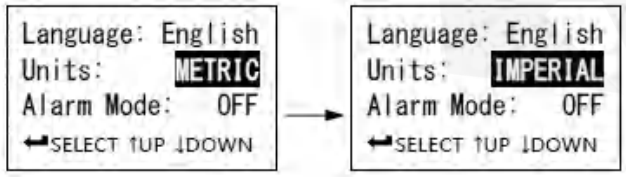
f. Press the confirm key to return thickness display interface, and the 2-Point calibration is completed.

Notice: 2-Point calibration will increase the measurement accuracy only if the measurement thickness is between the thin thickness and the thick thickness used by the calibration.

18. Setting Units

The units of the gauge can be switched between Metric (mm) and Imperial (in) systems.

Units can be switched in Basic Setup menu.



19. Setting Beeper

The beeper of the gauge can be turned on / off in Basic Setup menu. When the buzzer mode is turned on, a prompt tone will be given when the instrument is operated. When the buzzer mode is turned off, the instrument will be in a quiet operation state.

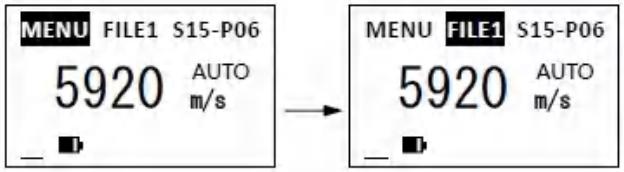
20. Using the data logger

The gauge is equipped with an on board data logging feature. This will prove to be a valuable reporting tool for inspection purposes. It will increase efficiency by reducing the time it takes to manually record the measurements during the inspection process. The gauge can then be connected to a computer to save the results of the inspection. The gauge has a storage capacity of 1000 measurements. The gauge has 5 files consisting of 200 sequential storage locations in each file. The procedure for using the data logger is outlined in the following steps:

1) Setting active file

a. Press the power key to power up the gauge, and press the menu key to select the FILE tab.

b. Press the direction key or to switch the active file.



Notice: For each file, 200 measurements could be stored. If the user attempts to write to a file that is currently full, the display will show the full notice, and the user can change the active file or delete some date.

2) Saving a measurement manually

a. Press the memory key to freeze the measurement, and then the measurement will be shown in inverse color.

b. Hold the memory key for 2 seconds, and then the measurement

will be stored at the same time that the frozen is released.

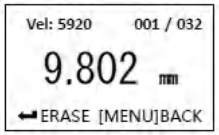
3) Saving the measurement automatically

a. Hold the memory key for two seconds while the measurement is not frozen, and the memory indicator will be shown on the status bar. The gauge enter auto save mode.

b. The measurement will be saved automatically after each measuring accompanied by two beepers.

4) Looking up and deleting the stored measurements

a. Press the power key to power up the gauge, and press the menu key to select the FILE tab.



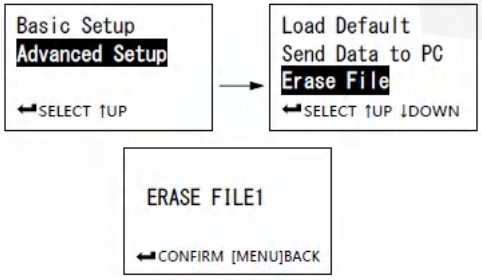
b. Press the direction key or to switch the active file, and press the confirm key to looking up the stored measurements of the active file.

Where the display of "001" is the sequence number of current measurement, "032" is the total measurement counts of the active file , "5920" is the sound velocity of current measurement, and "9.802mm" is thickness value of current measurement.

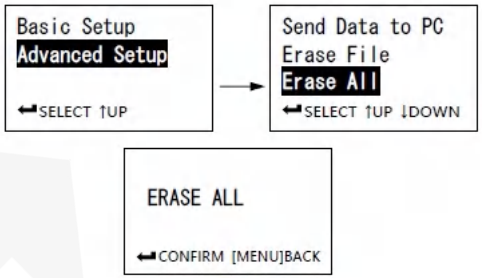
c. Press the direction key or to switch the measurement, or press the confirm key to delete current measurement.

d. Press the menu key or velocity key to exit.

5) Clearing active file in Advanced Setup menu

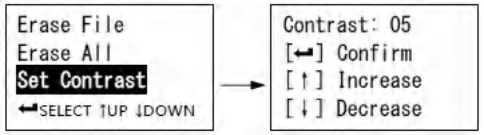


6) Clearing all files in Advanced Setup menu



21. Setting contrast

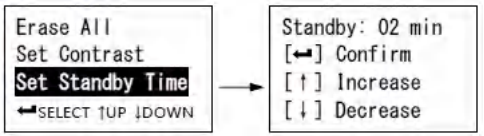
The contrast can be adjusted in Advanced Setup menu.



22. Setting Standby Time

To save power, the gauge will be powered off automatically during a nominal time, set by user. The following procedures outline how to set up this feature:

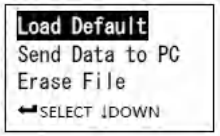
The standby time can be adjusted in Advanced Setup menu.



Notice: The function of auto power off will be disabled if the standby time is set to zero.

23. Restore factory settings

The gauge can be restored to factory settings in Advanced Setup menu:



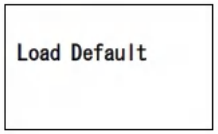
The following procedures outline the quick way:

a. Power off the gauge

b. Press the memory key and power key simultaneously to power on the gauge.

c. Release the power key , and key holding the memory key

d. Release the memory key while the screen display "Load Default"

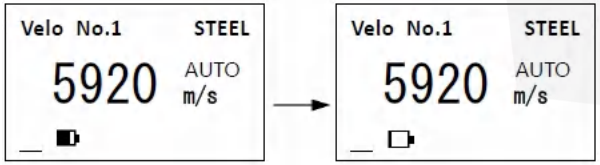


24. Using the Backlight

Press the backlight key to turn on or turn off the backlight while the gauge is powered on.

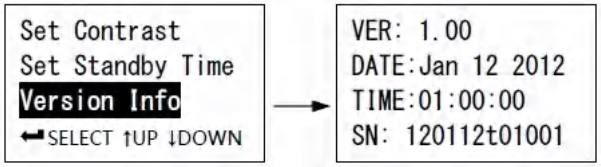
25. Using the Battery Indicator

The battery indicator on the status bar indicates the current battery level. The battery should be replaced if the battery indicator changes to " ", or else, the gauge will be powered off automatically anytime.



26. Viewing theVersion Information

Version information can be viewed in Advanced Setup menu:



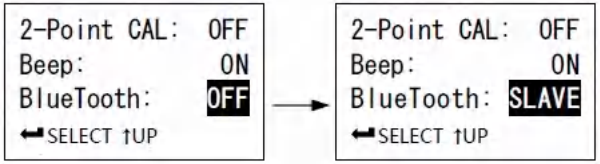
27. Power Off

Hold the power key for two seconds to power off the gauge manually, or the gauge will be powered off automatically by out of standby time or low battery.

28. Wireless Communication

The connect to a computer or mobile phone via wireless transmission (requires the **optional 7315** series wireless receiver) to output keyboard signal data (equivalent to entering measurement data via keyboard), enabling the transmission of measurement data to documents such as Excel, Word, or TXT files.

1) Set the Bluetooth to Slave mode in Basic setup menu



2) Data transmission

Press the button on the receiver to enter pairing mode; the light will begin flashing (see receiver manual for details). Pairing will complete automatically after performing one measurement with the device.

a. When Real-time Transmission is set to BLUE in the settings, once the measurement result stabilizes after testing, the device will automatically transmit the dispaly data.

b. When Real-time Transmission is set to s-BLUE in the settings, when the measurement result stabilizes after testing, press the Save button once and the device will transmit the current display value.

29. USB communication

The ability of USB port can be used to communicated with PC.
Configure the gauge and PC as below:
1) Connect the gauge to the PC by the Mini-USB cable provided with the instrument
2) Open serial port communication tools on PC, choose the serial port (COMx) of the gauge (with the keyword of "CP210x" in the description of the port), and configure the communication tool as blow:
Data Bits - 8, Parity check- None, Start Bits - 1, Stop Bits - 1,
Baud Rate - 9600
3) Transfer data from the gauge:
a. Enter "Advanced Setup" menu, select "Send Data to PC" option
b. Press the confirm key ↵ to send data

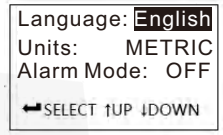
30. Online measurement

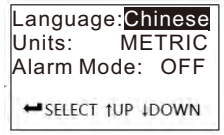
The instrument has real-time online measurement function, and can be set in the basic setting menu, the setting of real-time should be right. The Status can be OFF, USB, BLUE, s-USB, s-BLUE.

The function of online measurement will be enabled after starting a communication operation, and the gauge will send the measurements as soon as the measuring operation complete.

31. Language setting

The language can be switched between English and Chinese in Basic Setup menu.





Special Measurement

1. Measuring pipe and tubing

When measuring a piece of pipe to determine the thickness of the pipe wall, orientation of the probes is important. If the diameter of the pipe is larger than approximately 100 mm, measurements should be made with the probe oriented so that the gap in the wearface is perpendicular (at right angle) to the long axis of the pipe. For smaller pipe diameters, two measurements should be performed, one with the wearface gap perpendicular, another with the gap parallel to the long axis of the pipe. The smaller of the two displayed values should then be taken as the thickness at that point.

2. Measuring laminated materials

Laminated materials are unique in that their density (and therefore sound-velocity) may vary considerably from one piece to another. Some laminated materials may even exhibit noticeable changes in sound-velocity across a single surface. The only way to reliably measure such materials is by performing a calibration procedure on a sample piece of known thickness. Ideally, this sample material should be a part of the same piece being measured, or at least from the same lamination batch. By calibrating to each test piece individually, the effects of variation of sound-velocity will be minimized.

An additional important consideration when measuring laminates, is that any included air gaps or pockets will cause an early reflection of the ultrasound beam. This effect will be noticed as a sudden decrease in thickness in an otherwise regular surface. While this may impede accurate measurement of total material thickness, it does provide the user with positive indication of air gaps in the laminate.

3. Measuring hot surfaces

The velocity of sound through a substance is dependant upon its temperature. As materials heat up, the velocity of sound through them decreases. In most applications with surface temperatures less than about 100°C, no special procedures must be observed. At

temperatures above this point, the change in sound velocity of the material being measured starts to have a noticeable effect upon ultrasonic measurement.

At such elevated temperatures, it is recommended that the user perform a velocity calibration procedure (see 3.11) on a sample piece of known thickness, which is at or near the temperature of the material to be measured. This will allow the gauge to correctly calculate the velocity of sound through the hot material.

When performing measurements on hot surfaces, it may also be necessary to use a specially constructed high-temperature probe. These probes are built using materials which can withstand high temperatures. Even so, it is recommended that the probe be left in contact with the surface for as short a time as needed to acquire a stable measurement. While the probe is in contact with a hot surface, it will begin to heat up, and through thermal expansion and other effects, may begin to adversely affect the accuracy of measurements.