



A1207 PenGauge

Thickness Gauge

Revision 1.1.0

Acoustic Control Systems - ACS Group
Saarbrücken, Germany 2022

This instruction manual contains essential information on how to use this ACS product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

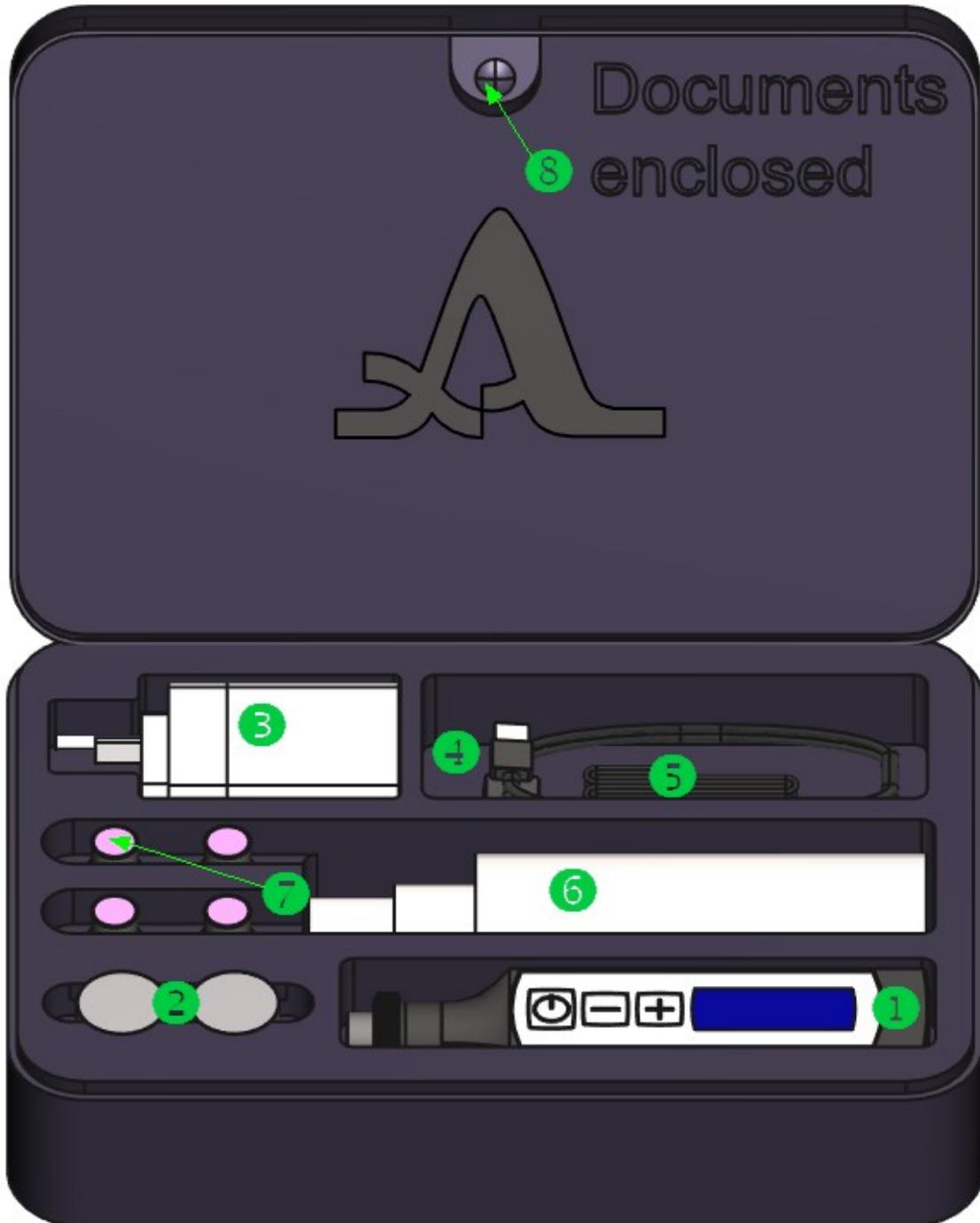
1. Operation manual	4
1.1 Scope of delivery	4
1.2 Description and operation of the instrument	5
1.2.1 The intended use of the instrument	5
1.2.1.1 Intended use and operation range	5
1.2.1.2 Operation conditions	6
1.2.2 Technical specifications	6
1.2.3 Instrument design and operation principle	6
1.2.3.1 Instrument design	7
1.2.3.2 Operation principle	8
1.3 Intended use	8
1.3.1 Operating restrictions	8
1.3.2 Factors influencing the operation of the instrument and accuracy of the readings.	8
1.3.2.1 State of the surface	8
1.3.2.2 Putting the piezoelectric transducer onto the surface	9
1.3.2.3 Non-parallelism or eccentricity	9
1.3.2.4 Acoustic properties of the material	9
1.3.2.4.1 Sound dispersion	9
1.3.2.4.2 Variation of velocity	9
1.3.3 Making the instrument ready for operation	10
1.3.3.1 Surface preparation	10
1.3.3.2 Switching On/Off the instrument	10
1.3.3.3 Select the measurement units	10
1.3.3.4 Adjustment of the instrument	11
1.3.3.4.1 Current ultrasonic sound velocity	11
1.3.3.4.2 Edit current ultrasonic sound velocity	11
1.3.3.4.3 Measure the ultrasonic sound velocity in the sample of known thickness	11
1.3.3.4.4 Calibration mode	12
1.4 Maintenance	13
1.4.1 Accumulator battery	13
1.4.2 Recharging the accumulator	13
1.4.3 Replacement of the transducer capsule	14
1.4.4 Common troubleshooting and remedies	15
1.5 Storage	15
1.6 Transportation	15
1.7 Appendix A	15
2. Firmware installation	18
3. Application software	19
3.1 Introduction	19
3.2 Application tabs	19
3.3 Connection to a Bluetooth device	19

3.4	Thickness measurement	22
3.4.1	Display mode	23
3.4.2	A-Scan mode	28
3.4.3	B-Scan mode	31
3.5	Settings	36
3.6	Service address	41
Index		0

1 Operation manual

1.1 Scope of delivery

The following section describes the scope of delivery for A1207 PenGauge.



A1207 PenGauge Scope of delivery

Part	Amount	Location
Electronic unit A1207 PenGauge with one build-in transducer	1	①

Reference block for functional tests	2	②
Power charger	1	③
USB cable	1	④
Strap	1	⑤
Couplant	1	⑥
Optional transducers (if ordered)	1	⑦
Warranty certificate	1	inside case ⑧
Calibration certificate	1	inside case ⑧

1.2 Description and operation of the instrument

The present operation manual (from now on referred to as "operation manual") contains:

- technical specifications,
- description of design,
- and operation principle of the A1207 Ultrasonic Thickness Gauge (from now on referred to as "thickness gauge" or "instrument"),
- as well as information required for proper working with the instrument.

Carefully read the operation manual before working with the instrument.

Only properly trained personnel who carefully read the operational documentation and understand general principles of the ultrasonic vibration propagation theory should be allowed to work with the instrument.

Test problems must be identified, inspection layouts shall be chosen, conditions of performing inspection using similar materials shall be estimated, etc., for proper ultrasonic inspection.

Continuous improvement of the instrument functions and its reliability and usability sometimes results in minor changes that are not reflected in the current version of the operation manual. Therefore, they do not affect the technical specifications of the instrument.

1.2.1 The intended use of the instrument

1.2.1.1 Intended use and operation range

Thickness gauges are pocket-type portable ultrasonic gauges of general-purpose.

The instruments are designed to perform wall thickness measurements of boilers, containers, pressure-operated vessels, hull plates, and other items made of black and non-ferrous metals, as well as small-diameter metal and plastic pipes (from 20 mm) with even and corroded surfaces with roughness Rz160 and minimum bending radius from 10 mm.

One can use the instrument under laboratory, field, and workshop conditions in various industries. Please be sure to perform the surface pre-treatment using couplant. Contact lubricants can be as follows: multiple oils, water, glycerin, special contact liquids, and ultrasonic testing gels, etc.

1.2.1.2 Operation conditions

The instrument is designed to work under the following conditions:

- ambient air temperature ranges from - 30 to +50 °C;
- relative air humidity up to 95 % at +35 °C.

1.2.2 Technical specifications

The table below lists the main instrument parameters.

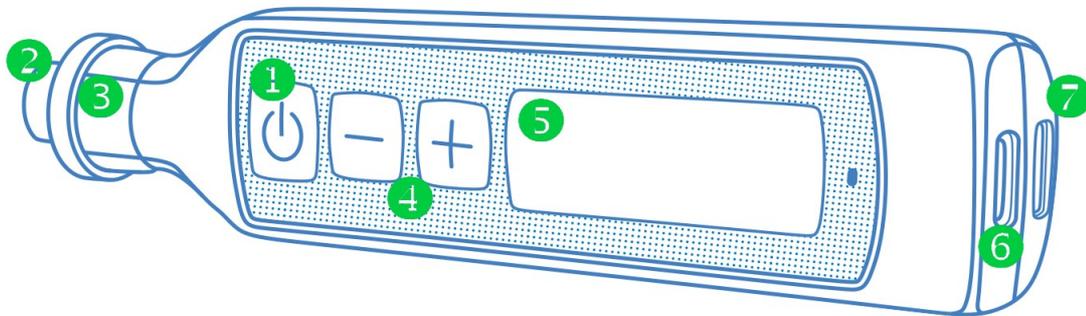
Table 1: Key instrument parameters

Parameter	Value
Measurement range of the thickness (steel), mm	from 0.8 to 75.00 (double-crystal transducer) from 25 to 100.00 (double-crystal transducer)
Sampling rate of the thickness indication, mm:	
from 0.80 to 9.99 mm	0.01
from 10.0 to 100.0 mm	0.1
Setting range of ultrasound velocity, m/s	from 1000 to 9000
Type of the built-in transducer	double-crystal or single element
Frequency of the built-in transducer, MHz	7 (double-crystal) or 5 (single element)
Diameter of the work surface of the built-in transducer, mm	8 (double-crystal) or 10 (single element)
Power	built-in LiPol rechargeable battery
Nominal battery voltage, V	3.7
Period of continuous operation of the instrument powered from the completely charged accumulator under normal environmental conditions, min.	16 h
Overall dimensions, max.	125 × 25 × 15 mm
Maximum weight, g	40
Average time between failures, min.	18 000 h
Average service life, min.	5 years

1.2.3 Instrument design and operation principle

1.2.3.1 Instrument design

A1207 Ultrasonic Thickness Gauge is a pocket-type one-piece case (see figure below) with a built-in accumulator battery and a built-in double-crystal transducer or single-crystal transducer (if requested).



Label	Description
❶	On/Off Key
❷	Capsule of the piezoelectric transducer
❸	Tip
❹	Tuning keys
❺	Digital display
❻	USB port
❼	Eyelet for strap

The instrument's design allows the replacement of the worn-out capsule of the built-in transducer by unscrewing the tip detaching the transducer capsule from the instrument without extra tools (see [Replacement of the transducer capsule](#)^[14]).

The  key is used to:

- switch the instrument On/Off;
- toggle between the measurement units (millimeters/inches).

The setting keys  and  are used to switch:

- the velocity adjustment mode;
- the calibration mode.

The digital measurement results, the ultrasound velocity, the accumulator battery state, and the current measurement units (see figure below) are displayed on the screen.

The USB connector is used to connect the power adaptor 220 V – USB to charge the built-in accumulator battery.



Label	Description
❶	Thickness measurement result
❷	Accumulator charge level
❸	Measurements units

1.2.3.2 Operation principle

The instrument measures the time of the double movement of ultrasonic pulses through the inspected object from one surface to another. This time is converted to the thickness value using a known velocity value.

The piezoelectric transducer integrated into the instrument's case sends ultrasonic pulses into the inspected object and receives their reflections. The transducer is put on the surface of the tested object in the point where the thickness should be measured.

1.3 Intended use

1.3.1 Operating restrictions

The instrument is designed to be operated under conditions listed in the section [Operation condition](#).

1.3.2 Factors influencing the operation of the instrument and accuracy of the readings

1.3.2.1 State of the surface

Loose or exfoliating rust, corrosion, or dirt on the surface of the object to be tested can influence the transmission of the ultrasonic sound in the material. Hence such surface should be cleaned of the rust and scale followed by applying more contact fluid as compared to the fluid amount required for the smooth surface.

Thorough cleaning of the rough corroded surfaces will increase the accuracy of the measurements and prolong the transducer's lifetime.

If there is a thick layer of paint on the surface or the paint starts to pill off, then remove it since the thick paint layer reduces the signal and can produce a false echo, thus resulting in false measurement results. The measurements can be executed through the thin paint

layer (0.1-0.3 mm). At that, the result of the measurements will include the thickness value of the paint layer.

If there is a thick layer of paint on the surface or the paint starts to pill off, then remove it since the thick paint layer reduces the signal and can produce a false echo resulting in false measurement results.

1.3.2.2 Putting the piezoelectric transducer onto the surface

The piezoelectric transducer should be tightly pressed to the surface of the tested item to provide a good transmission of the ultrasonic sound into the material.

When measuring the wall thicknesses of the cylindrical objects, minimal diameters, we recommend using viscous lubricant (viscous contact liquid) and applying more liquid to the point of contact.

Tightly pressing the piezoelectric transducer to the tube's surface and watching the instrument's readings, lean the transducer from side to side in the plane perpendicular to the tube's axis. At that move, the transducer gradually along the tube's wall. Do not slide along the wall to decrease the wearing of the working surface of the piezoelectric transducer.

If scanning is required, e.g., when searching for local thin areas of the material, then do it as gently as possible, do not apply strong pressure, and use clean contact grease only on the pre-cleaned surface.

The instrument's readings when the transducer is leaning from the middle position will be increased a little. The minimum steady reading of the instrument contacting the tube's wall with the middle of the working surface of the piezoelectric transducer will be considered the actual value of the measured thickness. If the transducer strongly leans from this position, then the instrument's readings could increase in discrete steps.

The tested objects with double convex curvature (tubes' bends, spherical coverings and so on) are the most difficult for inspection since they can be contacted in a single point only. If so, the transducer should contact the object in the middle of its working surface.

1.3.2.3 Non-parallelism or eccentricity

If the external and internal surfaces of the inspected material are not parallel or are eccentric to each other, then the reflected wave (echo – signal) will deviate from the required direction, and the accuracy of the readings will decrease.

1.3.2.4 Acoustic properties of the material

Some properties of the constructive materials can essentially limit the measurement accuracy and measurable thickness range, and they can also increase the measurement error.

1.3.2.4.1 Sound dispersion

In some materials (some types of stainless steel, cast-iron, composites), the sound energy is being dispersed (on the crystallite molding or additions in the composites). This effect reduces the possibility of the quality receipt of the signal reflected from the backside of the tested object, thus limiting the abilities of the ultrasound measurements.

1.3.2.4.2 Variation of velocity

Sound velocity can vary essentially when the sound goes from one point to another in some materials. This effect in some types of cast stainless steel and copper is caused

by the relatively big size of the grains and by the anisotropy of the sound velocity with respect to the grain orientation.

1.3.3 Making the instrument ready for operation

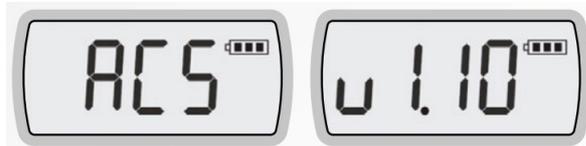
1.3.3.1 Surface preparation

Carefully clean the surface of an inspected object from dirt, friable rust, and scale before measurements. Apply a sufficient amount of the lubricant to the area of inspection.

1.3.3.2 Switching On/Off the instrument

To switch on the thickness gauge, shortly press the  key.

On the instrument's screen, a moving message with the manufacturer name and firmware version is displayed for several seconds.

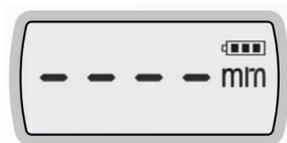


The instrument will switch into the measurement mode. The horizontal strokes, the accumulator battery state, and the current measurement units are displayed on the screen.

To switch off the thickness gauge, press and hold the key for more than two seconds.

NOTE

The instrument will automatically switch off in 5 minutes if neither keys are pressed, nor the measurement process goes.



1.3.3.3 Select the measurement units

Select the measurement units: metric or imperial.

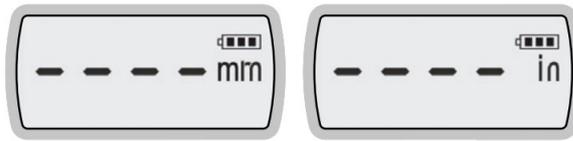
METRIC ("mm" shall be indicated) – the instrument measures the thickness in mm; the instrument uses m/s for velocity.

IMPERIAL ("in" shall be indicated) – the instrument measures the thickness in inches (in); the instrument uses inch/ms (in/ms) for velocity.

To select the measurement units, while switching on the instrument, press and hold the



key until the screen changes the displayed measurement values from "mm" (metric system) to "in" (imperial system) or vice-versa.



1.3.3.4 Adjustment of the instrument

1.3.3.4.1 Current ultrasonic sound velocity

To view current ultrasonic sound velocity (see figure below) shortly press (hold no longer than 2 seconds) the  or  key while in the measurement mode.



1.3.3.4.2 Edit current ultrasonic sound velocity

To edit the current ultrasonic sound velocity value, do the following:

- press (hold longer than 2 seconds) the  or  key while in the measurement mode, at that the current velocity value will start blinking;
- set the required velocity value using the  or  key;

The velocity value will stop blinking in three seconds, and the instrument will switch to the measurement mode. At that, the instrument saves velocity value.

NOTE

The instrument saves the set velocity value when off.

1.3.3.4.3 Measure the ultrasonic sound velocity in the sample of known thickness

To measure the ultrasound velocity in the sample of known thickness, do the following:

- set in the instrument the ultrasonic sound velocity value in the sample of the known thickness (see [Edit current ultrasonic sound velocity](#)¹¹);
- place the instrument onto the surface of the sample with a layer of the coupling media pre-applied;
- measured thickness value will be blinking;
- adjust the velocity value by means of the  or  keys, so that the known thickness value is displayed as the measurement value;
- take the instrument from the sample, the measured resulting velocity value will be blinking on the screen;

The velocity value will stop blinking in three seconds, and the instrument will switch to the measurement mode. At that, the measured velocity value will be saved.

NOTE

If there is no material sample, though the tested item is accessible from both sides, you can measure its thickness in the place convenient for inspection (using a micrometer), and then adjust the instrument in a way similar to adjustment using a sample of known thickness.

1.3.3.4.4 Calibration mode

For a single-crystal transducer, calibration mode consists of two stages. The first stage is turning off the noise threshold. The second stage is determining the latency value in the transducer using the calibration sample (5 mm calibration block) included in the delivery kit. The second stage is not obligatory. It shall be executed after the replacement of the transducer.

For a double-crystal transducer, calibration mode consists only of a single-stage - determining the latency value in the transducer using the calibration sample (5 mm and 25 mm calibration block) included in the delivery kit.



WARNING

Before calibration, clean the transducer!

To enter the calibration mode, simultaneously press and hold (longer than 2 seconds) the



keys. The blinking message "dUAL" or "SnGL" is displayed on the screen depending on the transducer built-in on the device.

The noise threshold will be determined automatically.

Within three seconds after the instrument has entered the calibration mode, place the instrument onto the surface of the calibration sample with a layer of the coupling media pre-applied.

The instrument shall remain on the sample until the calibration is completed. The procedure is indicated by a countdown.

If the calibration result is negative, the screen will display "FAIL" (see figure below). If so, restart the calibration on the sample. Otherwise, the instrument will go to the measurement mode.



For a single-crystal transducer, calibration is performed on one step of the calibration sample - 5 mm.

For a double-crystal transducer, calibration is performed on two steps of the calibration sample - 25 mm and immediately 5 mm.

After calibration on the 5 mm for a single-crystal transducer or 25 mm for a double-crystal transducer the determined velocity value in the instrument is shown on the display.

**WARNING**

The determined velocity value by the calibration procedure is not saved in the device memory! Notice the velocity value and manually set it in the instrument if needed!

The maintenance of the instrument includes cleaning it from dirt and dust and recharging the accumulator.

1.4 Maintenance

1.4.1 Accumulator battery

The rechargeable battery of the instrument is designed for operation over a wide range of temperatures. The battery capacity decreases at negative temperatures. The capacity is lower by approximately 15% than at normal temperatures.

If the battery is almost dead when the power is on, its state will be indicated by the blinking unshaded battery symbol. The instrument will automatically switch off when the accumulator battery is dead.

The rechargeable battery has built-in protection against overcharge, over-discharge, excess current, and temperature.

The rechargeable battery is designed for the entire warranty period of the instrument operation.

The rechargeable battery shall be replaced by the service centers only.

**WARNING**

Replacing the battery by the operator immediately voids the warranty for the instrument!

1.4.2 Recharging the accumulator

The accumulator is charged via the external charger or from the PC via USB.

When the charger is connected to the instrument, the battery filling sign starts blinking. During the charging process, the blinking symbol "moves" to the top of the battery sign.

The period of charging depends on the discharge level. The full charge takes about 4-5 hours. Repeated recharge is allowed.

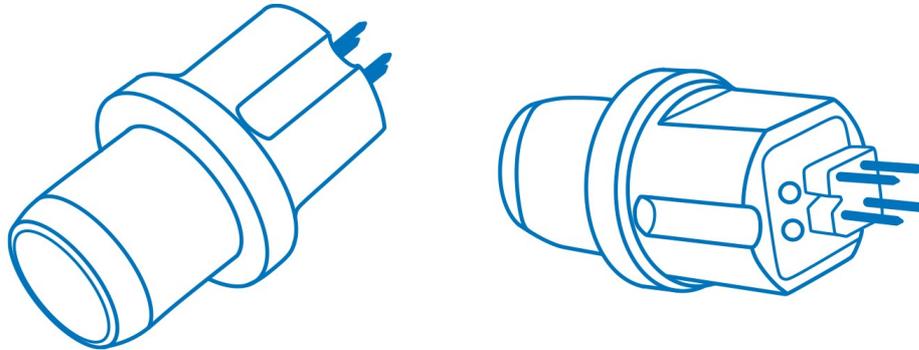
One can use the instrument during charging. In this case, the charging time will be 2-3 times longer.

**WARNING**

Don't store the instrument with discharged battery to prevent its functional loss!

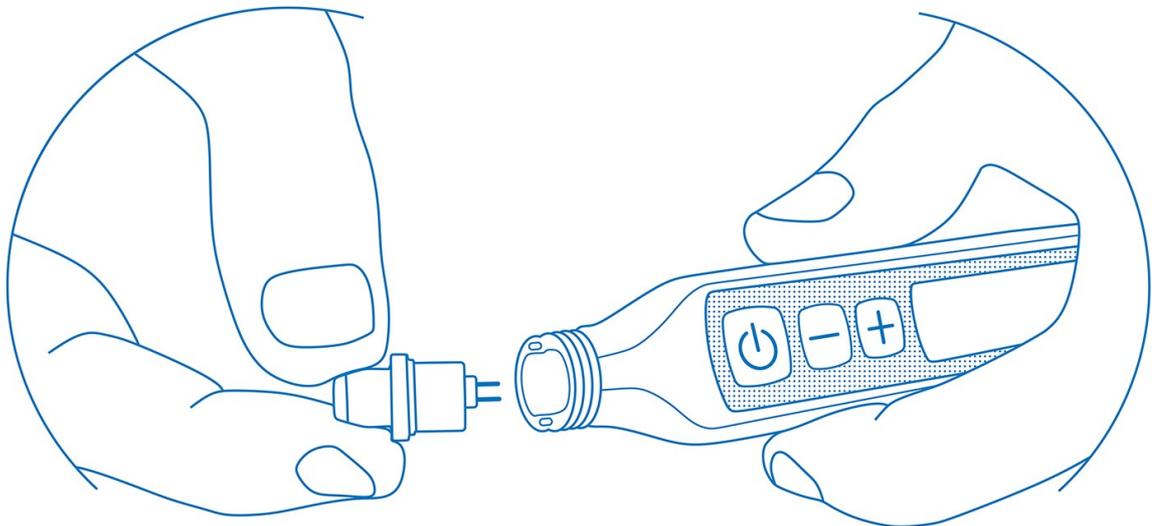
1.4.3 Replacement of the transducer capsule

The user can independently replace the worn out piezoelectric transducer capsule without any additional tools. The figure below shows a sample of a capsule.



To replace the capsule of the transducer, proceed as follows:

- Switch off the instrument;
- Unscrew the tip;
- Disconnect the capsule from the instrument (see figure below).
- Reinsert a new capsule;
- Screw in the tip



WARNING

After the capsule is replaced, calibrate the device using the calibration sample (see [Calibration mode](#)¹²⁾).

1.4.4 Common troubleshooting and remedies

Operators experiencing troubles during the instrument operation or having any questions relating to its operation, please immediately contact the manufacturer's representatives.

1.5 Storage

A1207 Ultrasonic Thickness Gauge should be shelf stored in the bag included in the delivery kit of the instrument.

The arrangement of the instruments in warehouses shall enable their free movement and unrestricted access to them.

The distance between the instruments and the walls, floor of the warehouse, and other warehoused instruments shall be at least 100 mm.

The distance between the heating of a warehouse and the instruments shall be at least 0.5 m.

The storage room shall be free from the current-conducting dust, admixtures of aggressive gases, and corrosive vapors able to attack the instruments.

1.6 Transportation

A1207 Ultrasonic Thickness Gauge should be transported in the bag included in the delivery kit of the instrument.

The transportation conditions with regard to the impact of the external environment climatic factors should correspond to storage conditions.

Any vehicle type can transport the packaged instruments for any distance without speed restrictions.

One should fasten the packaged instruments properly in the transport vehicle. One should protect the packaged instruments from precipitation and water splashes during transportation in an open transport vehicle.

One should fix the packaged instruments properly and steadily to prevent shocks of devices against each other and against vehicle walls during transportation.

The transportation conditions should conform to the technical conditions and regulations applicable to each type of transportation.

If shipped by air, properly packed instruments should be placed in hermetically sealed and heated compartments.

If the transportation conditions differ from the operation conditions, the instruments shall be kept under normal environmental conditions for at least 2 hours before use.

1.7 Appendix A

The table below presents the propagation speeds of the longitudinal ultrasonic waves in some materials.

Table 2: Sound velocities in some materials

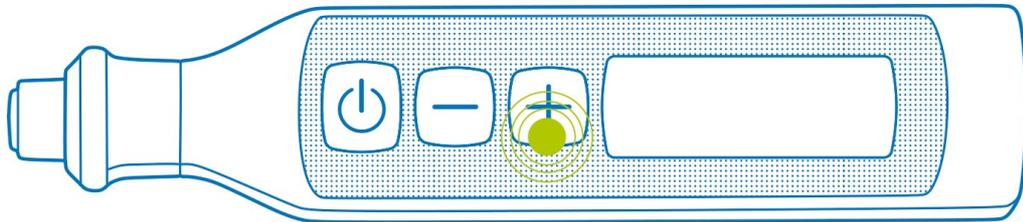
Material	Velocity, m/s
Aluminium	6260
Aluminium alloy D16T	6320

Bronze (phosphor	3530
Vanadium	6000
Bismuth	2180
Tungsten	5460
Ferrum	5850
Gold (Aurum)	3240
Constantan	5240
Concrete	2000 - 5400
Ragstone	5930
Gabbro 38	6320
Plaster stone	4790
Foliated granite	7870
Granite	4450
Toadstone 85	5800
Dolomite	4450
Limestone	6130
Brass	4430
Brass LS-59-1	4360
Magnesium	5790
Manganin	4660
Manganese	5561
Copper	4700
Molybdenum	6290
Nickel	5630
Stannum	3320
Osmium	5478
Lead	2160
Limestone 86	4640
Capron	2640
Quartz glass	5930
Labradorite 44	5450
Ice	3980
Marble	6150
Plexiglass	2670
Polystyrol	2350

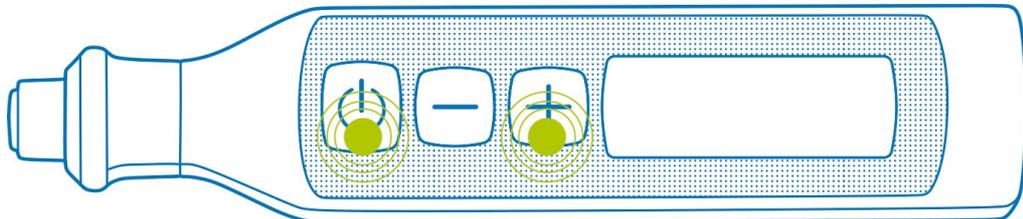
Rubber	1480
Mica	7760
Acrylic plastic	2550
Silver (Argentum)	3600
Glass-ceramics	6740
Steel 20 GSNDM	6060
Steel HN77TUR	6080
Steel 40HNMA	5600
Steel HN70VMTU	5960
Steel HN35VT	5680
Tantalum	4235
Chromium	6845
Zinc	4170
Silicate glass	5500
Steel H15N15GS	5400
Steel St3	5930
Thermazote	2920
Teflon	1350
Porcelain	5340
Ebonite	2400
Circonium	4900
Cast iron	3500 - 5600

2 Firmware installation

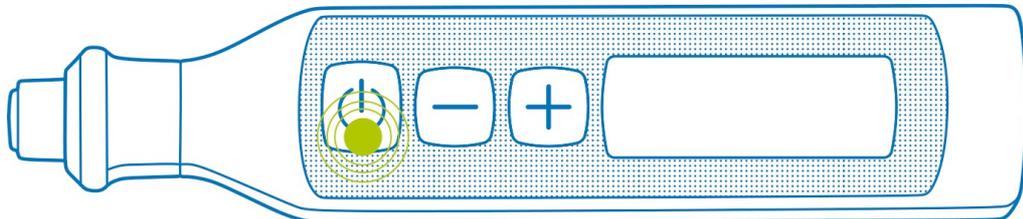
1. Press and hold  key.



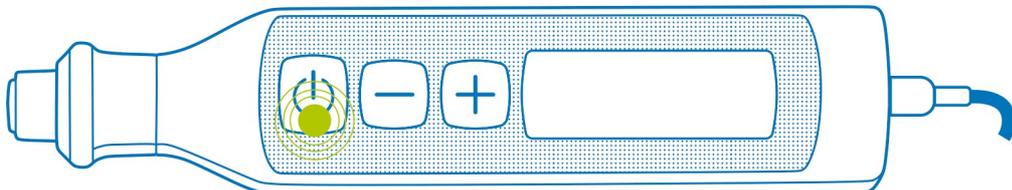
2. Then press and hold  key. On the display appears "Update".



3. Now you may release  key.



4. While the  key still pressed, connect the USB2.0 cable.



5. A new DRIVE appears (for example here - G:).



6. Copy newest (A1207_v3_43.bin) or desired firmware file to the new drive (here - >G:).
7. Disconnect the USB2.0 cable.

3 Application software

3.1 Introduction

The application software for A1207 PenGauge operates on Android smartphones and tablet PCs connected via Bluetooth with the same-named thickness gauge instrument by ACS. The main purpose of the software is to extend the regular functionality of the A1207 PenGauge to include additional data processing and reporting features for better usability.

3.2 Application tabs

The application has five tabs. They are depicted at the bottom of the application. The Table shows informational pictograms.

Pictogram	Description
	Connectivity tab
	Display tab
	A-Scan tab
	B-Scan tab
	Settings tab

NOTE

The pictograms are going yellow-colored by activating the corresponding tab.

3.3 Connection to a Bluetooth device

Open the application. It starts with the Connectivity tab. Under the Paired devices (Android) or Online devices (iPhone) section, you will see a list of all A1207 paired device (Android) online devices (iPhone) (see Figure 1).

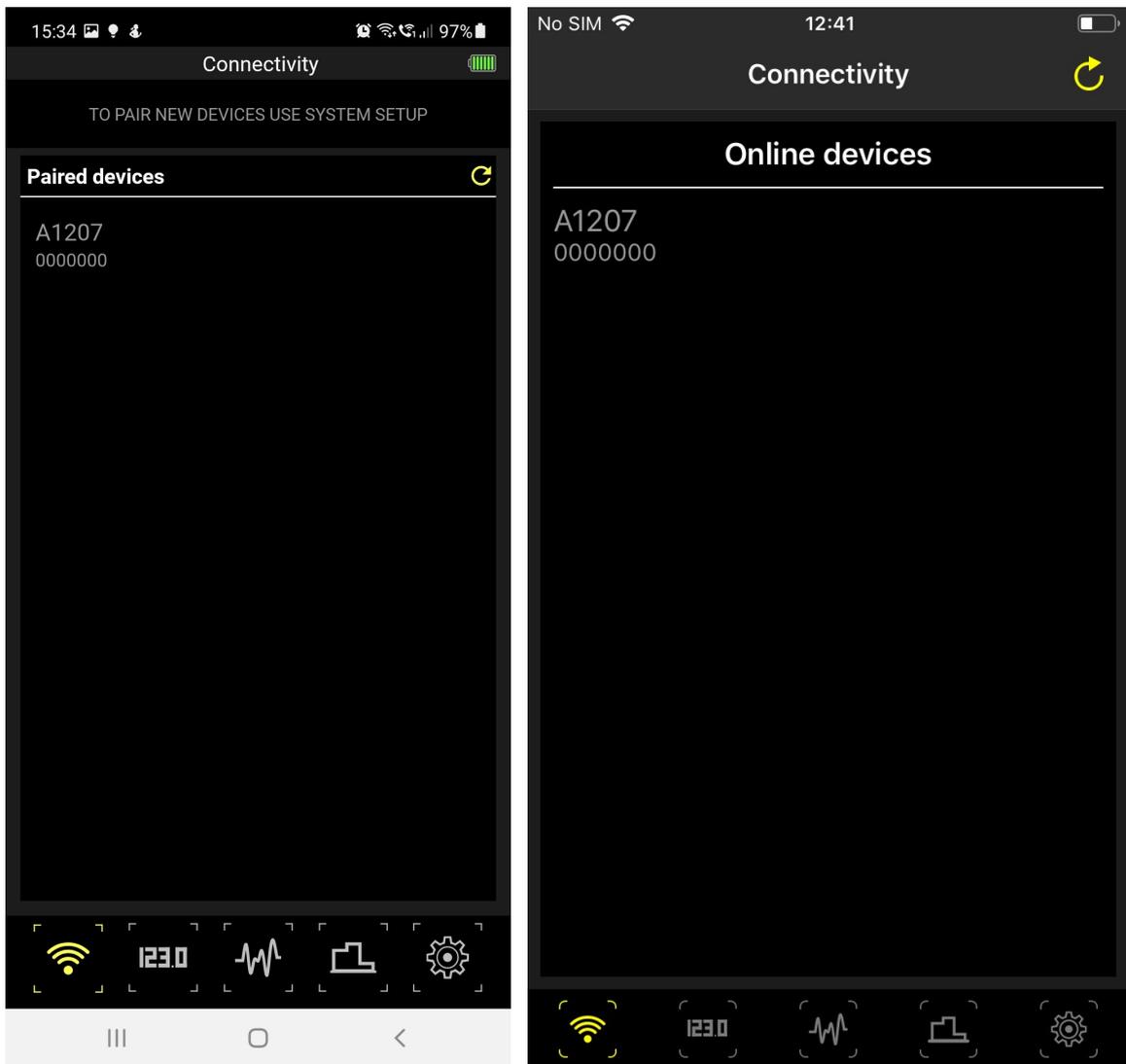


Figure 1: Connectivity tab (left - Android, right - iPhone)

NOTE

Only paired devices (Android) online devices (iPhone) will be listed. To pair a new device with Android see the section Pairing devices.

Click on the desired device name to connect (see Figure 2).

NOTE

You can connect only to one device simultaneously.

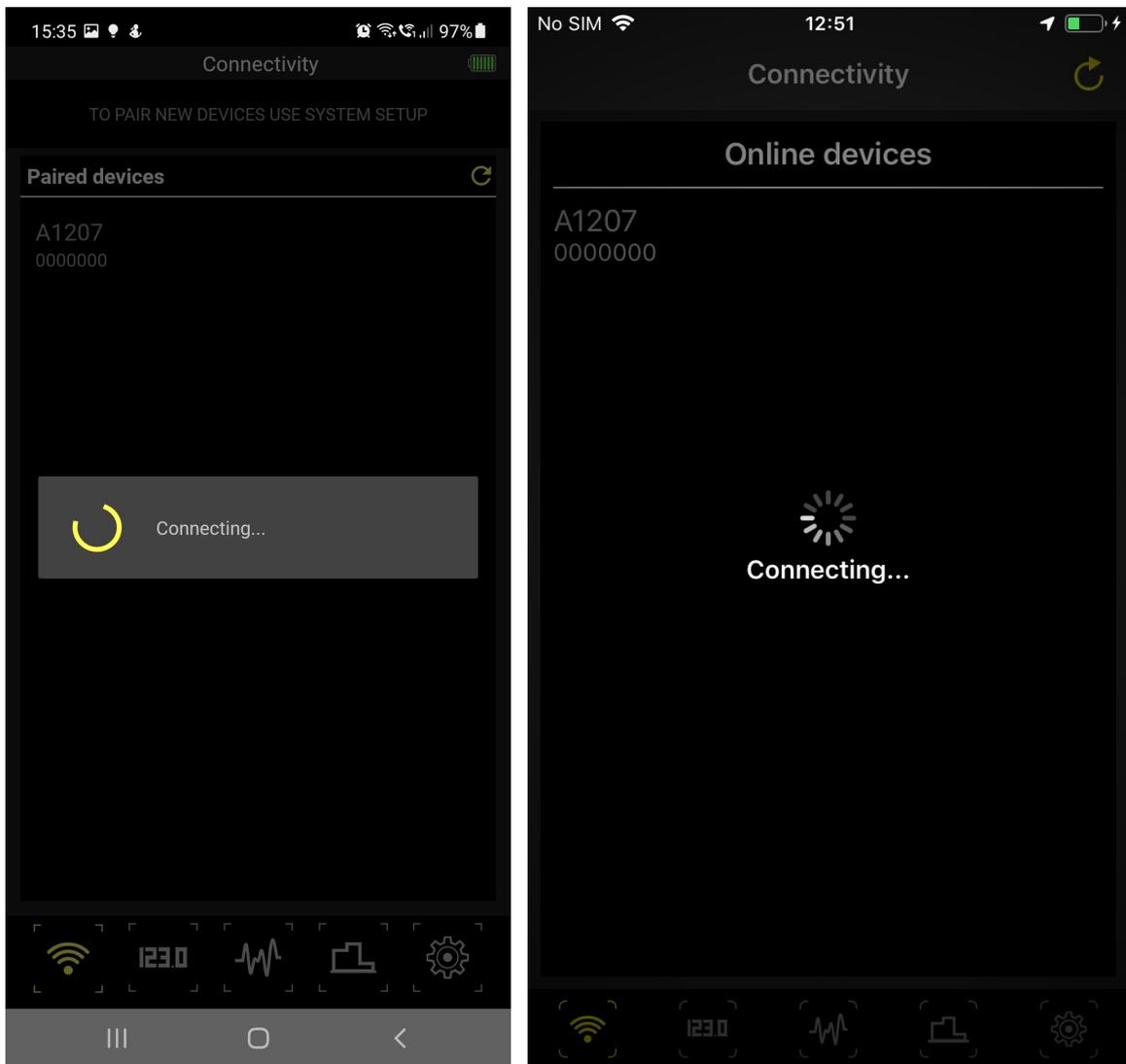


Figure 2: Connection to the device (left - Android, right - iPhone)

If the device is switched on, the connection will succeed. As long as the Bluetooth connection is active, you will see the serial number of the connected device and the battery level at the top of the application (see Figure 3).

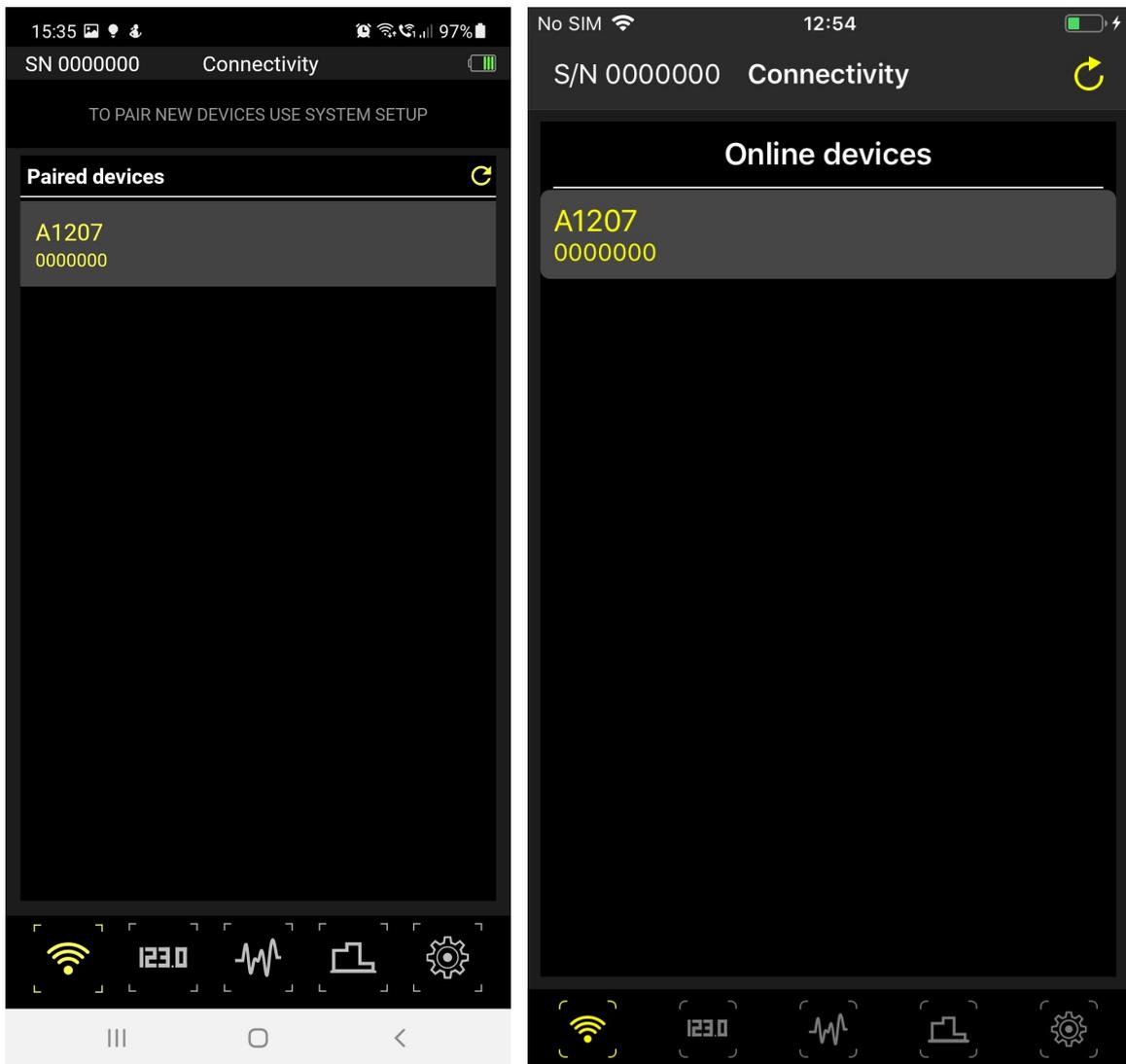


Figure 3: Connected device

Now you can start the measurement.

If the Bluetooth connection is lost, the application will switch to the Connectivity tab again.

3.4 Thickness measurement

There are three modes of the thickness measurement provided by the A1207 PenGauge in combination with the application software:

1. **Display:** The measurement proceeds only in auto mode; you will see the results in digital form.
2. **A-Scan:** Besides the digital results, you can see the signal plot, which can be scaled to view more details.
3. **B-Scan:** Continuous measurement to create a thickness profile.

3.4.1 Display mode



By clicking on the pictogram , the app goes to the Display tab. A standard view of the Display tab is shown in Figure 4.



Figure 4: Display tab (left - Android, right - iPhone)

Digital result

The top part of the view contains the digital result of the thickness measurement in corresponding units (mm or inch). Clicking and holding on the unit symbol switches between metric and the imperial system of measurement. This panel also contains some informational pictograms:

Pict ogra m	Functions	
	Contact status: no contact	
	Contact status: there is contact	
	ACF – Auto Correlation Function	An automatically chosen data-processing algorithm used for thickness value computation
	First negative peak	
	Intersection with zero	
	No measurement	
	Automatic mode	
	Applied sound velocity value	
	Applied gain value	

Saving measurement and saved result

Under this panel, there is the “Save measurement” button. All saved results are organized into groups and cells. In the lower part of the view, the table containing all results is shown. Both groups and cells have a three-dot menu, which will give you further configuration options (see Figures 5, 6).

NOTE

The value of each cell is converted to the corresponding units (mm or inch) after switching the measurement units.

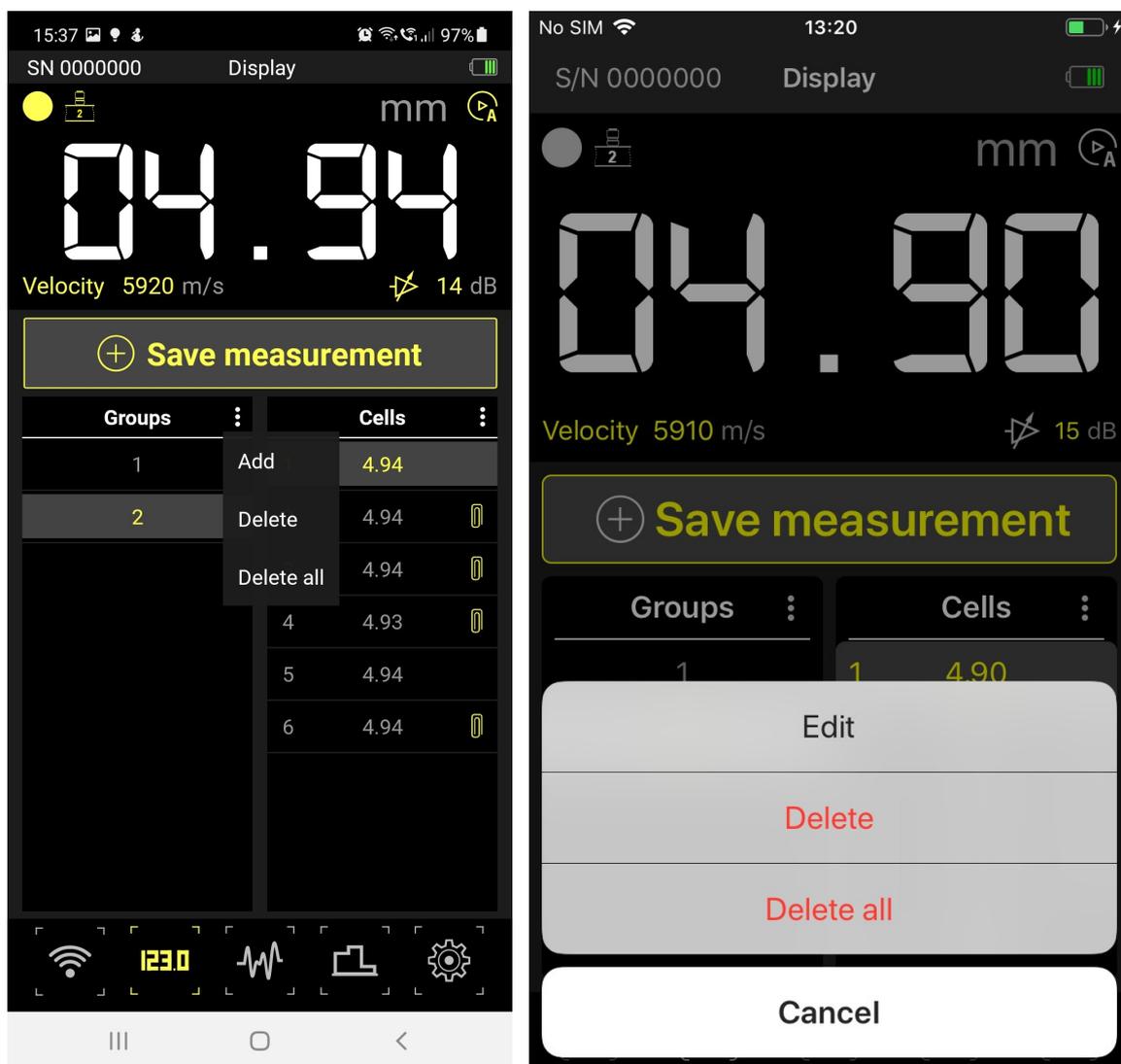


Figure 5: Menu for groups (left - Android, right - iPhone)

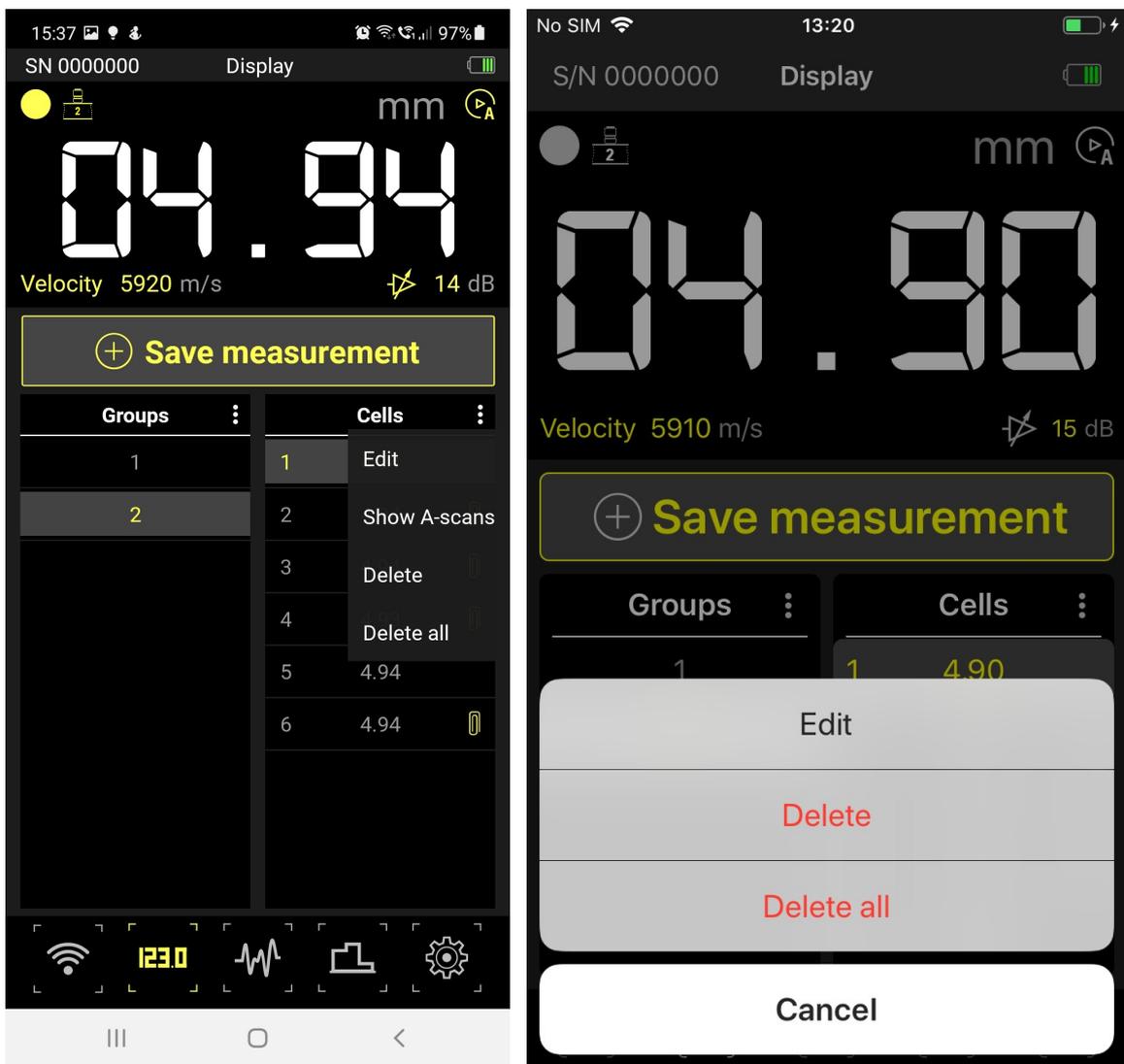


Figure 6: Menu for cells (left - Android, right - iPhone)

Measurement groups

For managing the measurement groups, you have the following options:

1. **Add** – Add a new empty group.
2. **Delete** – Delete the currently selected group.
3. **Delete all** – Delete all groups.

NOTE

By clicking on the Add button, the new group is appended at the bottom to the list with groups.

Measurement cells

For the value cells, you have the following options:

1. **Edit** – The next result to save will replace the currently selected group.
2. **Show A-Scans** – Allows you to see saved A-Scan pictures.
3. **Delete** – Delete currently selected cell.
4. **Delete all** – Delete all cells in the current group.

NOTE

By clicking on the Save measurement button, the new cell is appended to the list after the selected cell.

When the saved data is in editing mode, you can see a pencil icon on top of the cells (see Figure 7). Press the Edit button again to exit the editing mode (a pencil on the top of the cells will disappear).



Figure 7: Edit mode (left - Android, right - iPhone)

Clicking on the Show A-Scans option opens a separate page where you can see the signals (if the result was saved from the A-Scan tab) and the calculation method for each result. See more details at the end of the following section [A-Scan mode](#)²⁸.

NOTE

A paper clip symbol means that the cell contains a saved screenshot of A-Scan.

3.4.2 A-Scan mode



By clicking on the pictogram, the app goes to the A-Scan tab. A standard view of the A-Scan tab is shown in Figure 8.

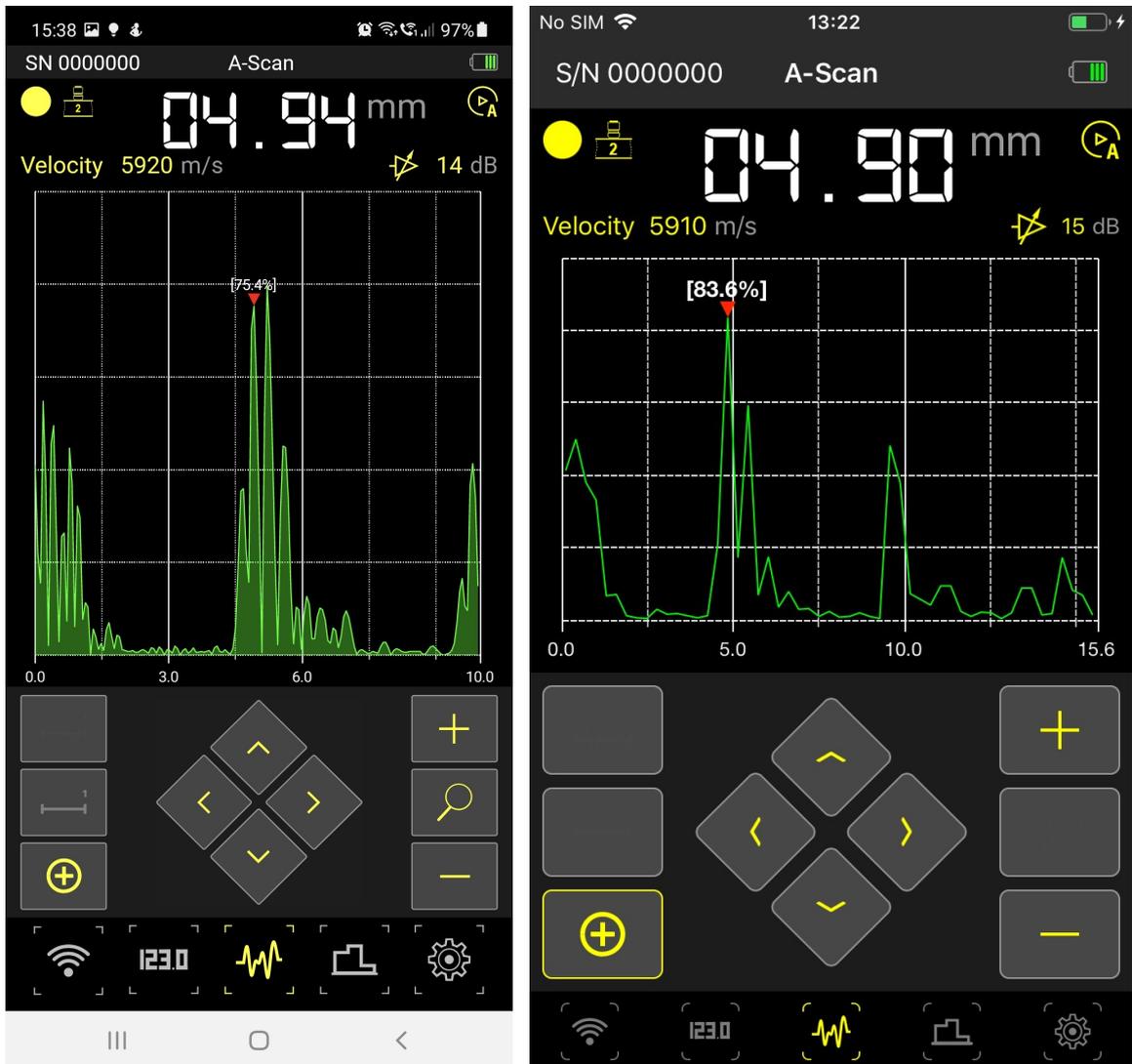


Figure 8: A-Scan tab (left - Android, right - iPhone)

Digital result

The top part of the view contains the digital result of measurement in corresponding units. Clicking and holding on the unit label switches between metric and the imperial system of measurement.

NOTE

The value of each cell is converted to the corresponding units (mm or inch) after switching the measurement units. However, the A-Scan plot remains unconverted.

The panel also contains some informational pictograms:

Pictogram	Functions	
	Contact status: no contact	
	Contact status: there is contact	
	ACF – Auto Correlation Function	Algorithm used for result computation
	First negative peak	
	Intersection with zero	
	No measurement	
	Automatic mode	Mode of a device, clicking and holding on the pictogram switches between manual and automatic modes. In manual mode, you can manually change the signal evaluation parameters.
	Manual mode (currently unavailable)	
	Applied sound velocity value	
	Applied gain value	

Plot with A-Scan

Under this panel, you can see the plot where the ultrasonic pulse-echo signal is shown.

Measurement control

In the lower part of the view, there are several buttons to control the measurement.

Pictogram	Functions	
	ACF – Auto Correlation Function (currently unavailable)	Chosen algorithm for calculating the result (ACF, One peak, One gate two peaks, Two gates). Available only in manual mode. Clicking on the corresponding button opens the dialog for algorithm selection.
	One peak (currently unavailable)	
	One gate two peaks (currently unavailable)	
	Two gates (currently unavailable)	
	Allows you to save the current measurement result with a plot (A-Scan).	
	Selects gate as the active control element to interact on A-Scan or apply joystick actions. In the case of manual mode and if the ACF algorithm is selected, the click and hold enable you to reset the gate.	
	Selects signal as the active control element to interact on A-Scan or apply joystick actions. Clicking and holding on this button (only in manual mode, see Settings ³⁶ for more information) opens the dialog for selection gain instead of zoom  (and vice versa). In this case, the joystick action is applied to the gain.	
	Joystick actions to zoom/pan the signal, to resize/move the gate or to increase/decrease the gain.	
		
		
		
		
		

Saved result

When the results in the A-Scan tab are saved, the plot image is saved simultaneously. In the cell table, such results are marked with a paperclip symbol. The “Show A-Scans” command allows you to see the signal image connected to the corresponding result (see Figure 9).

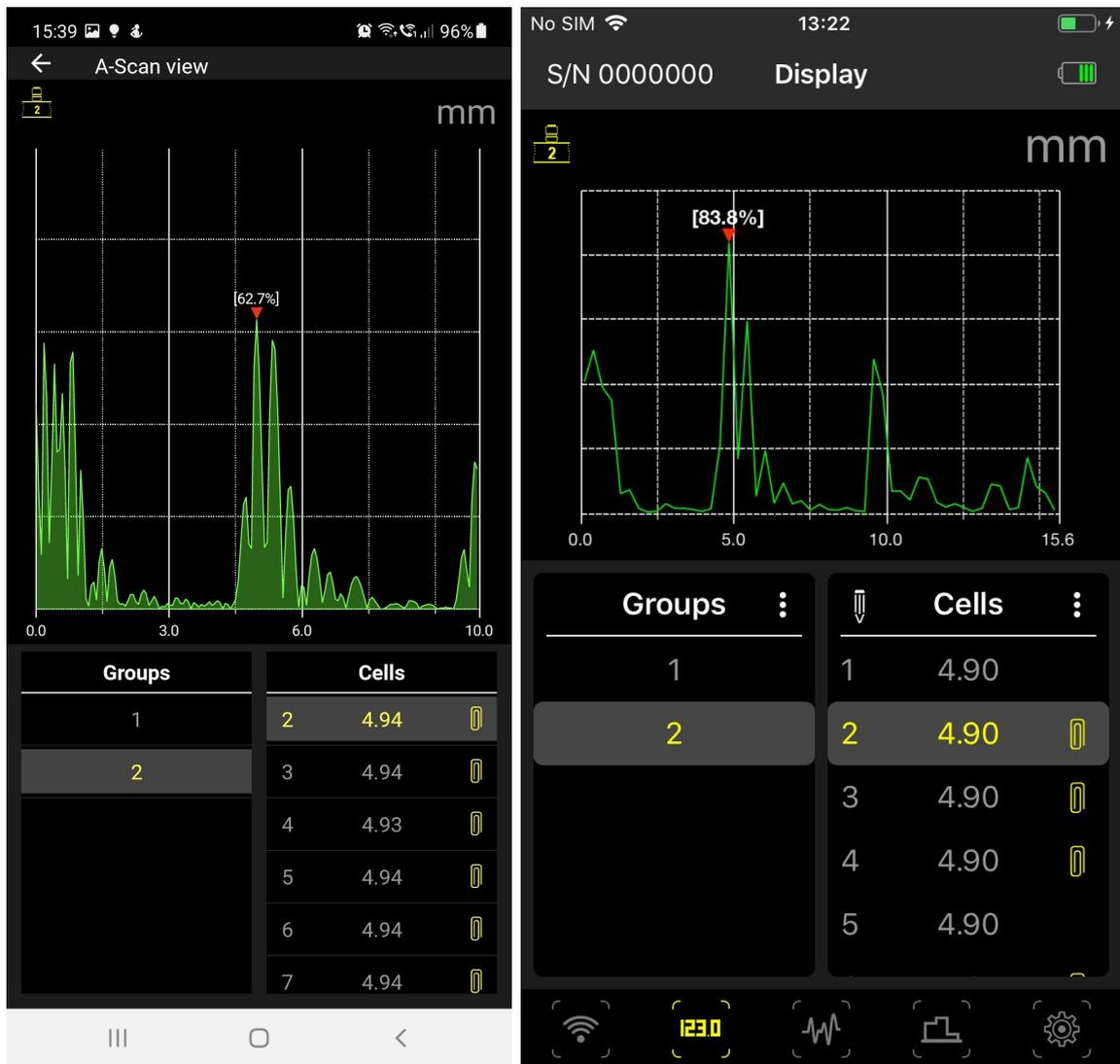


Figure 9: Saved results viewer (left - Android, right - iPhone)

3.4.3 B-Scan mode



By clicking on the pictogram , the app goes to the B-Scan tab. A common view of the B-Scan tab is shown in Figure 10.



Figure 10: B-Scan tab (left - Android, right - iPhone)

Digital result

The top part of the view contains the digital result of measurement currently selected by cursor the position in corresponding units. Clicking and holding on the unit label switches between metric and the imperial system of measurement. The panel also contains some informational pictograms:

Pictogram	Functions	
	ACF – Auto Correlation Function	Algorithm used for result computation
	First negative peak	
	Intersection with zero	
	No measurement	
	Automatic mode	Mode of device, changing the mode is allowed only in the A-Scan tab.
	Manual mode	
	Applied sound velocity value	
	Applied gain value	

Plot

Under this panel, you can see the plot where the set of consistently received signals are combined into a B-Scan image (thickness profile). Under the plot, you can see the information about minimal and maximal values in the measurement.

Measurement control

In the lower part of the view, there are several buttons to control the measurement.

Pictogram	Functions
	Starts the measurement process.
	Stops the measurement process.
	Allows you to save the current result with a plot. Clicking and holding on this button shows the dialog, where you can choose two additional options: clear plot or show saved B-Scans.
	Selects the cursor as the active object to interact on the plot or apply joystick actions.
	Selects B-Scan image as the active object to interact on the plot or apply joystick actions.
	Joystick actions to zoom/pan the signal, to resize/move the gate or to increase/decrease the gain.
	
	
	
	

Saved B-Scans

Clicking and holding on the button  opens the sub-menu, where one can select between of the two options:

1. **Delete** – delete current B-Scan shown on the plot.
2. **List** – list all saved B-Scans.

Selecting the option to show saved B-Scans switches to the table containing all saved B-Scans (see Figure 11).

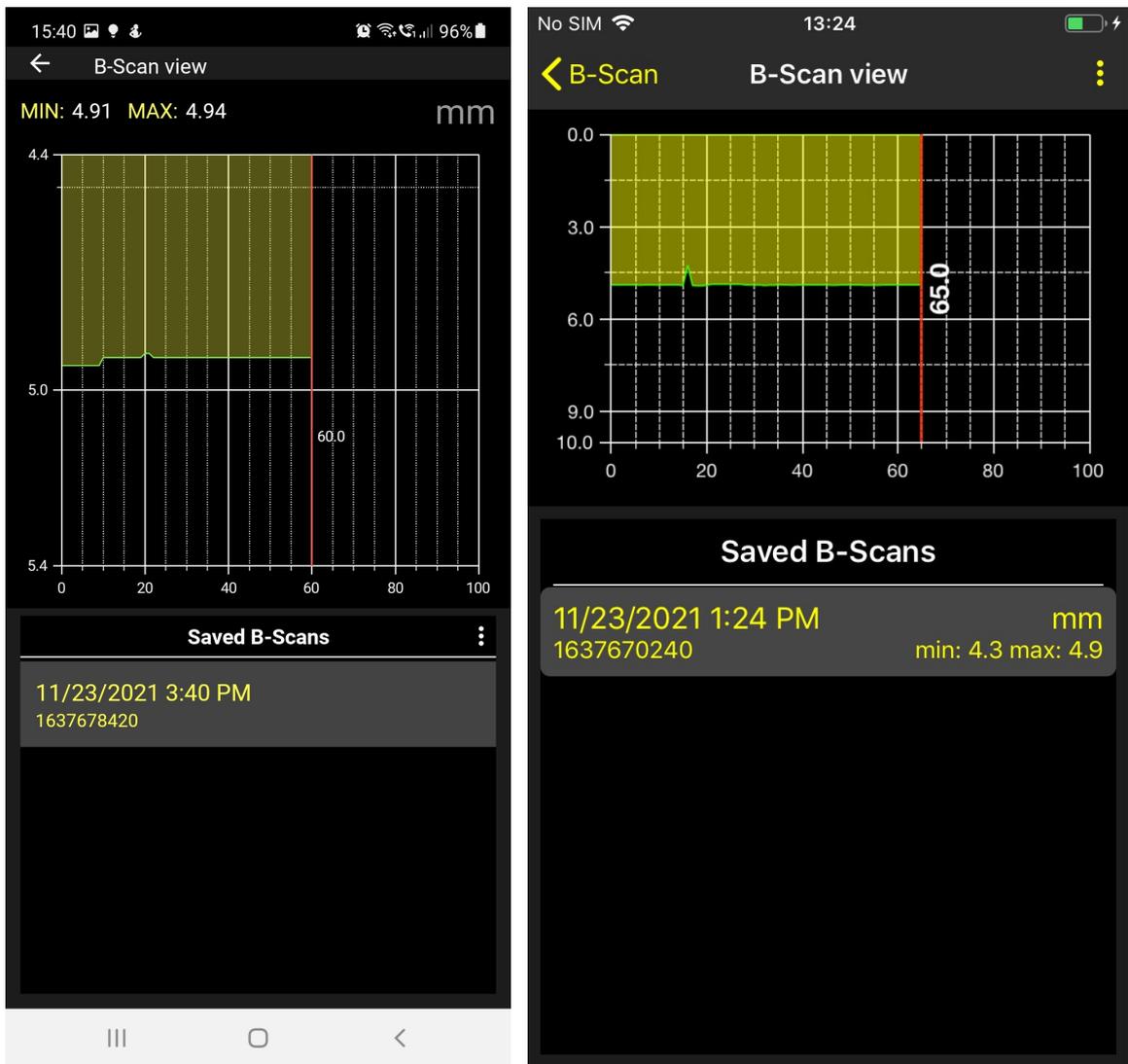


Figure 11: Saved results viewer (left - Android, right - iPhone)

By clicking on the desired item, you can see the image connected to this item and the minimum/maximum information as well. The table has a three-dot menu (see Figure 12) with the following options:

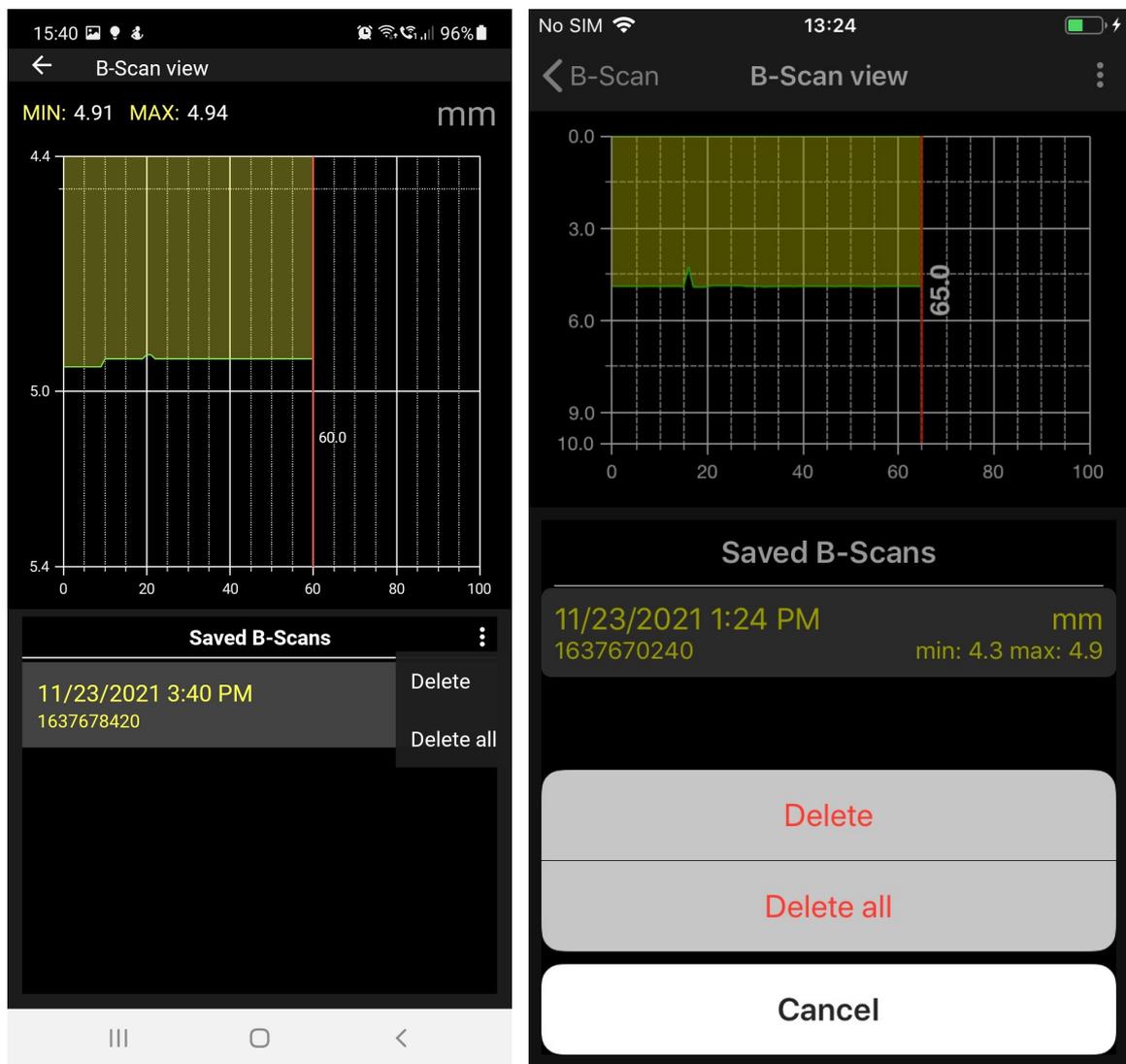


Figure 12: Menu for B-Scans (left - Android, right - iPhone)

1. **Delete** – Delete files connected to the currently selected B-Scan item.
2. **Delete all** – Delete all B-Scans.

You can also pause data acquisition from the A1207 PenGauge instrument. This could be done by clicking and holding on the result value in all three measurement tabs: Display,

A-Scan, or B-Scan. The pictogram  will be added to the information panel.

3.5 Settings

By clicking on the pictogram , the app goes to the Settings tab. The list of the available measurement settings in the application is shown in Figures 13, 14.

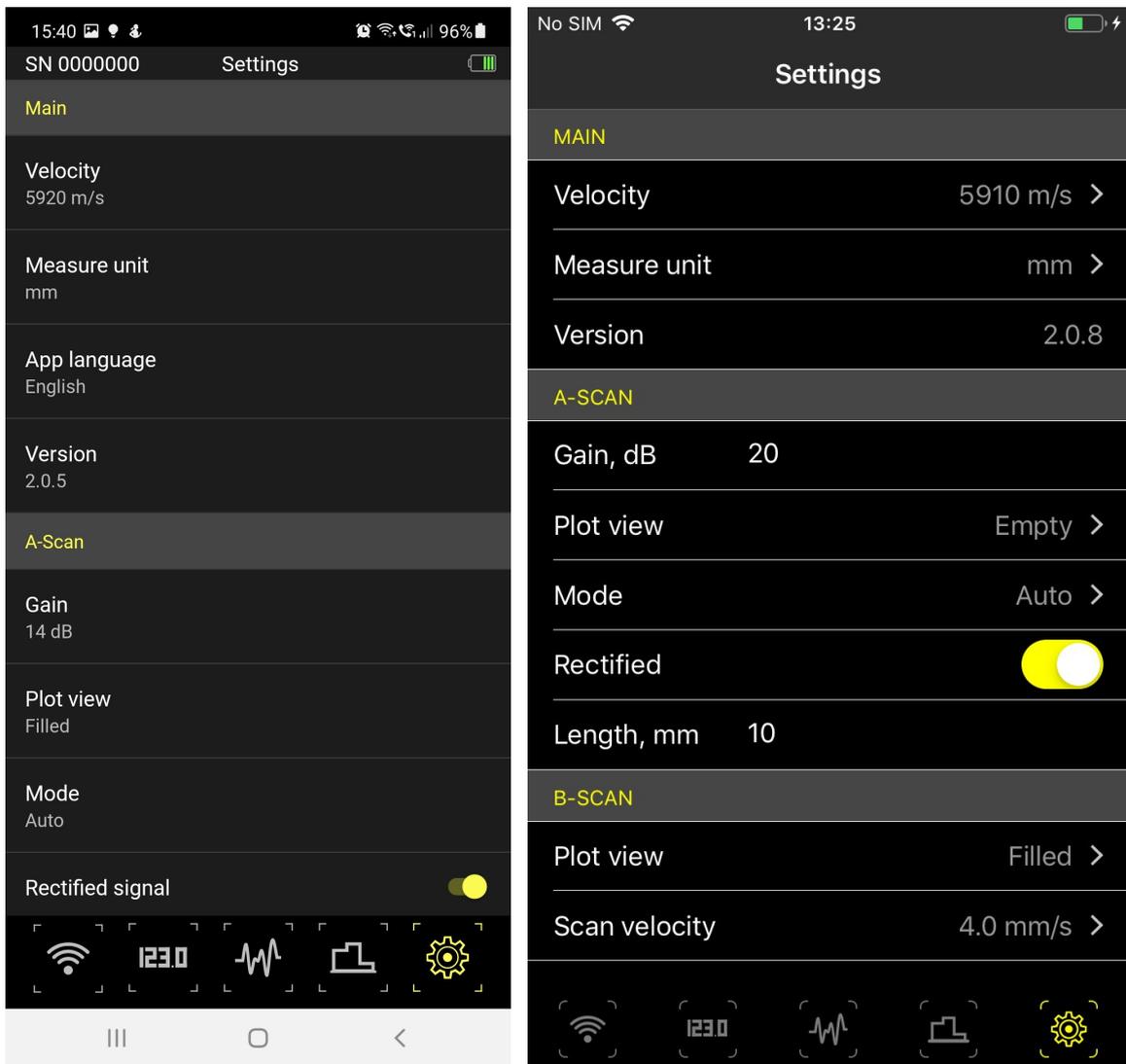


Figure 13: Settings tab (left - Android, right - iPhone)

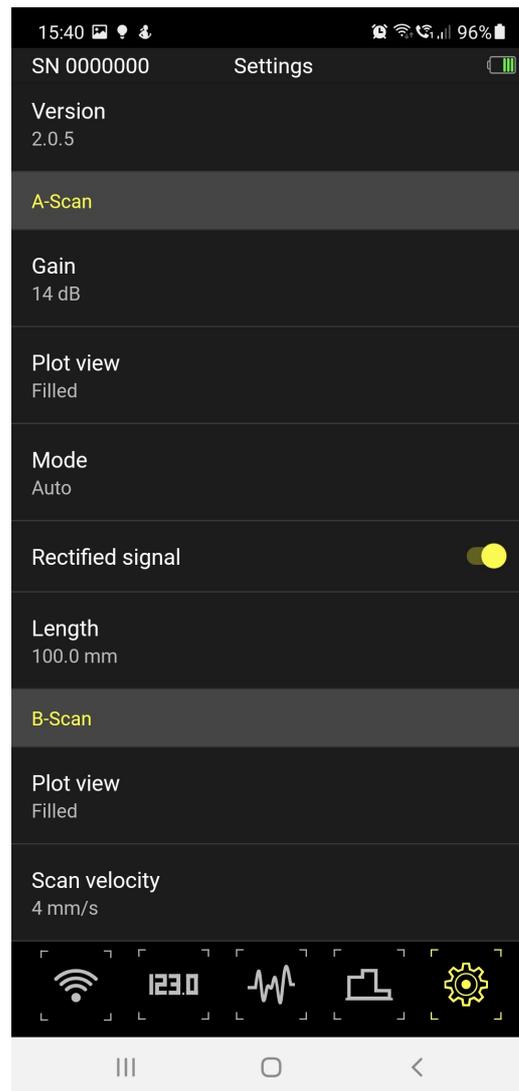


Figure 14: Settings tab

The Main setting category consists of the following items:

1. **Velocity** – Applied ultrasound velocity.
2. **Measure unit** – Used system of measurement: metric or imperial.
3. **Version** – Version of the used application.
4. **App language** – Used language in the application: English or Russian (Android only).

Velocity

The ultrasound velocity can be changed directly on the A1207 device or in the application. For that purpose, the material editor is used (Figure 15).

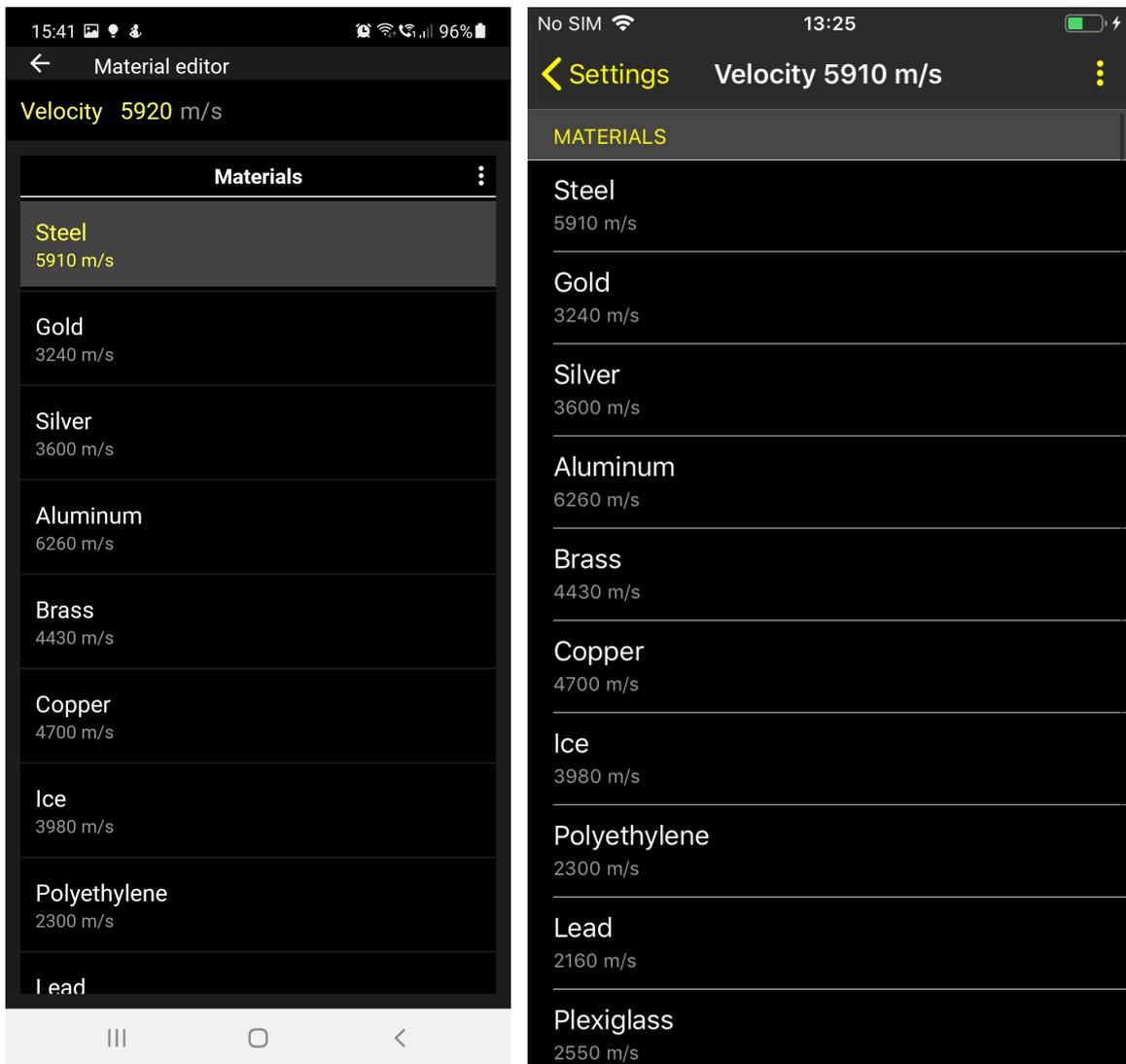


Figure 15: Material editor (left - Android, right - iPhone)

The Material editor contains a table with several typically used materials and their values for the sound velocity. The material list can be extended or changed with the velocity values for individual materials. The table has a three-dot menu (see Figure 16) with the following options:

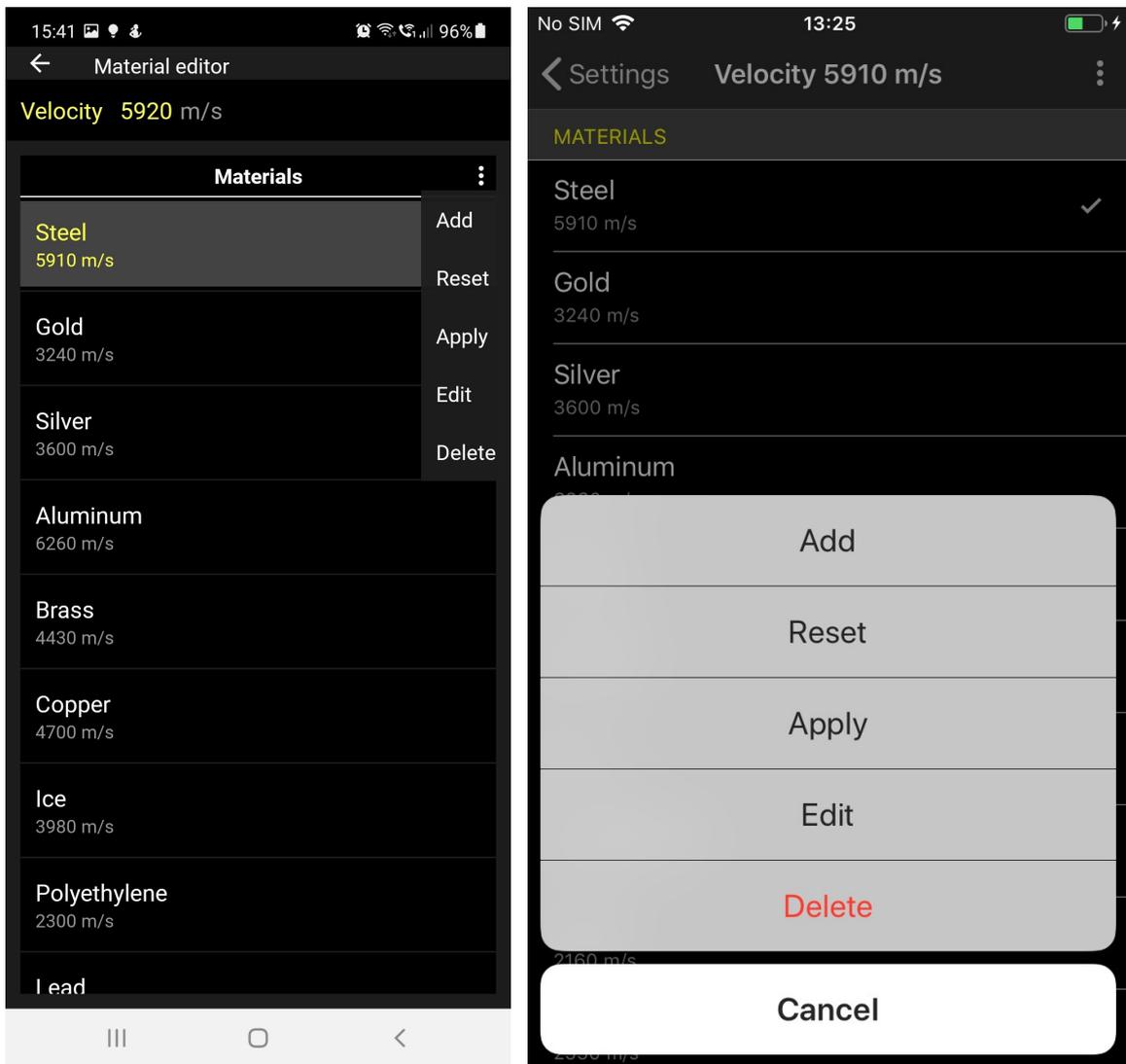


Figure 16: Menu for materials (left - Android, right - iPhone)

1. **Add** – Add new material with a new sound velocity value.
2. **Reset** – Reset the material list to default.
3. **Apply** – Set the sound velocity of the currently selected material to the device.
4. **Edit** – Edit the sound velocity value of the currently selected material.
5. **Delete** – Delete the currently selected material.

A-Scan

The A-Scan configuration consists of the following parameters:

1. **Gain** – Gain value applied in the manual measurement mode.
2. **Plot view** – Representational view of the A-Scan (empty or filled).
3. **Mode** – Measurement mode (auto or manual). Manual mode is currently unavailable.
4. **Rectified signal** – Switch on/off the signal rectification.

-
5. **Length** – The upper boundary of the shown A-Scan length.

B-Scan

The B-Scan configuration consists of the following parameters:

1. **Plot view** – View of the B-Scan image, empty or filled, similar to A-Scan,
2. **Scan velocity** – Velocity of the device during the scanning, moving from 1 to 10 mm/s.

The resolution of the B-Scan plot is constant and represents one measurement result per millimeter.

3.6 Service address

Acoustic Control Systems is always available at info@acs-international.com for support if you have any questions regarding the installation or usage of the A1207 PenGauge mobile application.