A1221 ANCHOR

Ultrasonic Low-Frequency Tester

Operation manual

Revision 1.1.3

Acoustic Control Systems - ACS Group
Saarbrücken, Germany 2021

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 Instrument Description

This manual provides basic operating instructions for the A1221 ANCHOR ultrasonic low-frequency tester. The information in this manual is organized to explain the technology, safety details, hardware, and software. Practical measurement examples help the user become familiar with the instrument's capabilities.

1.1 Product description

Product description

The A1221 ANCHOR is an instrument for non-destructive assessment of various structural components such as anchor bolts, fasteners, stiffeners, and solid rebars in concrete, masonry, or stone. The A1221 ANCHOR tests adhesion quality and residual length of structural components in a wide range of civil engineering applications. The instrument's ability to investigate lengthy pieces offers engineers an outstanding opportunity to reduce production costs and increase production and maintenance quality. The A1221 ANCHOR operates with three specially designed piezoelectric transducers at 25, 50, and 100 kHz. The instrument can also work as a low-frequency flaw detector. The A1221 hat light-weight design, comfortable and robust soft case, and extended battery capacity.

The instrument improves knowledge about adhesion quality as well as about residual length of the tested component. The instrument was successfully tested on anchor bolts and solid rebars casted in concrete or grouted in stone. The A1221 ANCHOR offers an extremely wide range of assessment depths. The instrument has measurement range from 300 millimeters to 8 meters. For assessment the A1221 ANCHOR requires only one free outer end of a structural component. To guarantee an optimal quality the instrument must be used under the following conditions:

- Assessable bolt / rebar diameter: 20-40 millimeters (0.8-1,6 inch)
- Not grouted assessment length: up to 8 meters (26.3 feet)
- Minimal assessment length: 0.3 meter (9.8 feet)
- Assessable grouting depth in concrete: up to 1 meter (3.3 feet)
- Assessable grouting depth in rock: up to 4 meters (13.1 feet)

Instrument features

- Real-time A-scan waveform display
- Manual freeze mode with saving of results
- Manual zoom and range control of waveform display
- One manually controlled gate
- Receiver gain readout
- Display stored waveform

Instrument specification

Parameter	Value
Operating frequency range	25-250, kHz
Maximal data acquisition length	4000, μs
Assessment length	0.5-3 meters
Assessment length of embedded rods	up to 1 meter
Assessable rod diameter range	20-40, mm
Material velocity range	500-15000, m/s
Transmitter output voltage	±20, ±100, ±200, V
Transmitter pulse form	Bipolar meander, 0.5÷5.0 periods
Pulse repetition rate	1-45, Hz
Gain setup range	0-100, step 1, dB
Number of the programmable points of DAC function	24
Dynamic range of DAC function	30, dB
Power supply	Built-in battery
Operation time	14, h
Battery charging time	3, h
Display type	TFT (640 x 480)
Electronic unit dimensions	260×156×43, mm
Electronic unit weight	0.8, kg

Operating conditions

Parameter	Value
Operating temperature range	from -20 to +55 ˚C
Relative air humidity at +35°C	max 95 %

1.2 Maintenance

Cleaning

- The A1221 ANCHOR instrument must be regularly cleaned from dirt and dust using a cleaning agent for plastics.
- If the screen's protective glass is dirty, please wipe it with a soft cloth moistened in a household cleaning agent for plastic glasses.
- The keyboard allows the application of alcohol for cleaning.
- If dirt or foreign matter gets in the arming connectors, use a soft brush for cleaning.

Storage

- Store the A1221 ANCHOR in a hardshell case included in the delivery set.
- Store A1221 ANCHOR in racks.
- The arrangement of the device in warehouses shall enable its free movement and unrestricted access to them.
- The distance between the devices and the walls, floor of the warehouse, and other warehoused instruments shall be at least 100 mm.
- The distance between the heating units of the storage room and the devices should be min. 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.

Transportation

- Transport the A1221 ANCHOR in a hardshell case included in the delivery set.
- The packaged devices can be transported in any vehicle at any distance without speed limits.
- Fix the package steadily to prevent their hitting during the transportation.
- Protect the package from rain and water splashes while opening the vehicle.
- The arrangement and fixation of the packed devices in transport facilities should provide their stable position and exclude strokes against each other as well as against the walls of the transportation facilities.
- The conditions for device transportation should meet the requirements of the valid specifications, rules, and norms for each transport type.
- If shipped by air, place the device in hermetically sealed heated compartments.
- If transportation conditions differ from the operation conditions, the device shall be kept under normal weather conditions for at least 2 hours before the operation.

1.3 Environmental ratings

The A1221 ANCHOR is a rugged and durable instrument that you may use in harsh environments. The A1221 ANCHOR was designed to meet the requirement of the IP64 standard (Ingress Protection).

CAUTION

ACS Solutions GmbH cannot guarantee any level of ingress protection performance once the instrument seals have been manipulated. You must use sound judgment and take proper precautions before exposing the instrument to harsh environments.

To maintain the original level of ingress protection, you are responsible for the proper care of all routinely exposed seals. Additionally, you are responsible for returning the instrument to an authorized ACS Solution GmbH service center each year to ensure that the instrument seals are properly maintained.

1.4 Instrument Hardware Components

The A1221 ANCHOR front panel features a color display and a keypad. The instrument comes with a blind, a softcover, a stand, and a map case. The softcover protects the device and the display from minor impacts and damages. The cover also helps to hold the instrument tightly. The blind protects the display from direct sunny light if testing is carrying out in the open air. The map case allows the instrument being fixates around the neck while the operators' hand is holding the transducer.

Bottom side of the instrument has a rubber flap seal for the DC power and USB communication connectors. Transducer connectors are located at the top of the instrument, see see Figure 1.

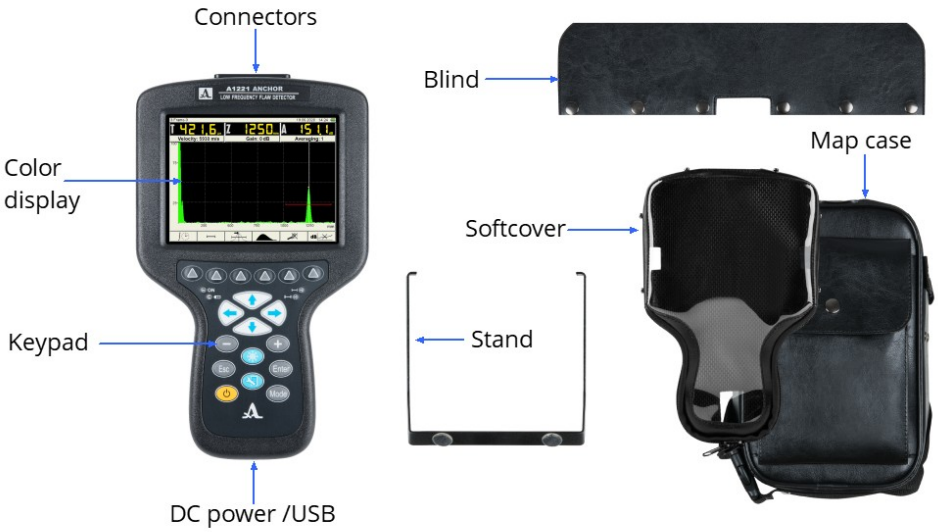


Figure 1: A1221 ANCHOR hardware components

1.5 Connectors

CAUTION

Charging of the A1221 ANCHOR and its simultaneous connection to a PC is prohibited.

The Figure 1 illustrates the connectors of the A1221 ANCHOR to the external devices

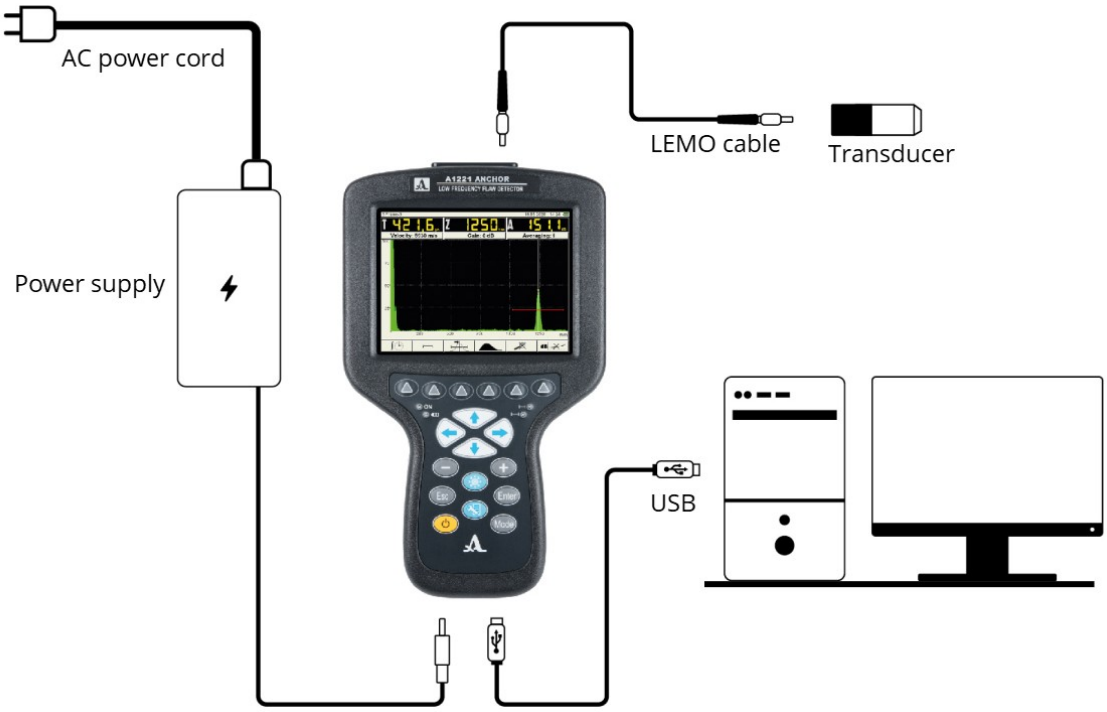


Figure 2: The A1221 ANCHOR connections

The A1221 ANCHOR has two LEMO sockets on its top. The LEMO cable connects the transducer to a socket LEMO 2, Figure 1. Socked LEMO 1(labeled by a red dot) ist not used.

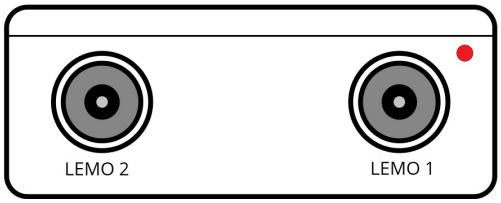


Figure 1: The A1221 ANCHOR connection of transducers

The DC power and USB connectors are located at the bottom of the A1221 ANCHOR.

CAUTION

To avoid the risk of injuries or equipment damage, use only the AC power cord and power supply delivered with the A1221 ANCHOR.

Do not use this AC power cord and power supply with other products.

1.6 Keypad functions

The A1221 ANCHOR comes with a membrane keypad. The keypad features both keys and indicators (see Figure 1)

Figure 3: The A1221 ANCHOR keypad

Some of the keys may have different functions in different operation modes. The corresponding icon on the screen depicts the particular function. The following table describes key functions and indicators .

Key	Functions	
	On/off - Turns the instrument power on or off. In order to power on or off hold the key for at least 5 seconds.	
	Power on indicator - Shows that instrument is on	
	Battery indicator - Shows the state of the battery. Yellow color stands for charging process. Green color shows that charging is completed.	
	First gate indicator - Is on if signal amplitude overrides gate threshold	
	Second gate indicator - Is on if signal amplitude overrides gate threshold	
	Setup mode key - Switches on or of the `Setup mode` of the instrument.	
	Stop mode key - Switches on or off the `stop mode` of the instrument	
	Function key - Activates a function which is pointed by this key on the instrument display. There are 6 function keys available.	
	Enter key	Function of theses keys depend on the current `device mode`. See description of the key function in dedicated chapter.
	Minus key	
	Plus key	
	Arrow left key	
	Arrow right key	
	Arrow up key	
	Arrow down key	

2 Powering of the A1221 ANCHOR

This chapter describes how to operate the A1221 ANCHOR using different power supply options.

Power indicator

The power indicator is always present in the right top corner of the screen. It shows the level of the battery charge and whether it is being charged(s. Figure 2).

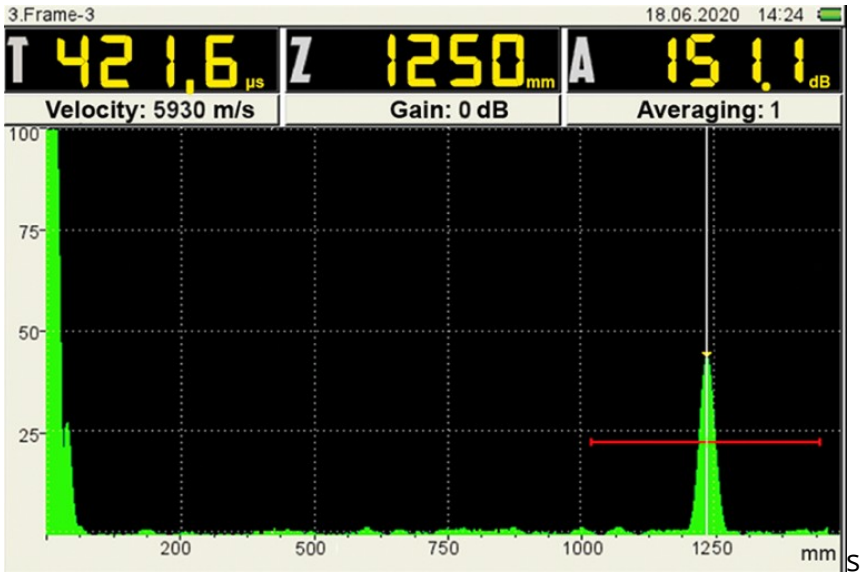


Figure 2: Power indicator

The power indicator takes one of the states denoted by the following icons.

Symbol	Description
	battery operation (100% remaining charge)
	battery operation (80% remaining charge)
	battery operation (60% remaining charge)
	battery operation (40% remaining charge)
	battery operation (20% remaining charge)
	battery charge level is almost empty At this level the A1221 ANCHOR shows a notification message and shuts down.
	battery alert The A1221 ANCHOR powering does not work correctly. Contact support.
	charging the battery Do not disconnect AC charger/adapter until the battery is fully charged.

Using the AC Power

You can operate the A1221 ANCHOR with the AC power using the charger/adapter (P/N GSM60A15-P1J/proConnecting). The GSM60A15-P1J has a universal AC power input that operates with any line voltage 80-264 VAC with the 47 Hz to 63 Hz line frequency.

CAUTION

To avoid the risk of injuries or equipment damage, use only the AC power cord and power supply delivered with the A1221 ANCHOR.

Do not use this AC power cord and power supply with other products.

CAUTION

Charging of the A1221 ANCHOR and its simultaneous connection to a PC is prohibited.

To use AC power:

1. On the A1221 ANCHOR, lift the rubber seal covering the DC adaptor connector on bottom of the A1221 ANCHOR (see Figure 3) and connect the DC power plug to the instrument

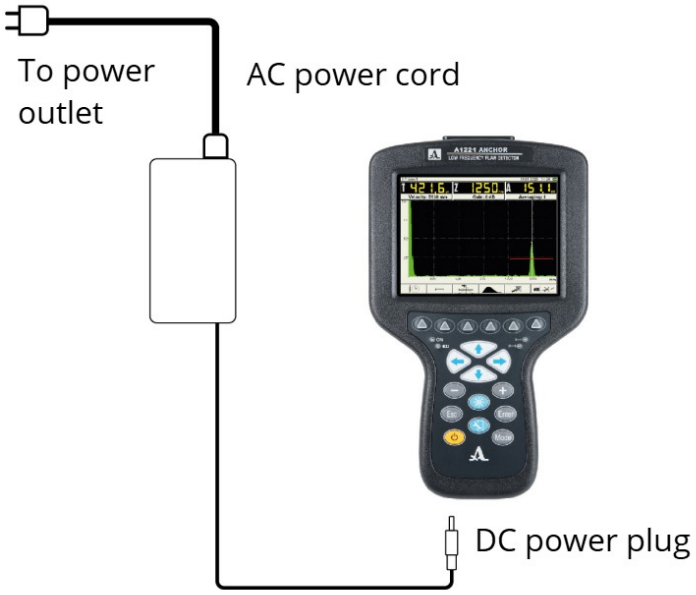


Figure 3: Connecting the charger/adaptor

2. Connect the AC power cord to the charger/adapter (P/N GSM60A15-P1J)
3. Connect the power outlet to the power plug of the power supply network

4. Turn on the A1221 ANCHOR

WARNING

Use the AC charger/adapter as it is described above. Not following the description may damage the A1221 ANCHOR.

Using Battery Power

The A1221 ANCHOR comes with a rechargeable lithium-polymer (LiPol) battery with 4000 mA/h. The A1221 ANCHOR automatically recharges the battery when you connect the instrument to the AC power.

Battery Operating Time

The battery operating time depends on the age of the battery and the instrument settings. To provide realistic battery operating times, the A1221 ANCHOR has been tested with mid-level operating parameters (repetition rate set to 5 Hz and display brightness set to 75%). The nominal battery operating time for new batteries is about 12-14 hours.

Charging the Battery

WARNING

The A1221 ANCHOR charger/adapter `GSM60A15-P1J` was tested to charge A1221 ANCHOR batteries only. Do not attempt to charge any other battery types or use any other chargers/adapters to charge the A1221 ANCHOR batteries. Doing so may cause an explosion and injury.

To charge the internal battery connect the A1221 ANCHOR using the AC power (see description above). The battery charges when the instrument is ON or OFF, but the rate of charge is slower when the instrument is ON.

NOTE

When the battery is fully charged, the battery charging symbol shows 100% remaining charge (full battery). It takes approximately 2 to 3 hours to fully charge a battery depending on its initial conditions.

NOTE

It may take several cycles of complete charging and discharging of the battery to bring the battery to full capacity. This conditioning process is normal for this type of rechargeable batteries

Battery Usage Instructions

- The battery must reach full charge on a regular basis for proper capacity and cycle-life maintenance.
- Fully recharge discharged batteries as soon as possible after use.

Storage Instructions

- Never store the instrument with discharged batteries.
- Store the instrument in a cool, dry environment.
- Avoid long-term storage under sunlight or in other excessively hot places such as the trunk of an automobile.
- While in storage, fully recharge batteries at least once every two months.

Replacing the Battery

CAUTION

Do not open the A1221 ANCHOR housing and do not try to exchange or repair the battery. Doing so may cause damaging of the instrument or/and injury. If you experiencing any problems with the device, contact support.

3 Measurement

This chapter describes the main steps to be carried out for successful measurements and evaluation of results.

IMPORTANT

The term `object` stands for any structural component under the non-destructive assessment. The object includes anchor bolts, fasteners, stiffeners, and solid rebars.

3.1 Preparation

This section describes the main steps to be carried out for a successful measurement.

A1221 ANCHOR functioning check

The operator must ensure A1221 ANCHOR functioning before starting the measurement. The step-by-step checking procedure is listed below:

- Connect the transducer S0205 to A1221 ANCHOR
- Switch on A1221 ANCHOR
- Setup measurement parameters (see Figure 4)

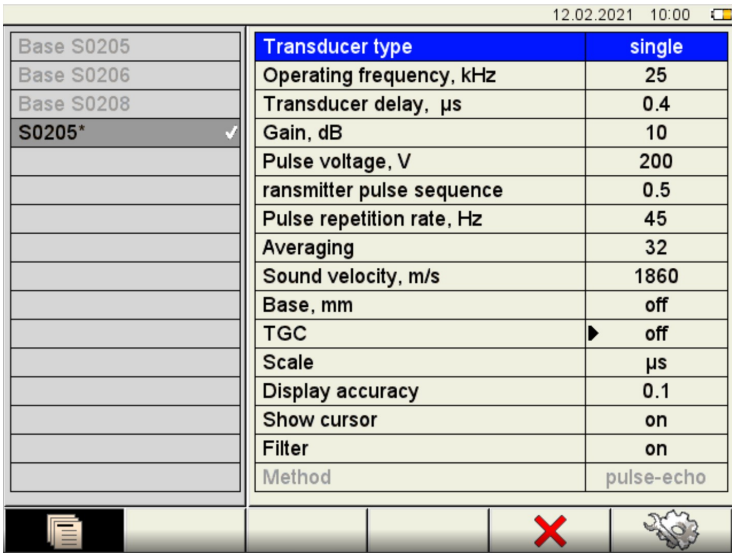


Figure 4: The A1221 ANCHOR calibration parameters

- Attach the calibration sample `1` and the ultrasonic transducer `3` (see Figure 5). Use ultrasonic couplant `2` between the calibration sample and the transducer.

Figure 5: **The calibration sample with the transducer**

- Set view parameters to receive the following view (see Figure 6). The gate (red line) must catch the amplitude of the first positive oscillation.

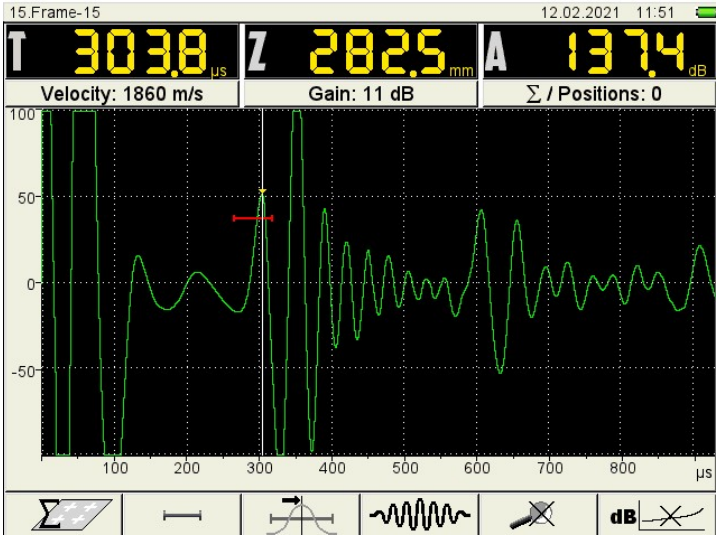


Figure 6: The A1221 ANCHOR calibration

- Check the amplitude and the time of the detected peak. Allowable values are `A = 135±6 dB` and `T=303±2.5 µs`. Change the `gain` parameter so that the peak reaches 50% of the screen height. Adjust the time `T` with changing `transmitter delay` parameter.

NOTE

Use adjusted `transmitter delay` for all new configurations.

Object preparation

Make sure an outer end of the object is clean and flat. In order to reach the desired condition use abrasives, files, drills etc. The ultrasonic transducer and the object's face should fit snugly together. Apply ultrasonic gel, which is a part of the instrument delivery set, to ensure acoustic coupling between the transducer and the object's face.

3.2 Evaluation

This section describes an approach for the evaluation of measurement results. The presented method can be later adapted or extended for different kinds of objects and situations. The main idea is to roughly classify the objects into three main classes A, B, and C. To refine the evaluation, one can use subclasses for each class. A class/subclass possesses some unique characteristics resulting from the calibration procedure. Considering an application area of A1221 ANCHOR, we suggest the following definition of classes (see Figure 7).

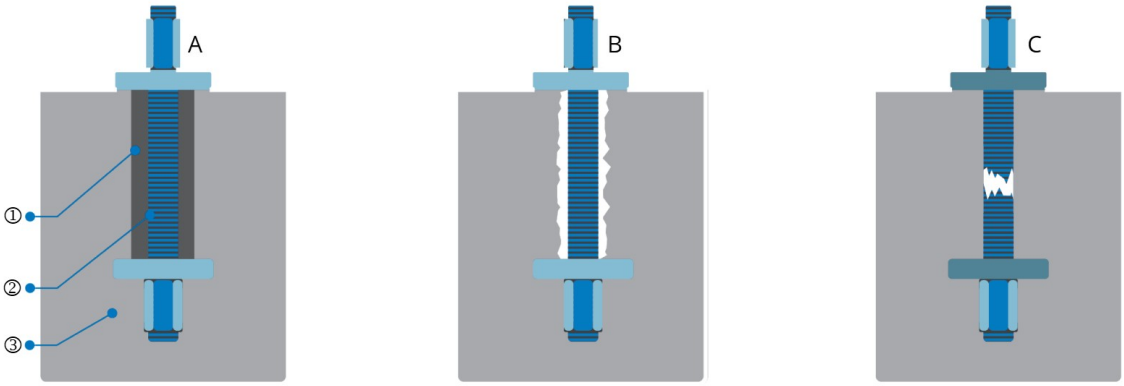


Figure 7: A,B and C object classes

The labels 1,2 and 3 in the Figure stand for adhesive interface (cement routing), object (rod, anchor, or bolt), and main concrete structure.

Class A

A Class A object corresponds to an object with optimum function i.e. continuous cement grouting of a good quality (low water/cement-ratio) and there are no damages, fissures, or corrosion along the object. In that failure-free case, there is no signal reflected from the opposite end of the object (back-wall signal) since the ultrasonic wave penetrates and dissipates in the concrete. In Figure 4 the expected location of the back-wall is 1250mm (see the crossing of the red gate and white vertical line). The amplitude is less than the given threshold.

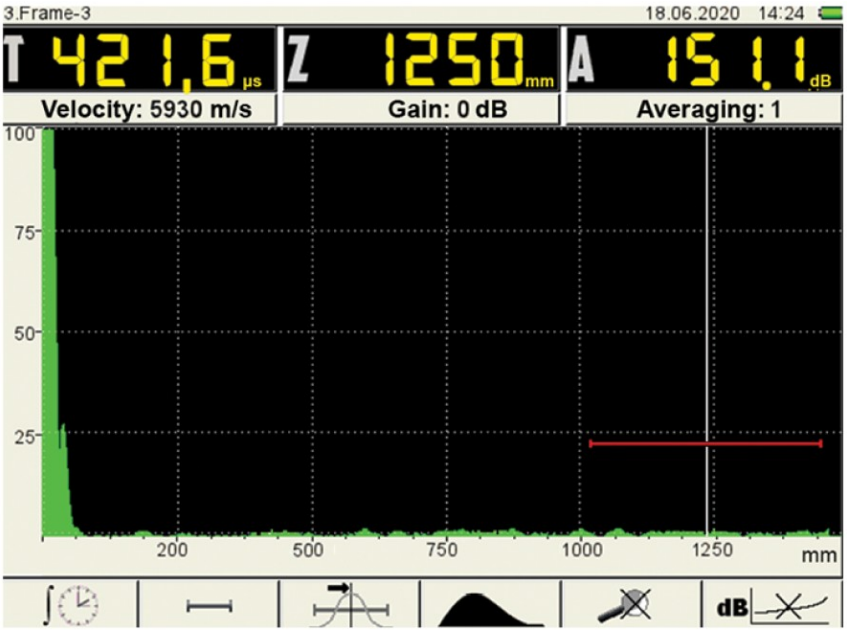


Figure 4: Waveform example from a Class A object

Class B

A Class B object corresponds to an object with reduced function, i.e. a cement-grouting that either does not cover the entire object's length or has reduced strength (high water/cement-ratio). The reduction of the function is a result of damages, fissures, or corrosion long the object. The ultrasonic wave does not dissipate in the concrete but propagates in the object towards its back-wall and reflects. Figure 5 introduces a stable back-wall signal with its maximum at 1250 mm.

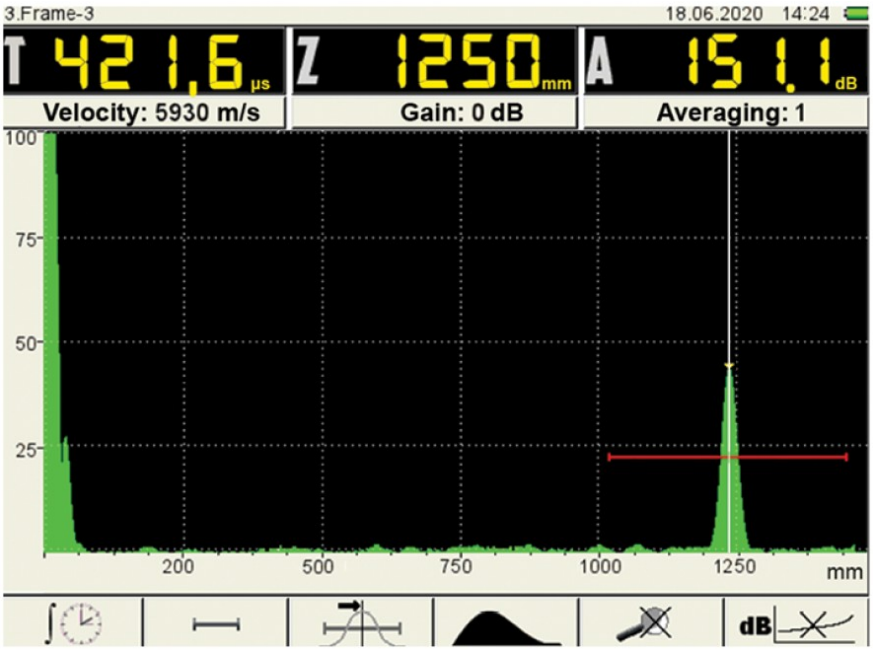


Figure 5: Waveform example from a Class B object

The amplitude of the back-wall signal is a characteristic of the object's integrity. For instance, low amplitudes point towards high integrity. An application of the back-wall amplitude for the integrity evaluation requires unique calibration. The calibration must utilize concrete type, grouting type, aging, the object material and length, and environmental conditions. The maximum amplitude and its time are to be used to estimate the object length. Use the table at the end of the chapter to recall the sound propagation speed in different materials.

Class C

A Class C object corresponds to an object with a non-existent function because of at least one significant damage to the object. Due to aging, tension, or possibly corrosion, the object may become fissures along its length. In the case of breakage, the reflected signal appears earlier than expected. Figure 6 shows a stable waveform that rises at 700mm depth.

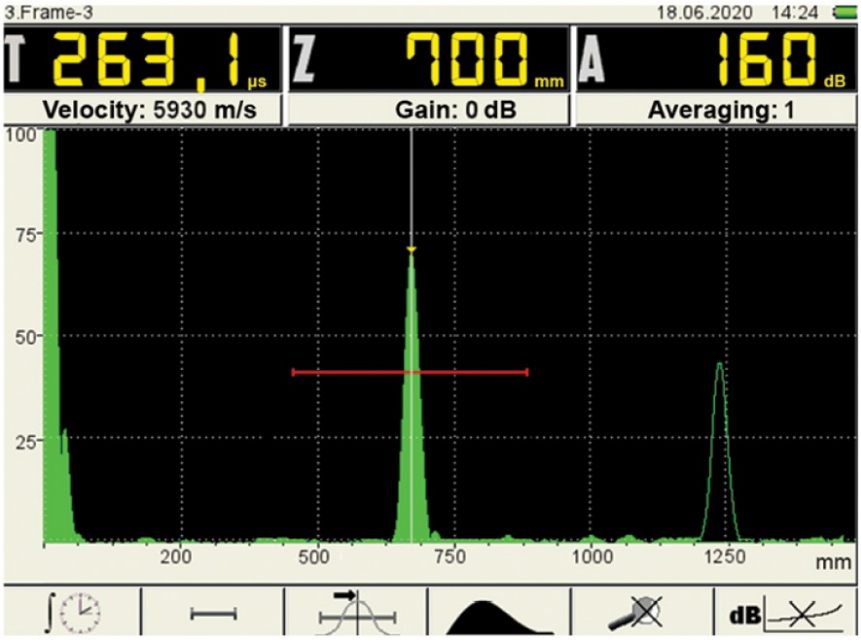


Figure 6: Waveform example from a Class B object

This signal overrides an expected one at 1250mm indicating a possible breakage in the object.

Table of materials

The following table lists longitudinal ultrasonic wave propagation velocity in different materials.

Material	Velocity m/s
Concretes	2000-5400
Basalt	5930
Glass	5500
Granite	4450
Ice	3980
Marble	6150
Mica	7760
Plexiglas	2670
Polystyrene	2350
Porcelain	5340
Quartz glass	5930
Rubber	1480
Teflon	1350
Textolite	2920

4 Operating modes

Short description

The A1221 ANCHOR provides an operating mode (the A-SCAN mode), the mode for saving and viewing the previously saved data (the STOP mode), and the SETUP mode that provides work with sets of the device parameters.

- A-SCAN mode, the primary measurement mode allows for the operator to observe measured waveforms on the instrument's display. The operator can also gate the signal through different algorithms and measure the signal's time and amplitude. A-SCAN mode offers the operator to select various visualization tools, including zooming in/out.
- The STOP mode is used to stop (freeze) the waveforms obtained in the A-SCAN mode, save them in the device memory, and review the previously saved frames.

  The STOP mode is activated from the A-SCAN mode by pressing the  key.
- In the SETUP mode the operator can change the measurement settings. The SETUP mode can be entered from the operating mode using the  key.

Configurations

The sets of device settings can be saved as configurations. Configurations are saved in the device memory. The user may assign a unique name to every configuration. Thus, the user may adjust the device for different conditions and testing objects in advance and choose the necessary configuration from the list when needed.

4.1 SETUP mode

The SETUP mode is used to set the instrument parameters. The first window in the SETUP mode demonstrates the configurations overview and it is shown in the Figure 8.

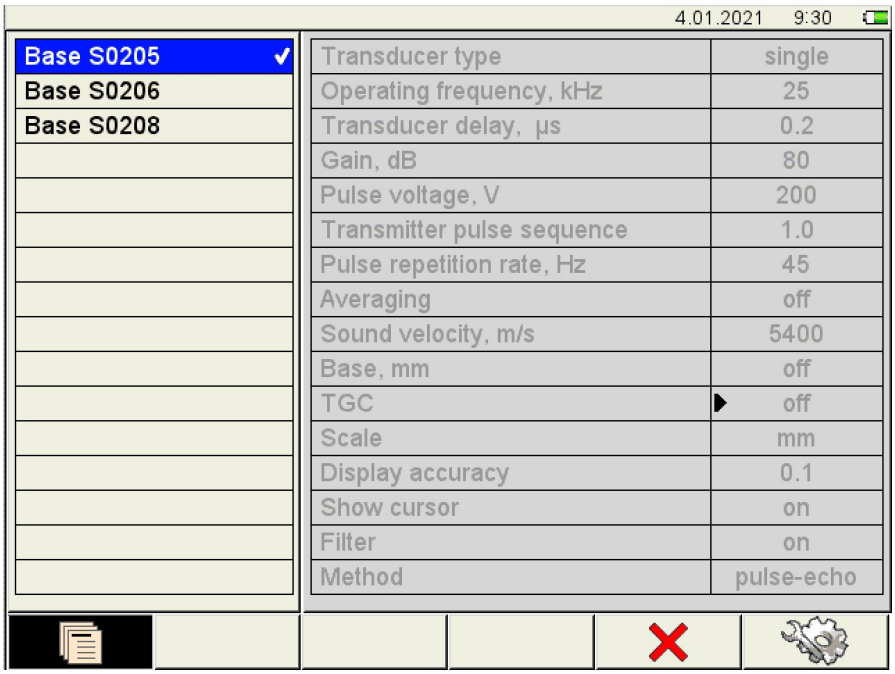


Figure 8: SETUP mode main screen

The actions connected to the functional keys in the `SETUP` mode are listed in the following table.

key	Icon	Action
F1		Switch to the configurations overview
F5		Delete the selected configuration
F6		Switch to the system settings

A-SCAN mode parameters

The configuration overview window is divided into two columns. The left column contains the list of the available configurations and the right one presents configuration parameters and their values. To edit parameters of the selected configuration press the  key. The functions of the keys activated when editing the parameters are given in the next table.

key	Function
	Enter the parameters editing mode for the selected configuration
	Navigate along the lines to select a parameter for editing
	Change the parameter value

Exit parameters editing

Exit SETUP mode

Change state for on/off parameters / Activate the parameter adjustment

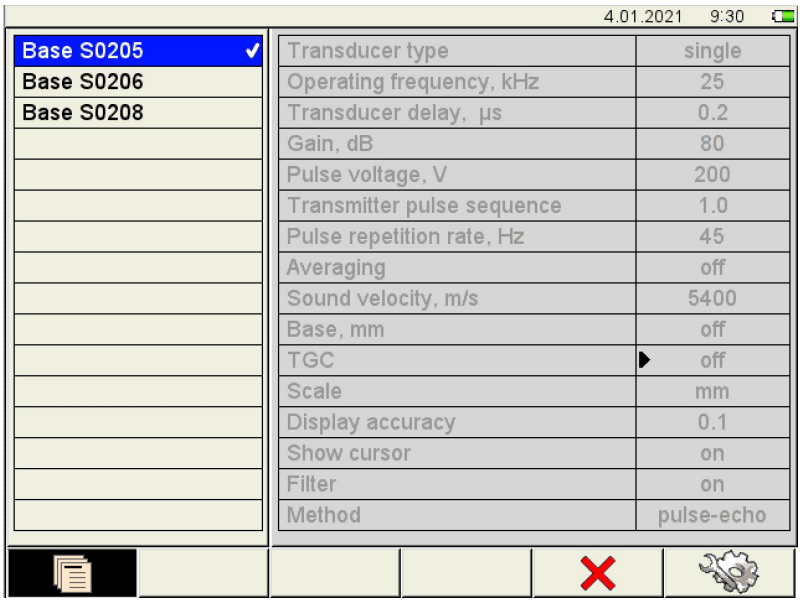
The names of the parameters in the A-SCAN mode and their values ranges are given in the table below.

Parameter	Value	Description
Transducer type	single / double	Type of the piezoelectric transducer in use: single crystal / double crystal
Operating frequency, Hz	From 5 to 45, step 5	Frequency of excitation pulse on ultrasonic transducers
Transducer delay, μs	From 0.0 to 100.0, step 0.1	Signal propagation delay within transducer
Gain, dB	From 0 to 100 with, step 1	Analog gain
Pulse voltage, V	20 / 100 / 200	Voltage of excitation pulse on ultrasonic transducers
Transmitter pulse sequence	From 0.5 to 5.0, step 0.5	Number of periods for excitation pulse. Value 0.5,1,... stand for 1 half-period, 2 half-period etc.
Pulse repetition rate, Hz	From 5 to 45, step 5	Number of measurements per second
Averaging	off / 2 / 4 / 8 / 16 / 32 / 64 / 128	Averaging factor is used to compute a-scans from a number of successive following measurements
Sound velocity, m/s	From 500 to 15000	The propagation speed of ultrasonic waves in the medium
Base, mm	off / from 10 to 15000	Thickness of the testing object. If Base is on, Scale is set to μs.
TGC	on/off	Switching on/off time gain compensation
Scale	mm / μs	Horizontal scale units
Display accuracy	0.1 / 1	Accuracy of displayed results
Show cursor	on / off	Show/hide cursor (vertical line in the A-Scan area)
Filter	on / off	Switching on/off the analog filter
Method	echo	Testing method

All settings of the device are saved after the device is switched off and when the battery is charged.

4.1.1 Configurations

The main window of SETUP contains information about available configurations their parameters. The active configuration is marked with the «✓» sign. Its parameters are displayed in the right part of the window.



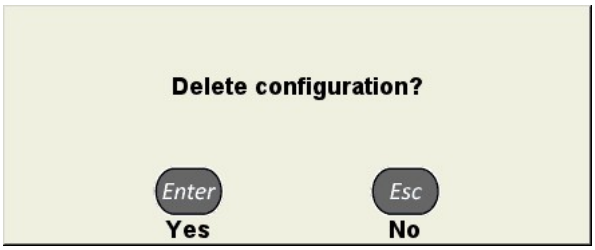
View the configuration parameters

To view the parameters of any other configuration, navigate through the configurations with  keys. The parameters of the highlighted configuration will be shown in the right part of the window.

To switch to the configuration, select one with the  keys and press  . To exit SETUP press the  key.

Delete a configuration

To delete a configuration, press F5  . Conform the deletion in the pop-up dialog:



NOTE

The A1221 has the following default configurations: `Base S0205`, `Base S0206`, `Base S0208`.

NOTE

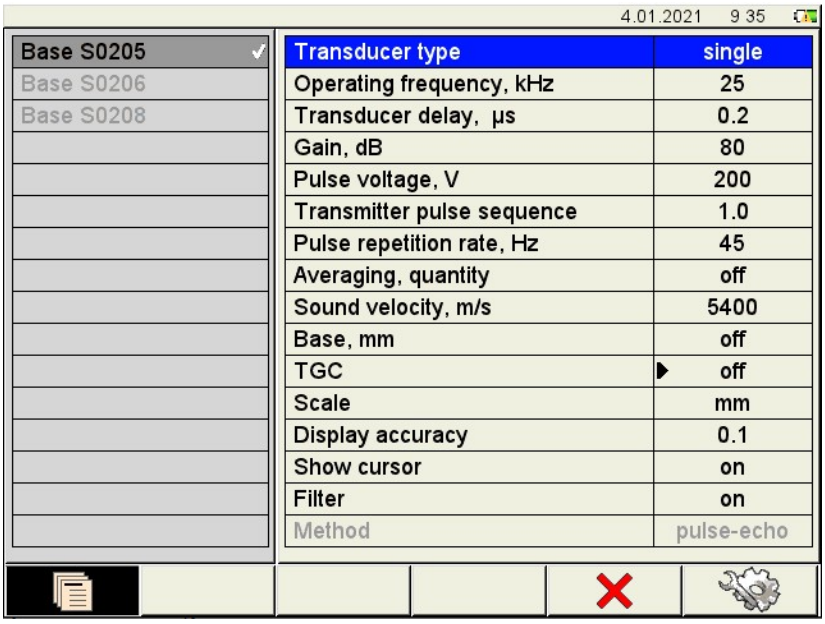
The default and active configurations can not be deleted.

If you attempt to delete a default configuration or the active configuration, the corresponding pop-up dialog will appear.

To exit SETUP without configuration saving press the  key.

Create a new configuration

The operator can created a new configuration using existing one. It can be `Base` or `User-created` configuration. To do so, navigate using  and  to the initial configuration and press the  key. To change any of the parameters, press the  key. The values of the parameters will become editable.



When any parameter of the saved configuration is edited, a new configuration is automatically created. Its name consists of the name of the configuration being edited extended with the "*" symbol. The new configuration is to be found at the end of the list.

NOTE

If a newly created configuration is based on a default one, it does not contain the word "Base" (Figure 9) in its name.

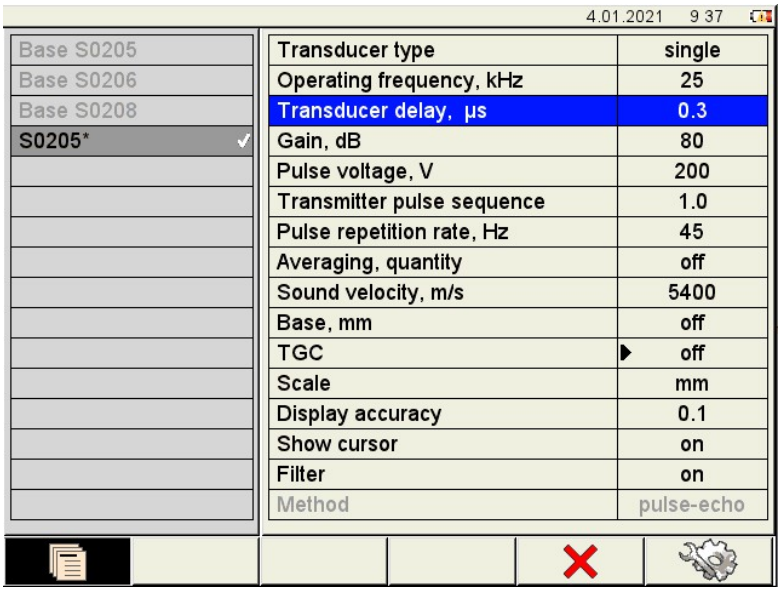
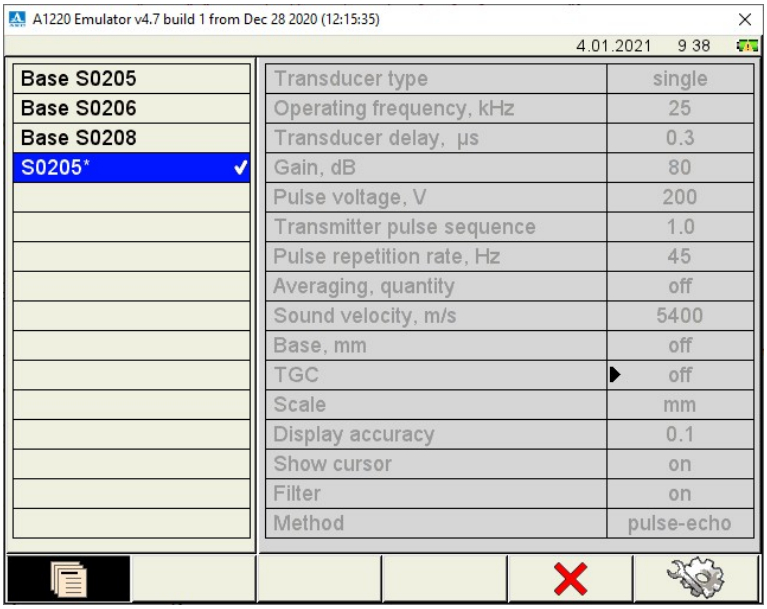
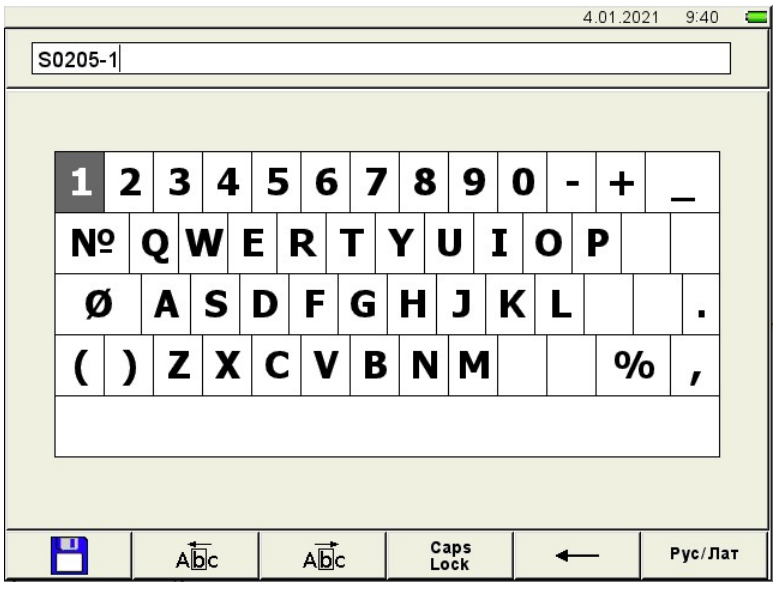


Figure 9: Create a new configuration from default one

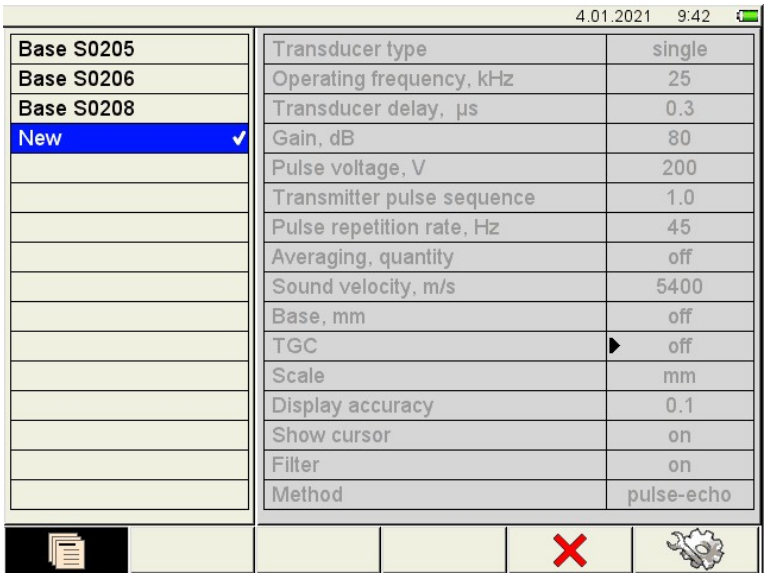
Finalize editing of parameters by pressing the key. The left column with the configuration names becomes active. The new configuration becomes the active one. Its name is temporary and needs to changed when saving.



To save the configuration, press the Enter key. In the opened window, enter the name of the configuration. The A1221 ANCHOR generates the configuration name automatically. It takes the name of the original configuration and adds an integer index. If the original configuration name already has an index, the new name gets the incremented index.



To save a new name, press the F1 ( ) key. The saved configuration appears in the list and it is the active one.



The functional keys available in the saving dialog are listed below.

key	Icon	Function
F1		Save the configuration
F2	Abc	Move the cursor in the name field to the left
F3	Abc	Move the cursor in the name field to the right
F4	Caps Lock	Switch to capital letters
F5	←	Delete a symbol located to the left from the cursor
F6	Рус/Лат	Switch the keyboard between the english and russian layout (only for Russian language of the interface)

Keys and their functions are given in the following table.

key	Function
	Keyboard navigation
	Move the cursor inside the name field to the left / to the right
Enter	Enter the highlighted key on the keyboard
Esc	Exit without saving

4.1.2 Time-gain compensation

Time gain compensation (TGC) is a feature that reduces impact of wave attenuation by the material. It enhances intensity of the received signal proportionally to the depth. Adjustment of TGC requires the calibration on reference reflectors both in near and far-field zone.

Preparation for adjustment

Before adjusting TGC, perform the following actions in the A-SCAN mode:

- Adjust time axis in such a way that echos from reflectors are displayed on the screen
- Put the gate at the 50-80% screen height level
- Set an area of interest using the gate
- Apply a transducer to the sample and find a maximal signal from the nearest reflector
- Use the gain to set the pulse maximum at the level of 50-80%

Adjustment

To adjust TGC, do the following:

- Enter the SETUP mode
- Select TGC parameter and use the  or  keys to switch on TGC, if it was switched off
- Press the  key to initiate adjestment of TGC
- Find the signal maximum from the nearest reflector (Figure 10). Move the cursor to it and create a TGC point with the  key.

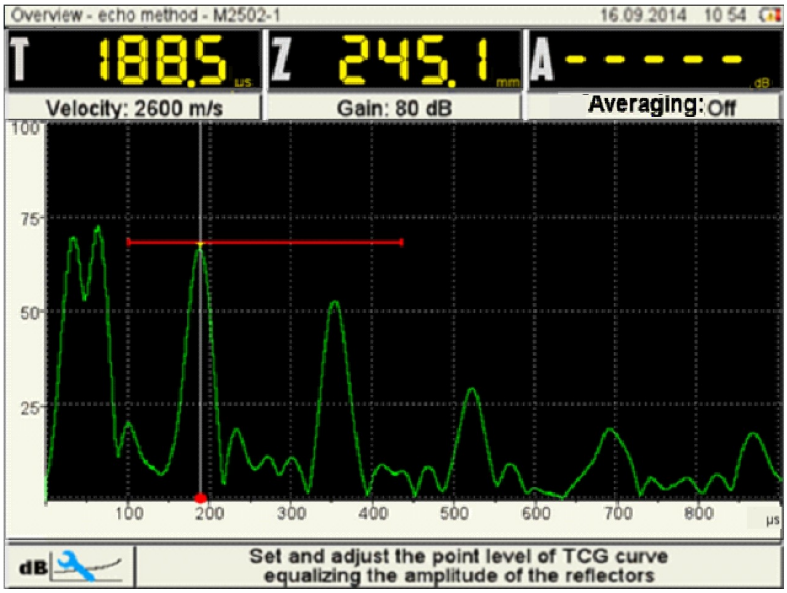


Figure 10: Maximum of the nearest reflector

- Repeat the procedure to create a TGC point for the next reflector (Figure 11). Correct the amplitude of the newly created TGC point pulling up the amplitude to the gate level using the  keys.

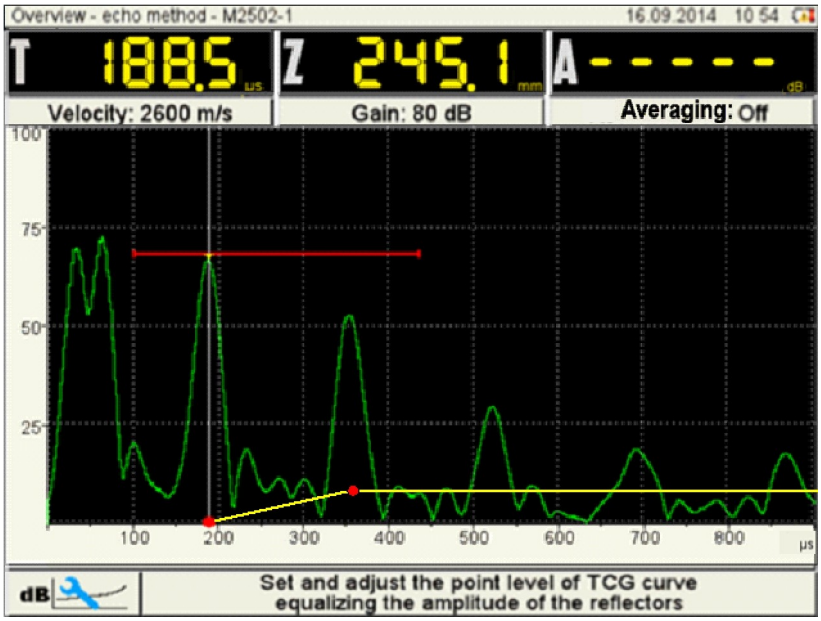


Figure 11: Adjustment of TGC point

- If the calibration sample has more than two reflectors, the operator should create TGC points for each of them.
- To delete a TGC point, place the cursor at it and press the  key.
- To save settings and return to the SETUP mode, press the  key.

An examples screen with a switched on TGC curve is shown in Figure 12.

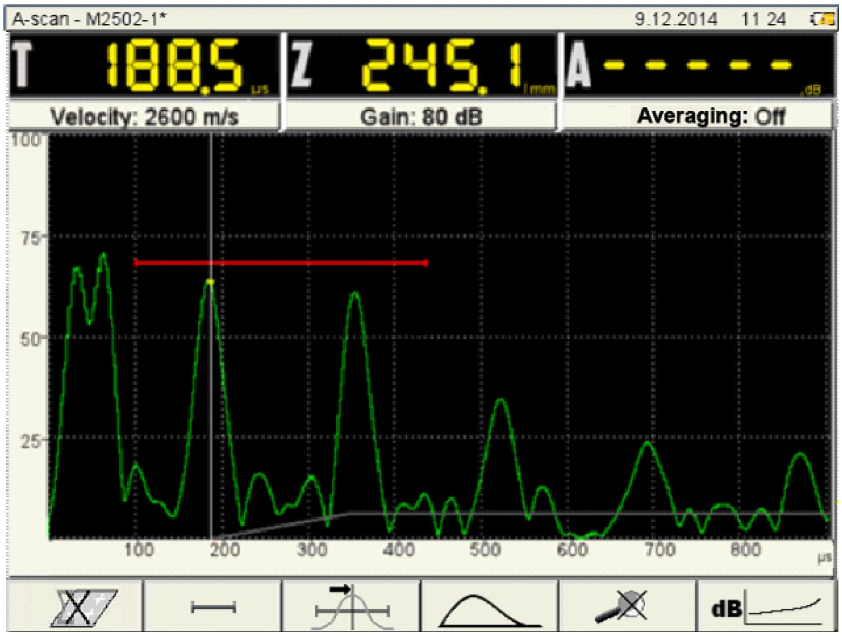
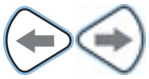


Figure 12: Pulled up amplitude

The following table lists the keys and their functions required for setting up the TGC curve.

key	Function
	Change the amplitude of a TGC point. If there is no TGC point near the cursor, nothing happens.
	Move the cursor to the left/right
	Move the cursor to the nearest TGC point in the corresponding direction
	Exit the TGC adjustment mode
	Applying TGC settings
	Add/delete a TGC point at the cursor's position

4.1.3 System settings

The system settings of A1221 ANCHOR are available in SETUP mode under F6 (Figure 13)

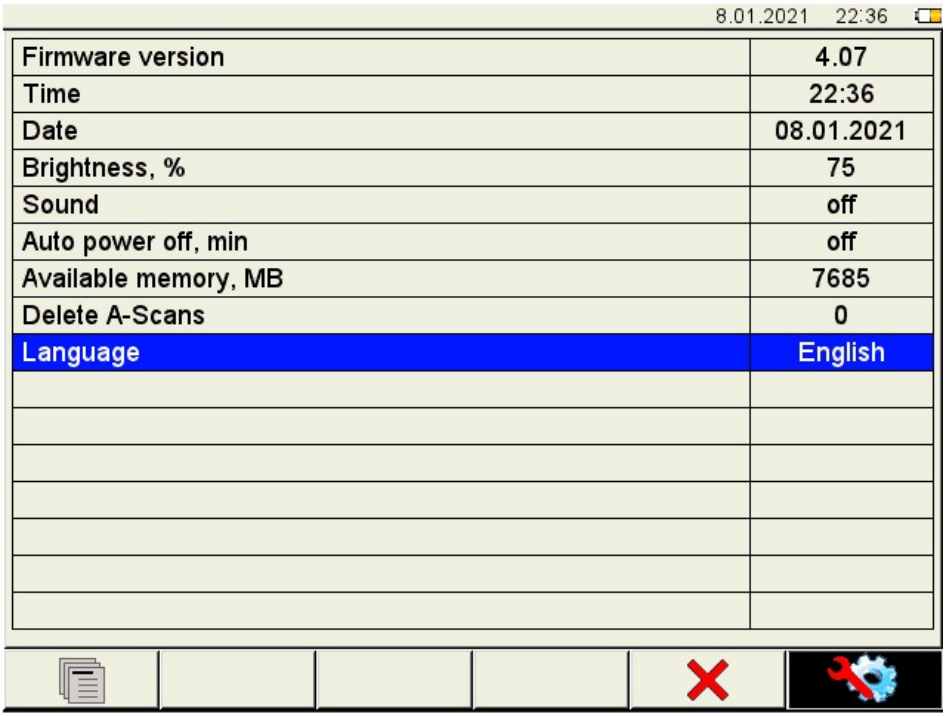


Figure 13: The A1221 ANCHOR system settings

The following table lists system parameters, their range, and corresponding description.

Parameter	Value	Description
Firmware version	X.X.X	Actual firmware version
Time	HH:MM	System time in 24-hour format HOURS:MINUTES. To enter editing mode use the Enter key.
Date	DD.MM.YY	System date in format DAY.MONTH.YEAR. To enter editing mode use the Enter key.
Brightness, %	From 5 to 100, step 5	Display brightness
Sound	off / on	Switching on/off the beep sound if a signal exceeds the gate
Auto power off, min	5 / 10 / 15 / 30 / 60	Time interval after the A1221 shutdowns itself to save the battery charge. The shutting down would take place if no key was pressed or there is no running measurement.
Available memory, MB	Megabytes	Available memory at the device hard drive

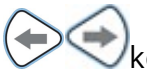
Delete all A-Scans	Number saved of A-Scans	All saved A-Scans will be deleted. Press the Enter key to delete.
Language	Selected language	Interface language

The following table lists the keys and their functions available in this window.

key	Description
	Navigate through parameters
	Change parameter's value
	Enter the time/date setting (for the `Time` or `Date` parameter)
	Start of the memory cleaning procedure (for the `Delete all A-Scans` parameter)
	Exit the SETUP mode

Setting time and date

To edit the `Time` or `Date` parameters:

- select the parameter and press the Enter key
- in the opened window (Figure 14) select a digit for editing using the  keys
- change the parameter value using the  or  keys
- to confirm the changes, press the Enter key, to cancel press the Esc key.

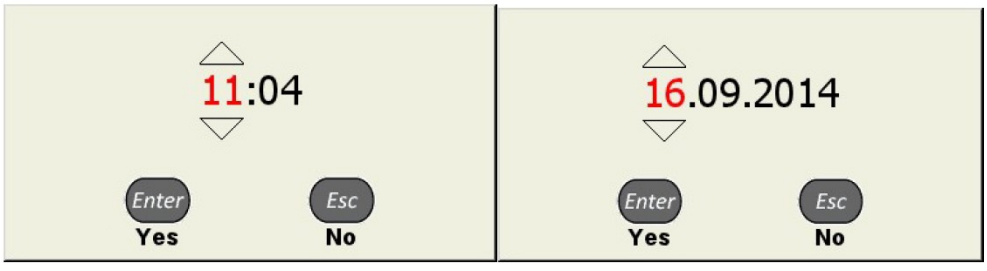
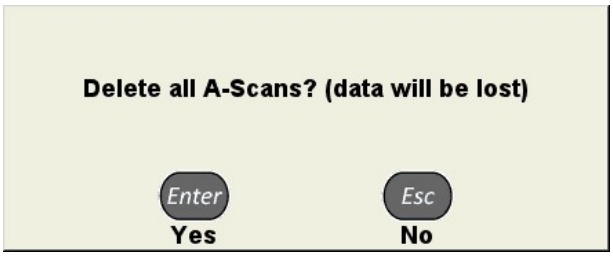


Figure 14: Time and date message dialog

Memory cleaning

After starting the “Memory cleaning” procedure the following warning appears.

Confirm the deleting using the Enter key. To abort the deleting press the Enter key.



4.2 A-SCAN mode

The A-SCAN is a measurement mode allowing the operator to acquire ultrasonic waveform, set parameters and carry out evaluation of results. The screen layout of A-SCAN mode has following elements (s. Figure 15):

Label	Name	Description
1	status bar	shows following information: • current mode • active configuration name • current date and time • the actual accu level
2	results panel	shows time of gated maximum, its sound path expressed in mm, and its amplitude
3	waveform graph	the area of a screen for waveform plotting
4	waveform	signal waveform
5	pictogram of functions available with functional keys	s. description below
6	quick-view panel	allows quick view to the following parameters: velocity, analog gain, and averaging factor.
7	cursor	shows gates maximum location
8	marker	depicts maximum within gate
9	gate	-

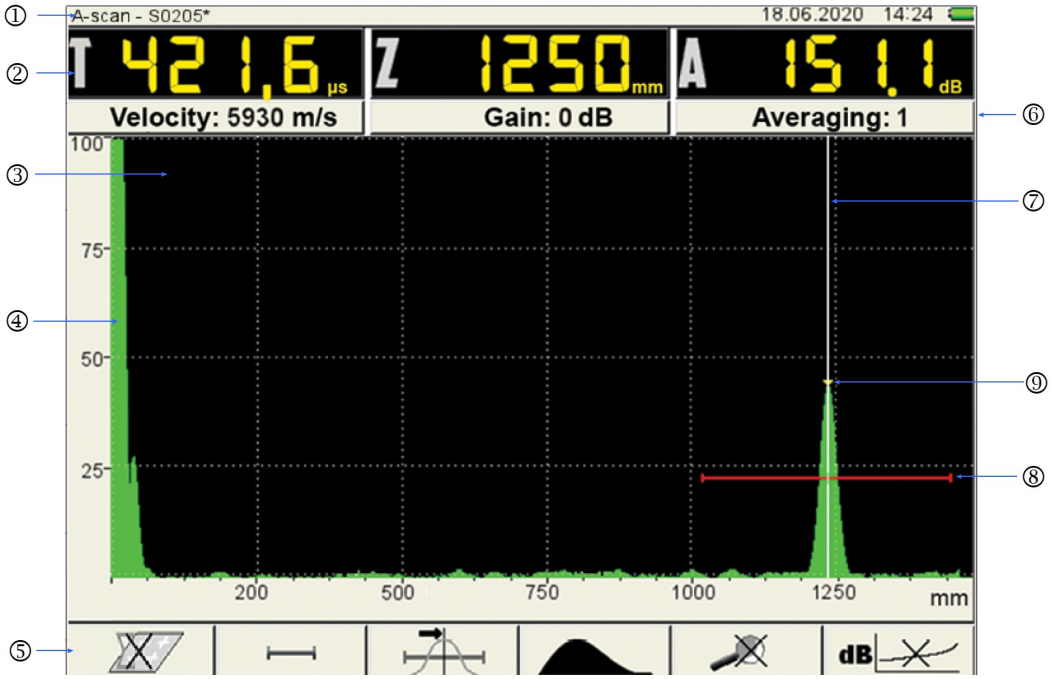


Figure 15: Screen layout of the A-SCAN mode

The following table lists the keys and their functions.

key	Function
	move the cursor
	
	up/down used for changing the analog gain right/left used for zoom in/out time axis
	entering the STOP mode
	F1 – F6 calls the corresponding action
	Enter the SETUP mode

4.2.1 Functional keys

F1 (Spatial averaging)

`Spatial averaging` allows collecting data from several spatially distributed positions. The measured waveforms in each location are plotted on the same A-SCAN. Spatial averaging improves an evaluation of signals attenuated due to environmental conditions: surface discontinuities, weak acoustical contact, shading etc. Use F1 to switch on/off the function:

-  spatial averaging is off;

-  spatial averaging is on

To use spatial averaging press F1 and get the stable signal. Press the Enter key to force pre-saving the signal. Now both `real-time` waveform ❶ and the `pre-saved` waveform ❷ are shown on the screen (Figure 16).

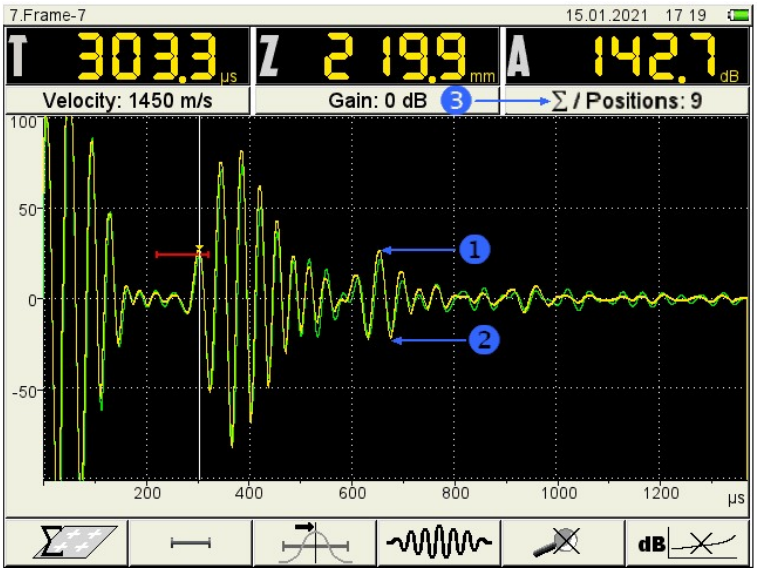


Figure 16: Spatial averaging

Further pressing the Enter key forces the A1221 ANCHOR to average the pre-saved waveform with the just acquired one. Then, the screen shows the averaged waveform and the real-time waveform again. The number of used signals indicates by `positions` ❸. It starts from zero (pressing F1) and increased by one after each pressing of Enter key .

F2 (Gate editing)

The gate sets the time (or the depth) as well as the amplitudes for signal analysis. Within the gate the A1221 ANCHOR monitors the signal and applies the processing algorithm selected by F3. The marker (colored triangle) and the cursor (while vertical line) is always placed at the time/depth of the detected signal. Overriding of the gate level by a signal is accompanied by a beep sound (if sound is on). Also the gate LED located on the keypad is on (s. Keypad functioins 9). If the gate is located outside of the displayed area, a red arrow appears near the right border of the screen. The vertical location of this arrow shows the actual gate amplitude level.

WARNING

The marker and the cursor are not displayed if the signal amplitude is outside the displayed area.

The  icon stands for active F2. The results panel shows the beginning of the gate X1, the end of the gate X2, and the gate level A (Figure 17)

Figure 17: Results panel during gate editing

During active F2 the following keys are available:

key	Function
	Move the gate up/down and left/right
	Change length of the gate. The left gate border stays unchanged.
	Switches off the gate. The gate will not be displayed until F2 is activated again. In that case keys  can be used to move the cursor/marker (maker follows the cursor) to the left/right. The 1221 ANCHOR shows the time/depth and amplitude at the cursor/marker position.
	Pressing any other F-key leaves the gate editing
	Enter the SETUP mode

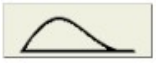
F3 (Measurement algorithm)

The F3 key switches between the gate analysis types for the automatic measurement mode.

-  detection of maximum in the gate
-  detection of the first overshoot in the gate

F4 (Waveform type)

The operator can select one of the following waveform types:

-  Contour
-  Filled Contour
-  Radio signal (HF signal)

F5 (Zoom)

-  Zoom is on
-  Zoom is off

If the Zoom is on, the A1221 ANCHOR extends the signal within the gate to a full screen (Figure 18).

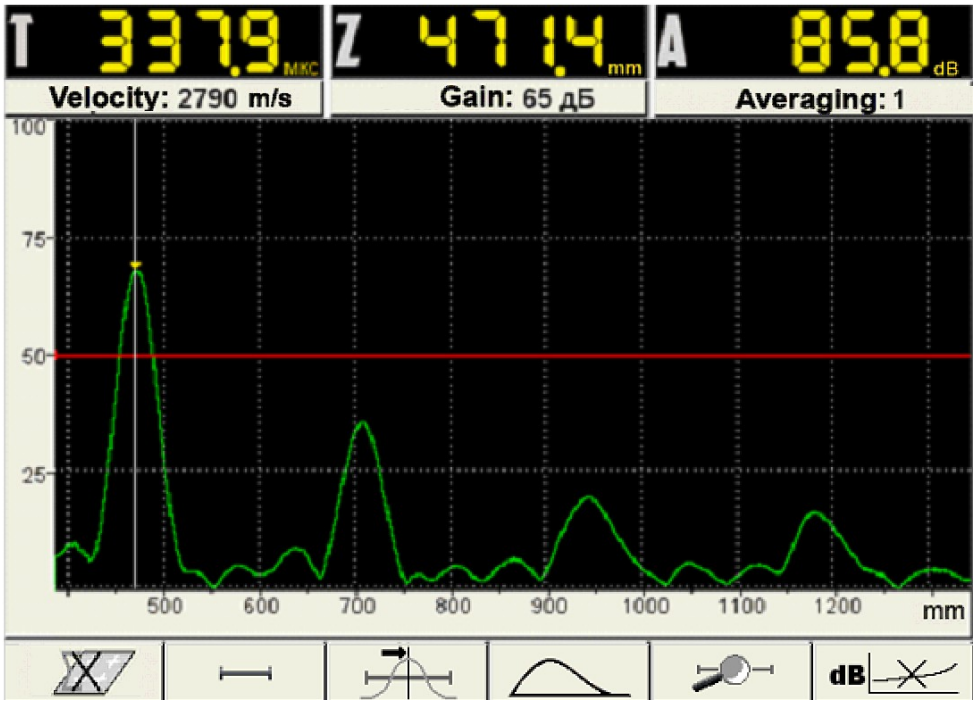


Figure 18: Active Zoom in

F6 (TGC)

-  TGC is on
-  TGC is off

4.2.2 Base parameter

Base is off

If the parameter `Base` is off, the A1221 ANCHOR computes depth Z using the velocity value from the active configuration. To compute depth, the A1221 ANCHOR takes either gated time (F2 is on) or the time corresponding to the cursor's position (F2 is off). The `results panel` displays: time T, depth Z, and amplitude A (s. Figure 19).

Figure 19: Results panel with Base = off

Base is on

If the parameter `Base` is on, the A1221 ANCHOR computes the velocity from `Base` (expressed in mm) and the detected time. The results panel shows velocity V, depth Z, and amplutude A (s. Figure 20).

Figure 20: Results panel with Base = on

4.3 STOP mode

The  key pressed in the A-SCAN mode starts the STOP mode. This mode is used to save the active waveform (A-Scan) and to view the previously saved A-Scans (also called frames). An example screen view in the STOP mode is shown below.

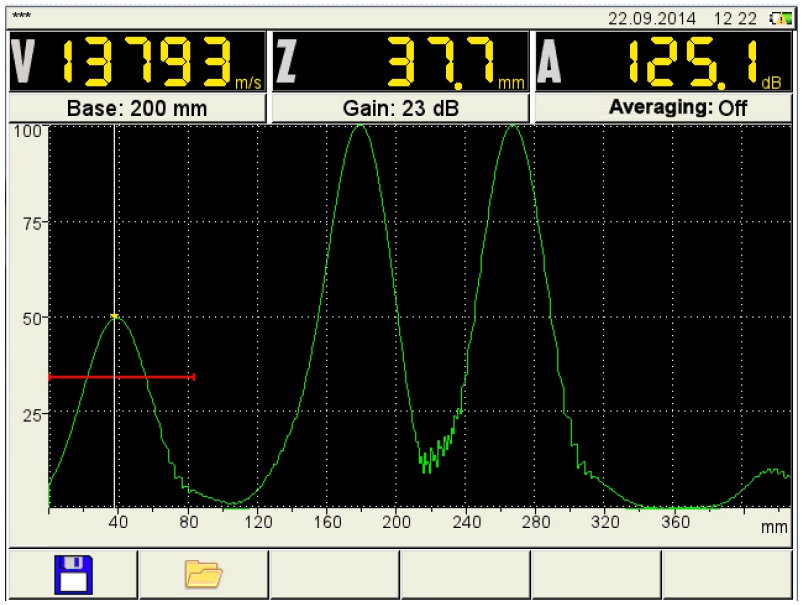
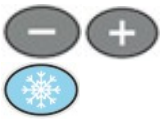


Figure 21: The STOP mode screen

The available functional keys are:

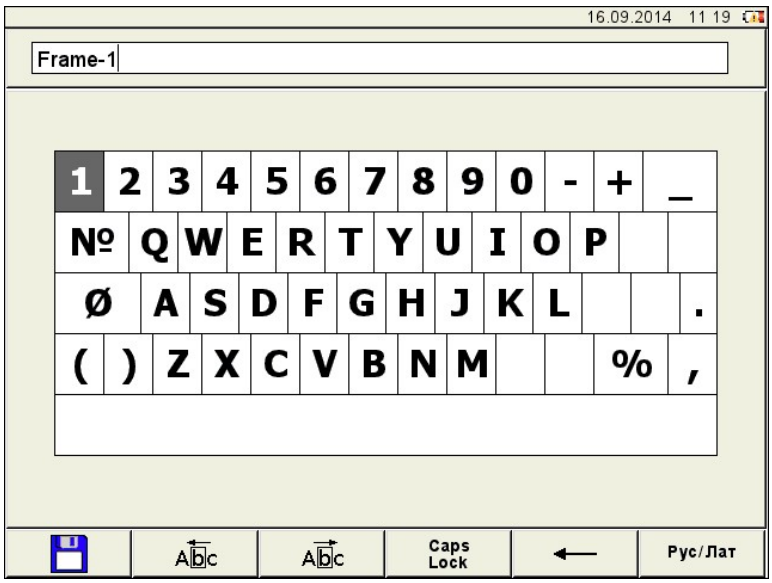
key	Icon	Function
F1		Saving window
F2		Explorer window

The available keypad keys are:

key	Function
	Positioning the cursor to the desired position
	Exit the STOP mode

Saving window

Press F1 to switch to the saving window. The name editing is analogous to the giving name to a configuration. For more information see Configurations 24.



Explorer window

Press F2 to switch to the explorer window (Figure 22).

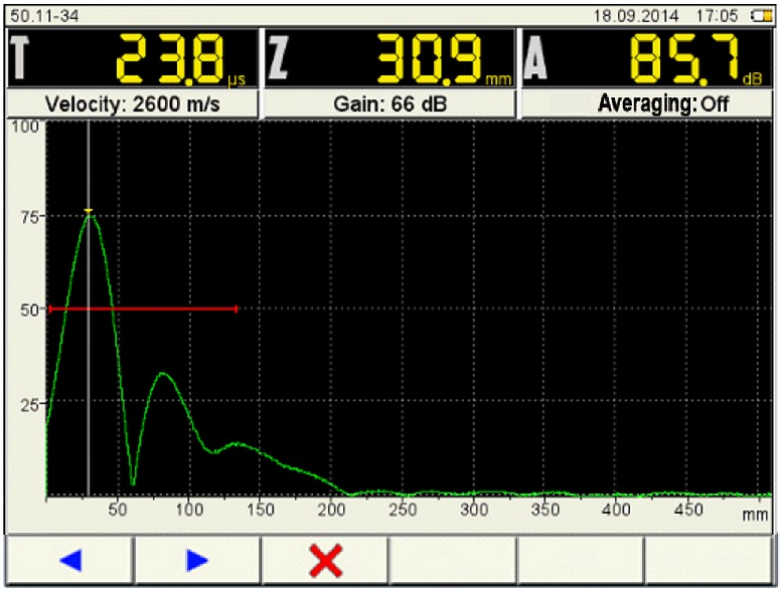


Figure 22: Explorer window

The available functional keys are:

key	Icon	Action
F1		move to the previous A-SCAN
F2		move to the next A-SCAN
F3		delete the current A-SCAN

Pressing F3 opens the confirmation dialog shown below.