



US-NANO

User Guide



US-NANO USER GUIDE

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1 Introduction

US-NANO is a UT portable system (electronic cards + software) allowing the measure and the signal analysis for the ultrasonic defect detection.

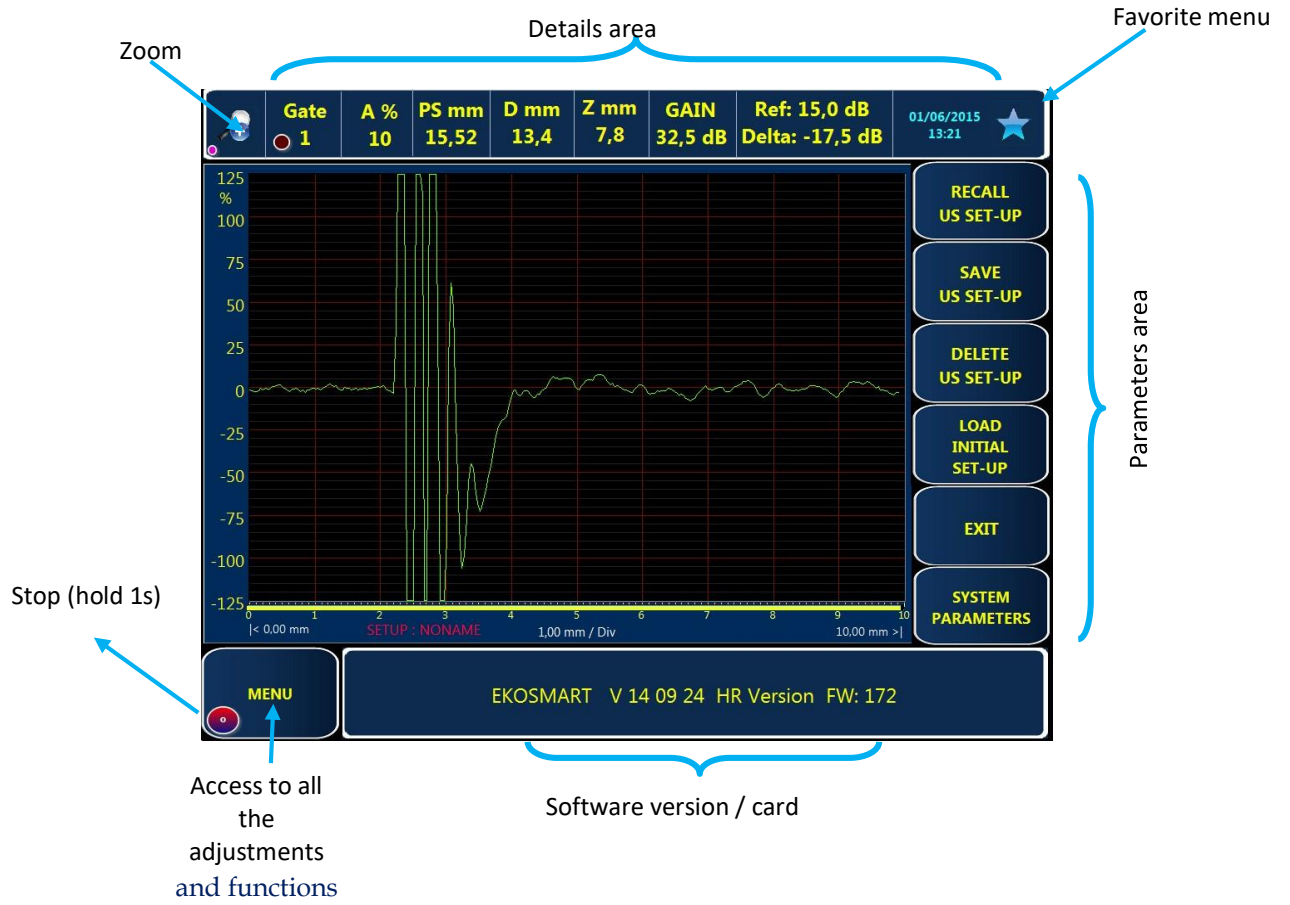
This product was developed in order to satisfy each user. It's dedicated as well to the novices and the training thanks to the graphic interface, very intuitive and educational, and also to the experienced and expert users thanks to its reliability and its advanced functions (FFT, TOFD, 30MHz bandwidth...).

This quick start guidebook is a simplified manual to use the card allowing to set up it for different types of controls.

2 Software starting:

Start the software via the icon situated on the desktop.

The software starts on the home screen with the following details:



To load an US configurations, go to  and select the configuration wanted.

Once in the software, to come back to the loading, click on  then .

3 Settings

At the beginning, there is no configuration.

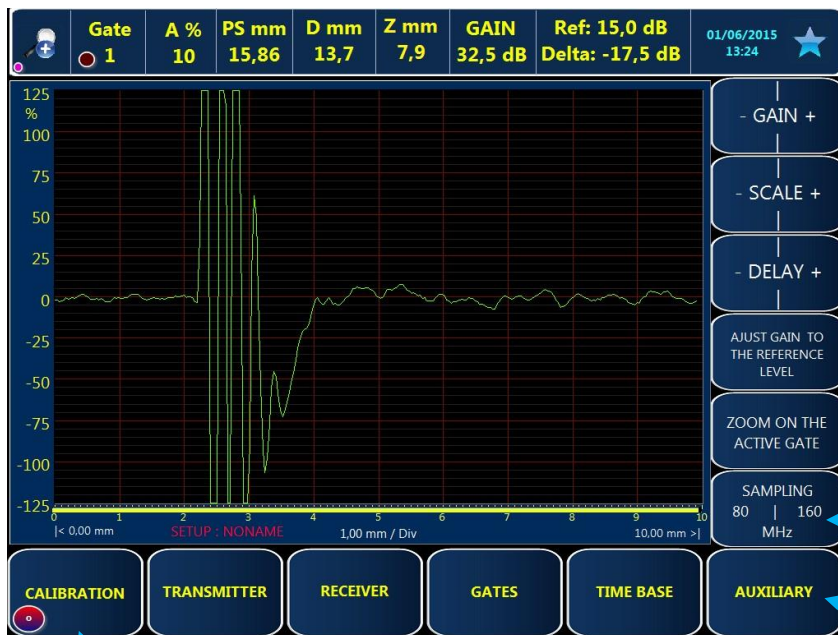
You can change the parameters by clicking on the side:



button, on the left of the bottom-hand

- Calibration (probe),
- Transmitter,
- Receiver,
- Gates,
- Time base

The right-hand side is composed of the main used adjustment:



Mainly used adjustments

Select the sampling frequency

Back to the main frame

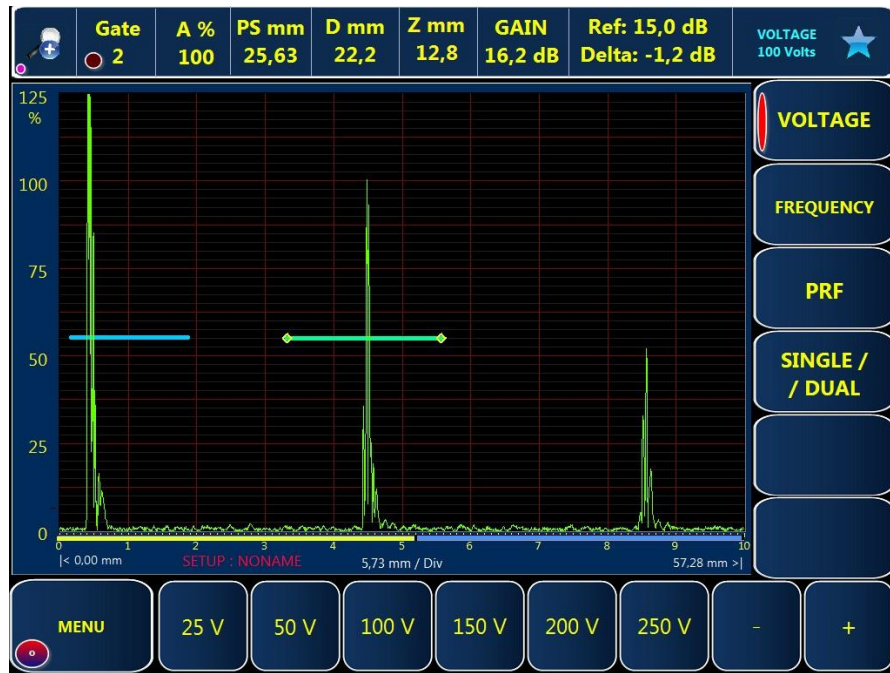
Set up one or more probe

Set up of the gates

3.1 Transmitter



In the transmitter toolbar, you can change different things like voltage, kind of probe (Single or Dual), duration pulse (probes frequency) just as PRF (Pulse Repetition Frequency).



- a) Generally, we use 200 V.
- b) Choose what kind of emission you want to use by clicking on « R/T »
 - Hit "Single" for a bi-element probe.
 - Hit "Dual" while using two probes, one for emit, the other one for receiving.
- c) By hitting « frequency » choose the emit duration (probe frequency)



Raise/reduce duration

The signal frequency is up to 33 MHz

- d) Then choose the pulse rate frequency (PRF), generally it is 1000Hz.

3.2 Sampling



The card has several sampling modes (80 and 160 MHz)

Careful: do not change the frequency of the sampling while controlling

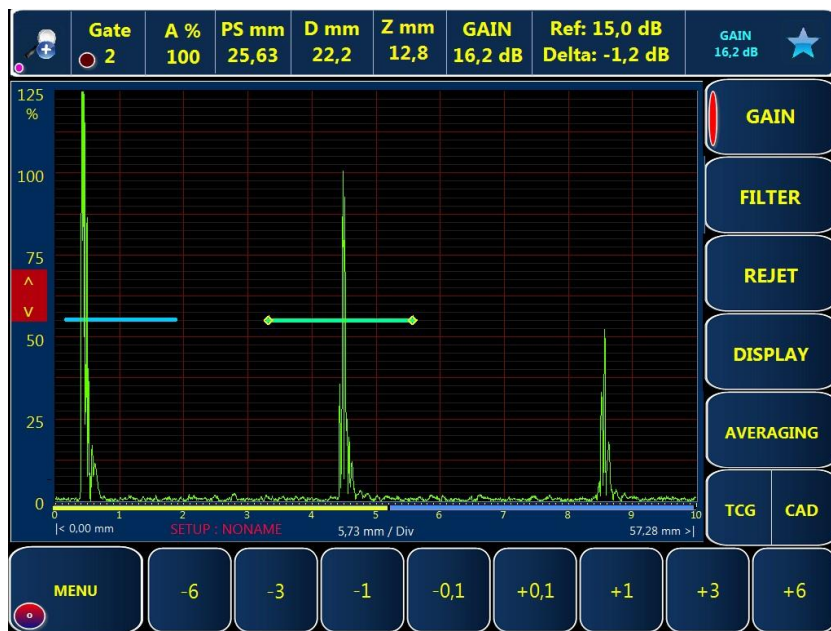


160 MHz sampling raises the clarity on the screen but also allows you to increase the bandwidth with (30 MHz).

The filters are not the same with a 80 MHz sampling.

Trick: a double click on « 80 » or « 160 » will allow you to go to rectified A-Scan or RF A-Scan.

3.3 Receiver



3.3.1 Filters



Choose the right filter adapted to your probe.

Filters available for a 80MHz sampling:



Filters available for a 160MHz sampling:



3.3.2 Gain



The gain can be changed by hand by increment of 0.1 , 1 , 3 et 6 dB.

It can also be automatically adjusted to the reference value (80%). Put a gate on the echo that you want

to adjust, then in favorite

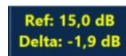


(on the right top corner) select

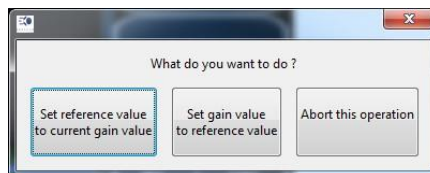


Careful: If the measure of the amplitude is not activated on the gate you are using, the automatic gain adjustment will not work (see §3.5).

The gain can be saved as a reference gain. By clicking on



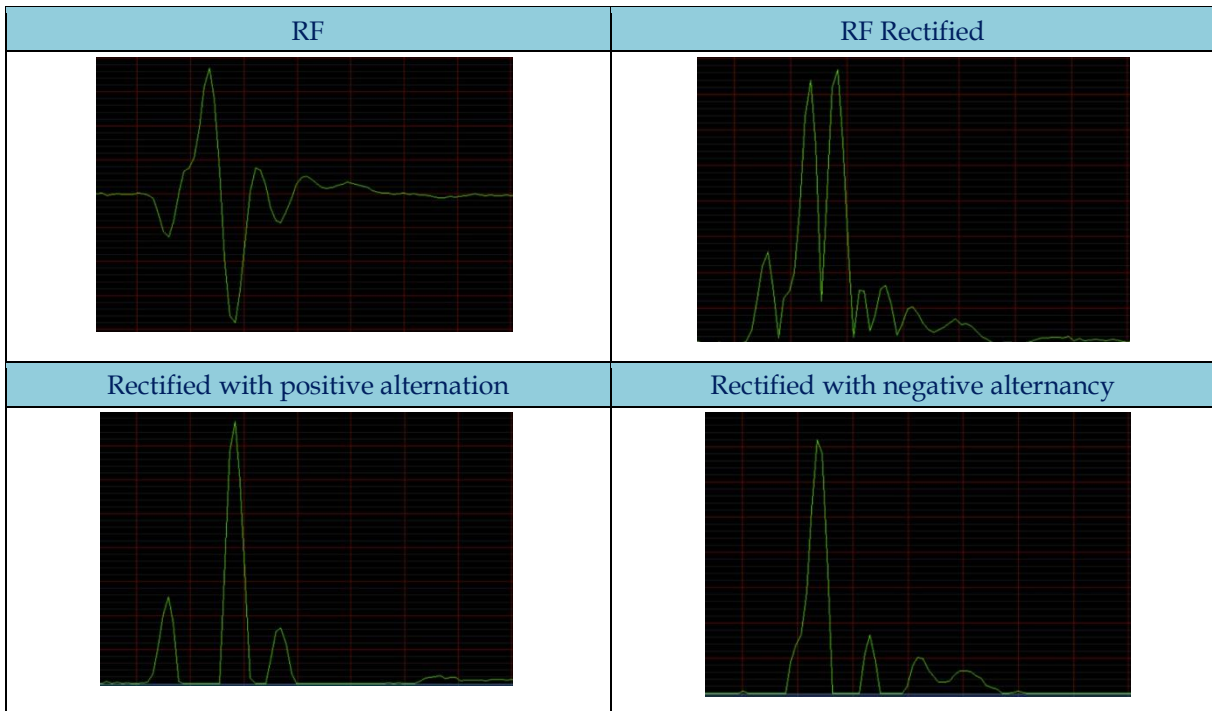
, a window opens with the following choices:



3.4 Display mode

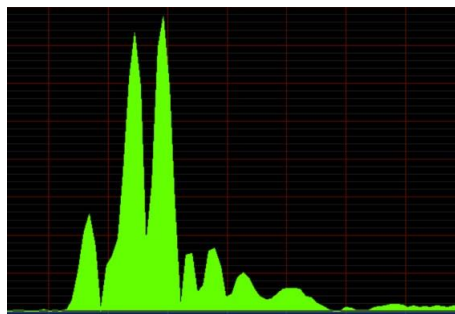


Several A-scan display modes are available



For the 3 rectified modes we can also smooth the signal and/or fill it.

Example of a signal rectified and full

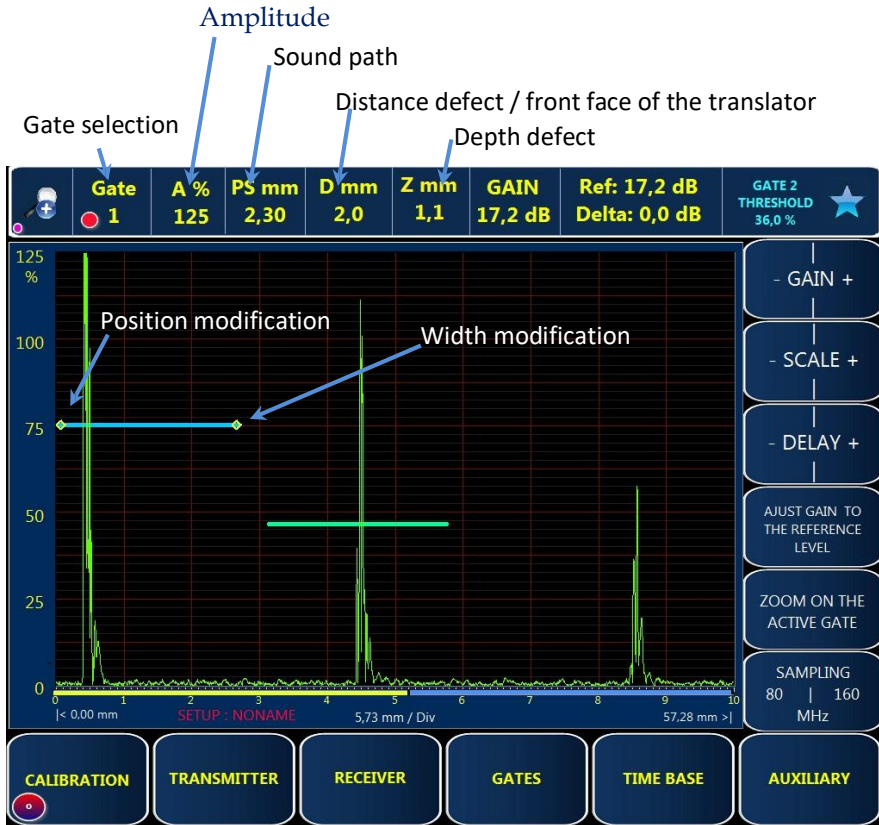


It is also possible to average the entering signal by hitting "Averaging"

3.5 Gates



The software can have 3 adjustable gates. Informations written on the top-hand side are from the active gate. The activated gate is represented by at the beginning and at the end of the gate.



NB: D and Z are the same if the translator's angle is straight (angle = 0°)

To change the selected gate, hit

Another function appears in the banner. It allows you to focus the gate in the center of the screen

You can also zoom-in on the activated gate, the scale and the display delay are automatically modified.

The function is in favorite



You can go back to the last scale and display delay by clicking once again on "zoom on the active gate"

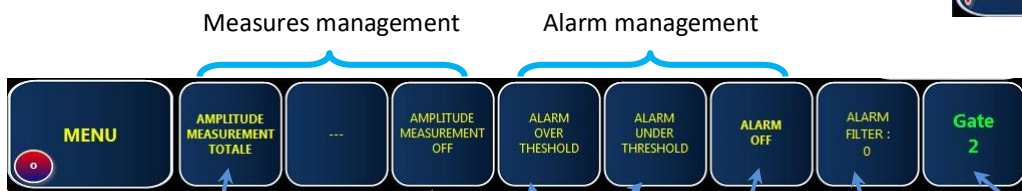
To improve the gate set-up:



Types of tuning

Gate selection

You can also choose the gates type detection by hitting the gates parameters



Total amplitude

Stop the measure

Alarm when appears/disappears the echo.

Stop alarm

Remove parasite spike

Gate selection

Two alarms are available: a ringing one (look on the next page to know how to set-up that one) and one visual (top-hand side of the software)

- Gate 1 Red indicator = Alarm
- Gate 2 Indicator off = No alarm

Filter alarms: this function allows you to filter the signal in case of parasites.


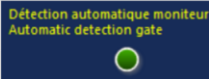
Alarms filter = 0 => Stop filter

Alarms filter = 7 (maximum) => signal display if it appears 7 times at the same place.



Gates and alarms Configuration:

Menu -> Auxiliary -> System parameters (enter the code: 1234) -> PAGE n°2

You can change set-ups of the gate selection:

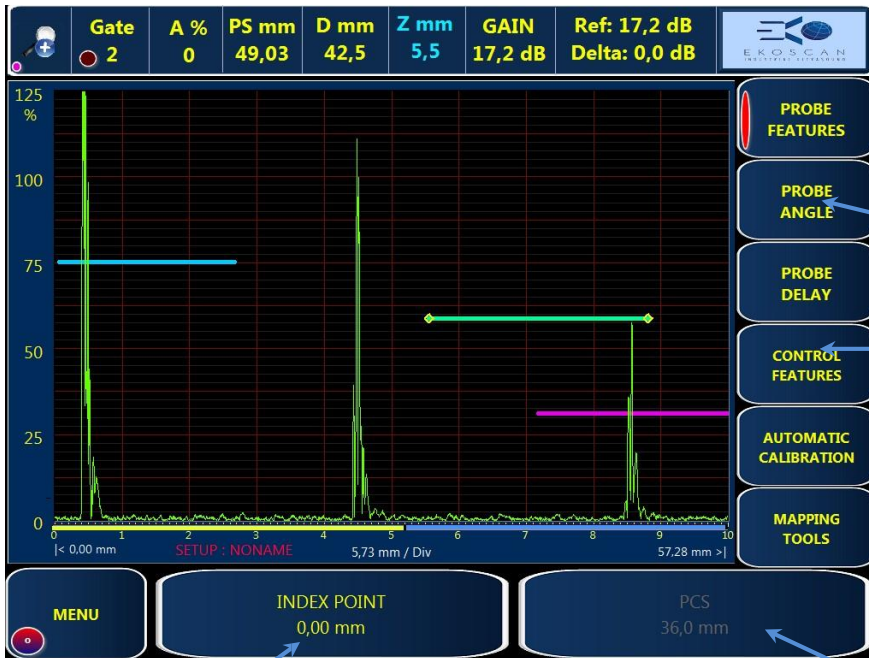
-  → You can change the gate height/width at the same time.
-  → Gate selection when the mouse/finger passes close to it.

You can change the gate parameters alarm:

-  → Modification of the alarm frequency (deep or high-pitched sound) expressed in Hz.
-  → Modification of the alarm timing expressed in ms.

3.6 Probe and materials

3.6.1 Probe set-ups



In single or dual crystal, you have to enter the probe angle and delay

Using the Single Crystal :

Enter the index point

Using Dual Crystal : Enter the distance between index point

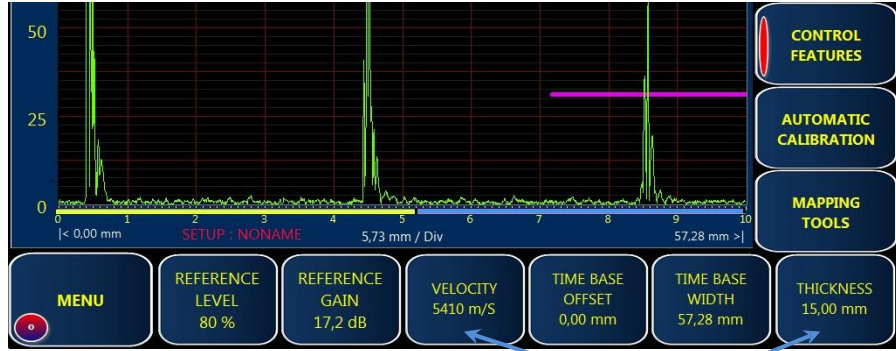
(Probes Center Separation)

If the delay sensor is not known → see § 3.6.3

3.6.2 Material Set-ups



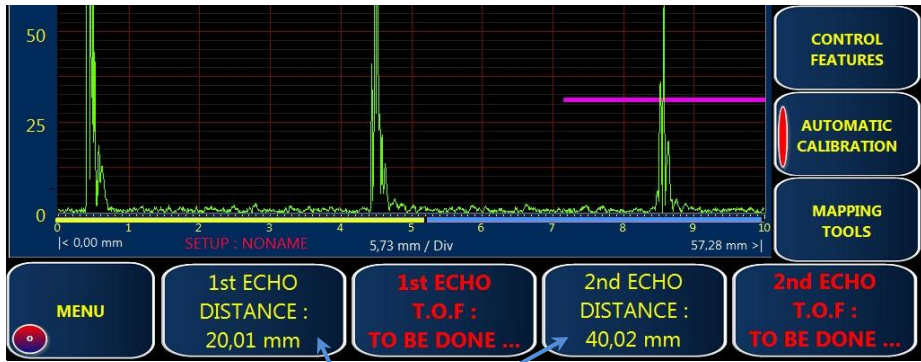
In order to end the settings before starting the control, enter the material velocity and thickness.



Velocity and thickness

If the material velocity is not known → see § 3.6.3

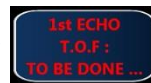
3.6.3 Material velocity and probe delay calculation



Distance of the 2 echoes

a) Enter the distance between the 2 echoes used for the velocity calculation.

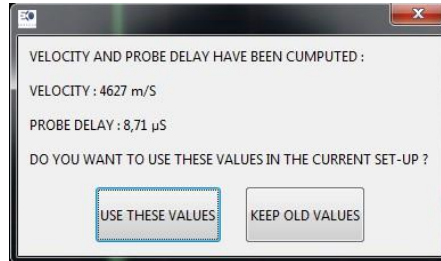
b) To position the gate on the first echo, click on



c) To position the gate on the 2nd echo, click on



d) Velocity and delay automatic calculation:



By validating the window, the probe delay and the velocity are automatically taken in consideration.

3.7 DAC → RECEIVER → TCG CAD

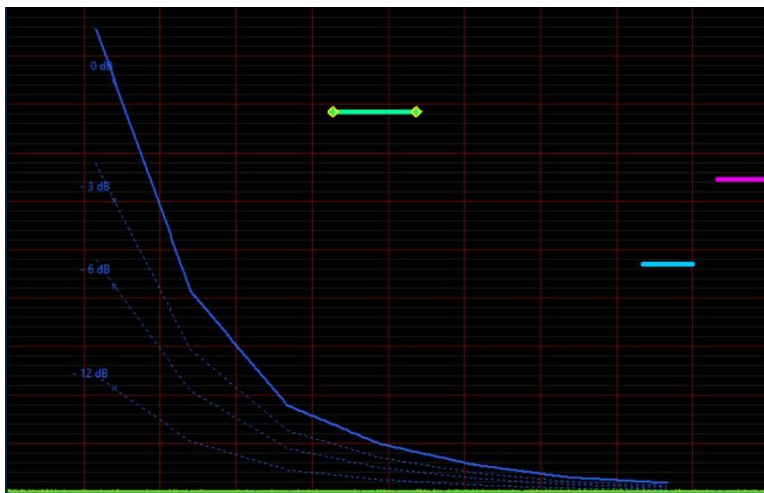


Click on **CAD OFF** to make visible the DAC → **CAD ON**

Place the gate on the echo and → **VALID NEW POINT**

Do this for all the DAC points.

To erase the DAC → **CLEAR CAD CURVE**



The DAC includes 4 curves:

- 0 dB
- 3 dB
- 6 dB
- 12 dB

3.8 TCG → RECEIVER → TGC CAD



Pass in automatic by unchecking **MANUAL ENTER**





Put the gate on the echo and click on
 Go to the next echo and repeat this manipulation as many times as necessary.

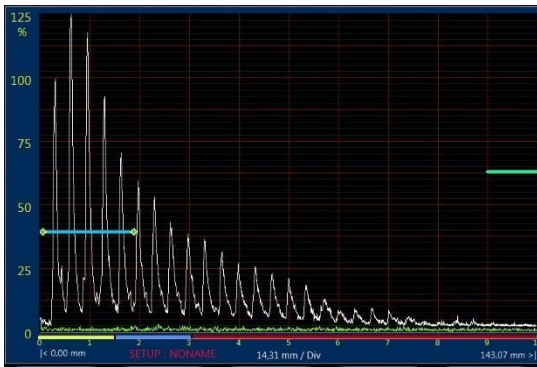
It is possible to pass in manual in order to improve the set-ups.

When the TCG is activated, a green point appears above the gain.



3.9 Dynamic echo display & Freeze

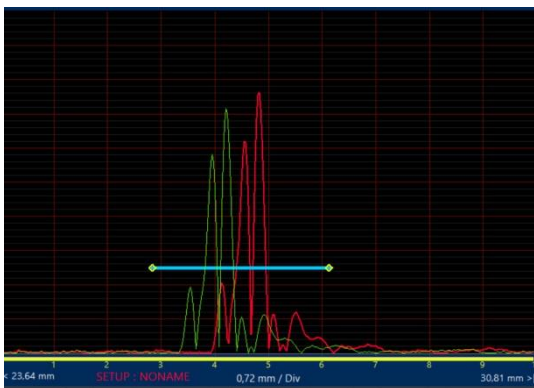
Dynamic echo:



When the signal is at its maximum, for a certain position, a copy of the signal is done. On the screen (A-scan) it appears in white.

This tool is used to find the maximum echo (find a focus point on a reference block or to locate a default more precisely.)

Freeze A-scan:



This tool allows you to freeze the signal. It can be helpful if you want to compare 2 signals

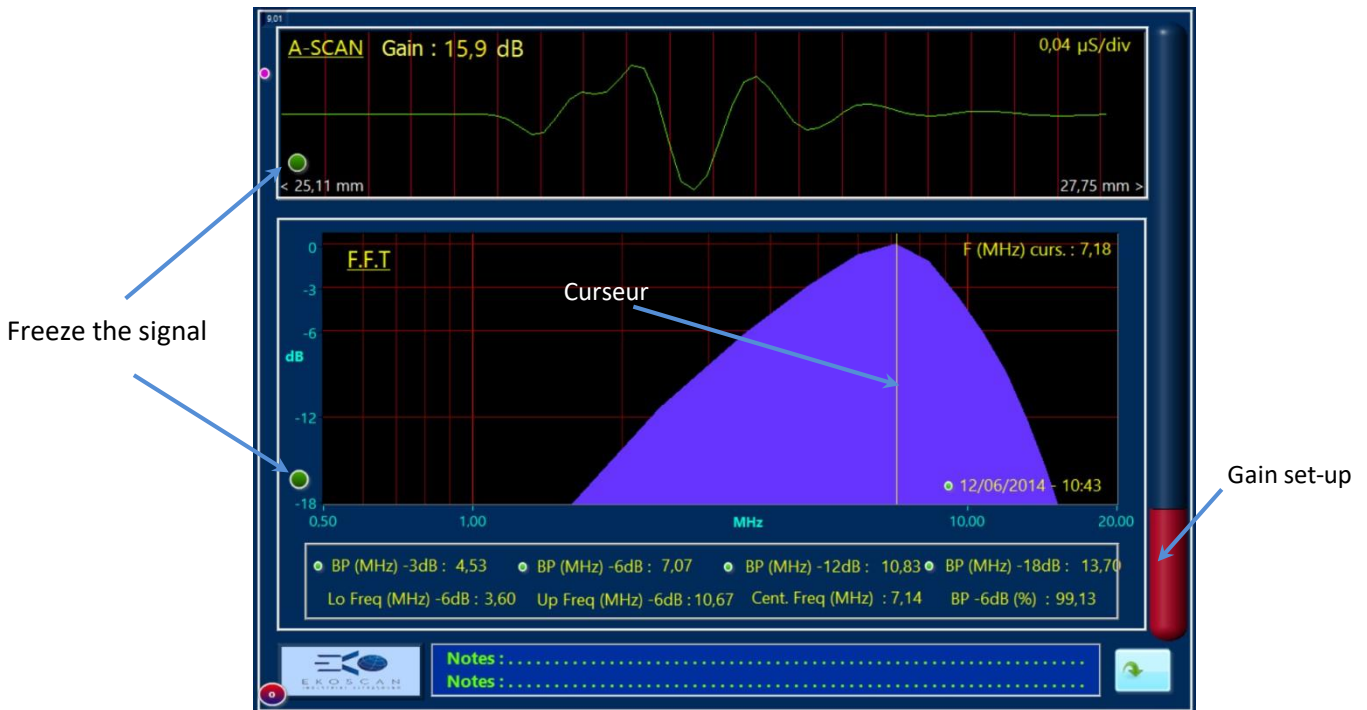
3.10 FFT



It is not possible to do a FFT if the display is not in RF. The FFT considers the screen width, if the scale is too important compared to the signal, you results will be wrong.

To have a good analysis, place a gate on the desired echo and zoom on it.

Then, activate FFT.



4 Control

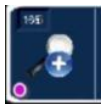
You have 4 types of controls available on this card:

- A-scan
- Scrolling B-scan
- Encoded B-scan (UT standard or TOFD)
- C-scan with 2 or 3 axes depending on the set-ups.

4.1 A-scan

Controlling is easier with two tools. The first one allows you to extend the A-scan screen by hiding the lateral and lower toolbar.

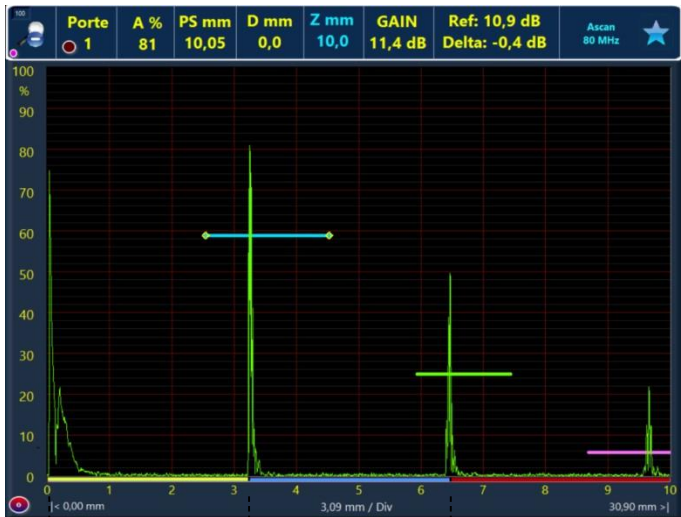
To activate the zoom, hit the button on the top left corner. The screen scale and delay will not be changed.




→ Zoom activation



→ Zoom deactivation



If you hit  you will have 3 choices:

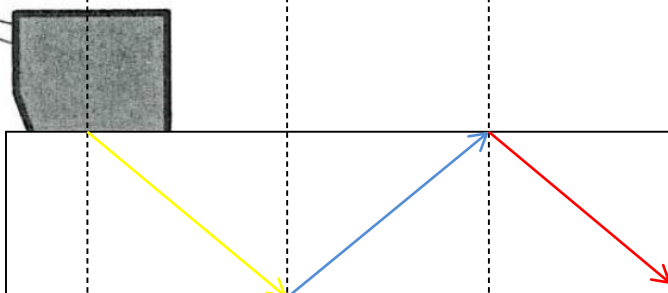
- Gain
- Scale
- Delay

They automatically disappear after several seconds.

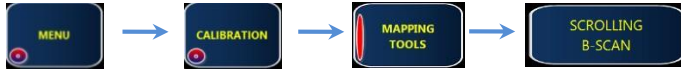


The second tool is the representation for the “direct scan” (in yellow), the “V-transmission” leap (in blue) and the rest (in red).

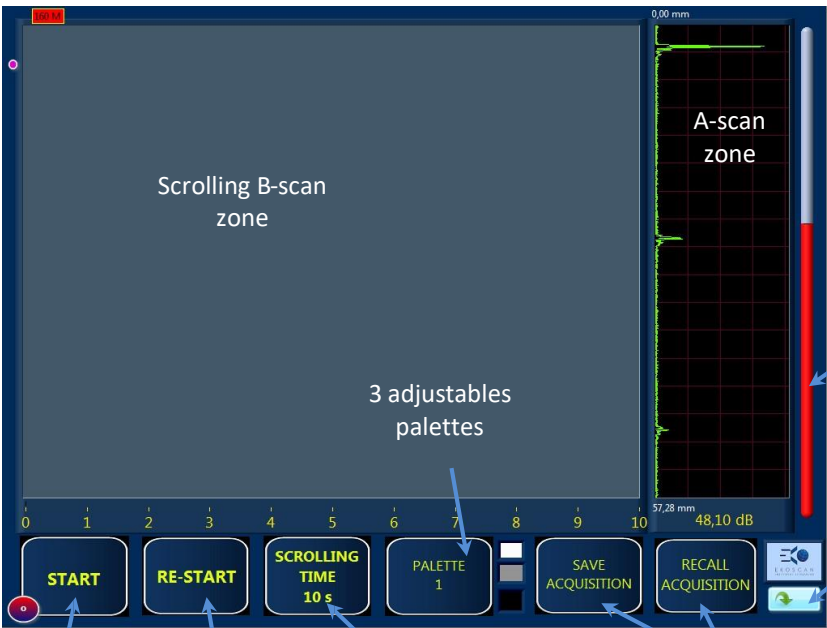
These graphs are calculated when the probe angle (§3.6.1) and the material thickness (§3.6.2) are given.



4.2 Scrolling B-scan



4.2.1 Acquisition



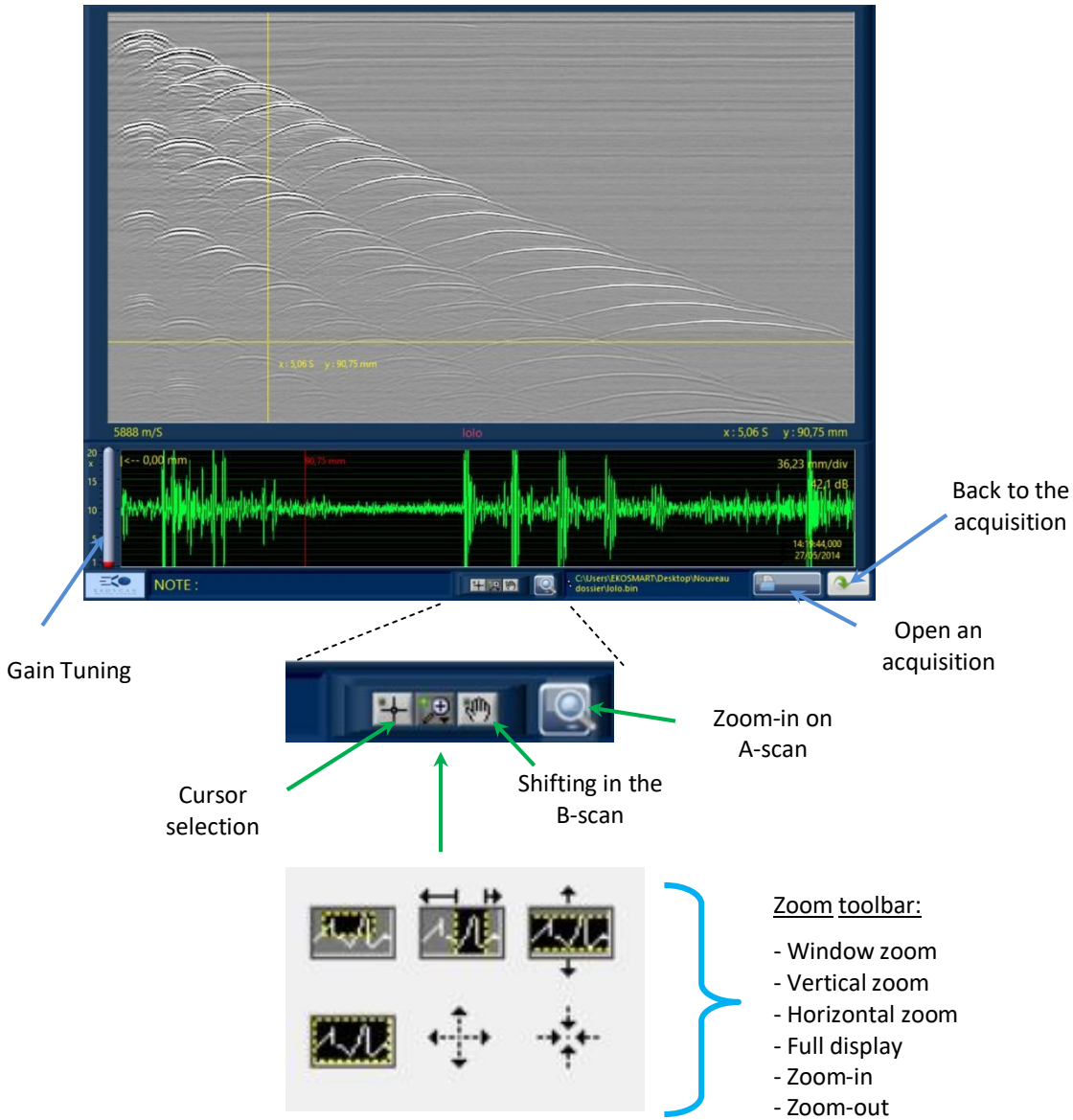
The screenshot shows the Scrolling B-scan acquisition interface. The main display area is labeled "Scrolling B-scan zone". To the right, there is an "A-scan zone" with a vertical scale. Below the main display, there are several control buttons and indicators:

- START**: Acquisition Start
- RE-START**: Pause / Resume
- SCROLLING TIME 10 s**: Acquisition duration
- PALETTE 1**: 3 adjustable palettes
- SAVE ACQUISITION** and **RECALL ACQUISITION**: Acquisition Save or recall
- Gain Tuning**: A vertical slider on the right side of the A-scan zone.
- Mapping Exit**: A button on the right side of the interface.

Additional information visible on the interface includes a distance of 57,28 mm and a gain of 48,10 dB.

4.2.2 Analysis

Measures done on a drilled reference block



Gain Tuning

Cursor selection

Shifting in the B-scan

Zoom-in on A-scan

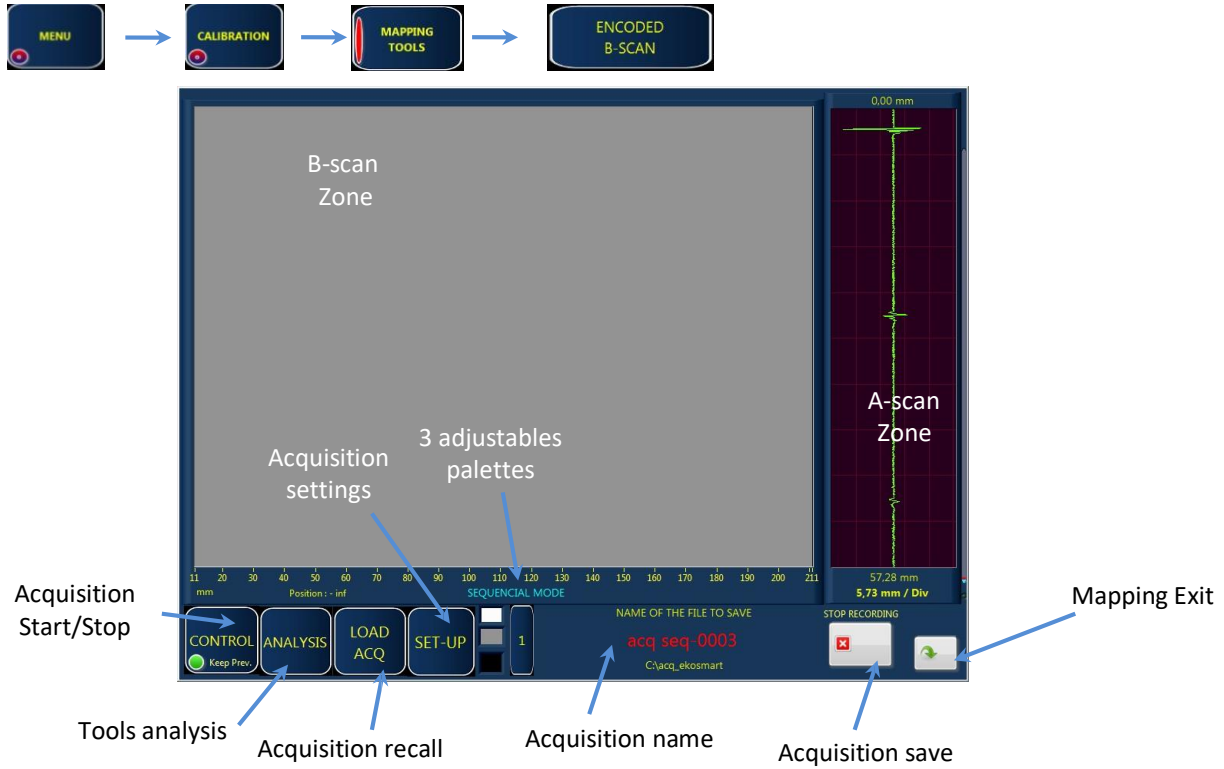
Back to the acquisition

Open an acquisition

Zoom toolbar:

- Window zoom
- Vertical zoom
- Horizontal zoom
- Full display
- Zoom-in
- Zoom-out

4.3 Encoded B-scan



nb: don't forget to enter the part thickness to have good results in TOFD.

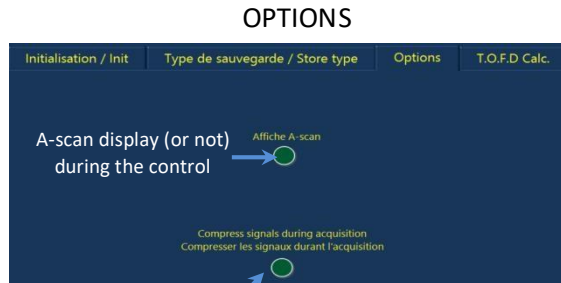
4.3.1 B-scan parameters



Four tabs are available to define the parameters: Init, Store type, options and a TOFD calculator.

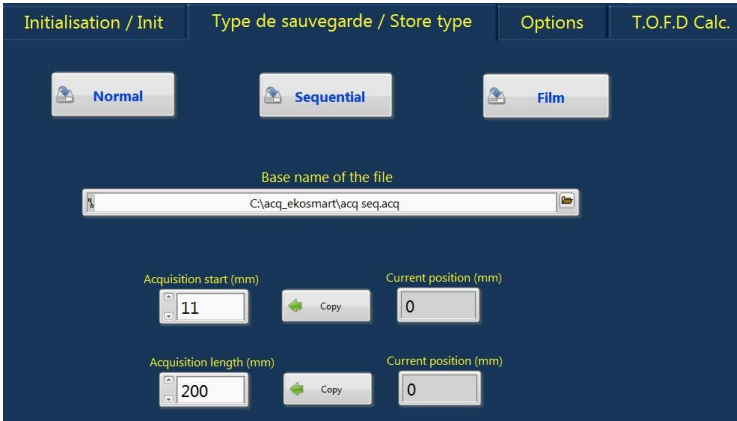


Encoder Resolution.
 Ekoscan encoder (with wire) = 22 counts/mm

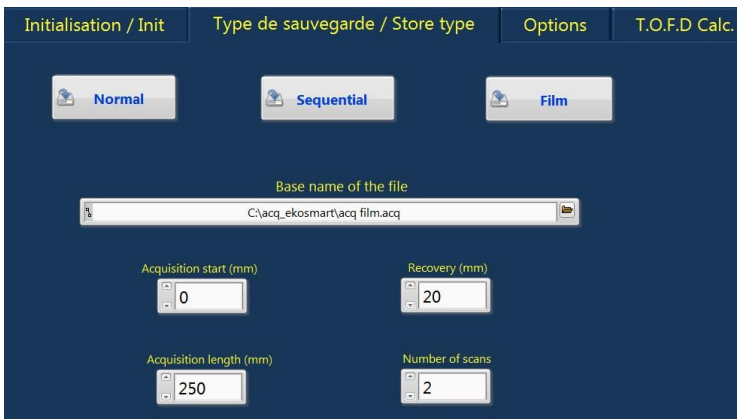


Compression or not of the signal during the acquisition.

You have at your disposal 3 types of back-ups:



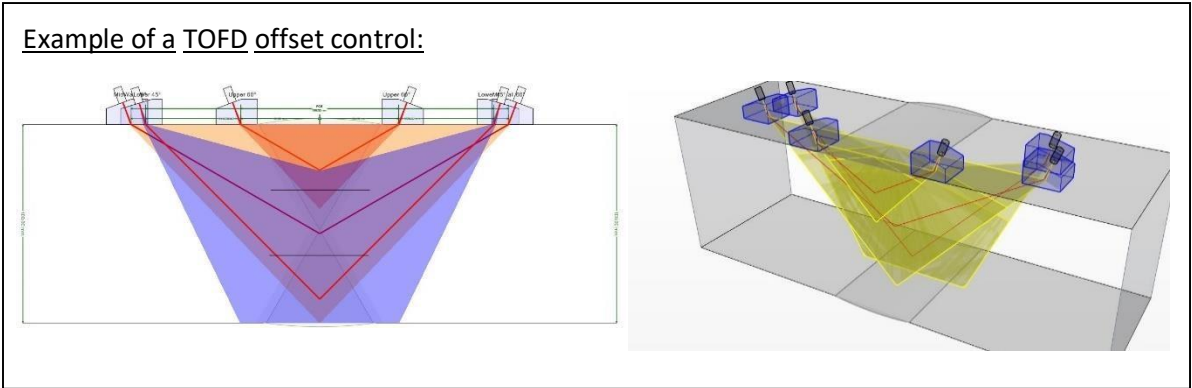
Normal Mode: one control, one recording. For new control, you have to give a new name to the file.



Sequential mode: the name of the recording file increment automatically. You can stop momentarily during the acquisition, for some tries and then restart when you are sure.

Film mode (mainly used for a TOFD control): this mode allows "TOFD offset" on a welding for example. On the same part of a welding, pass several times with different probes center separation in order to control the entire welding.

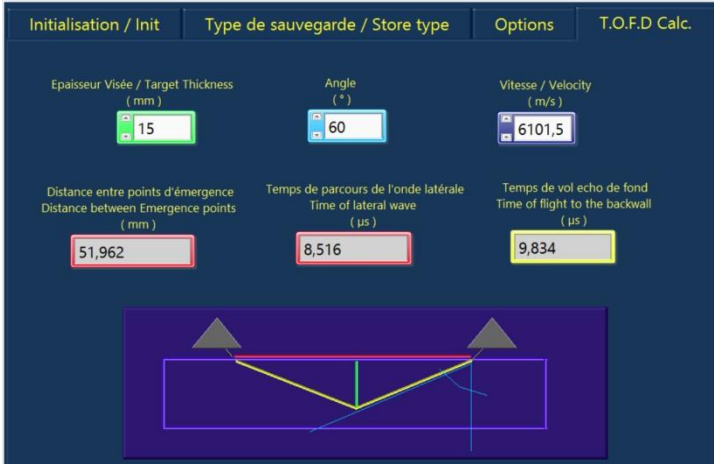
In Setup, you can define the recovery between each films as well as the number of scans per film.



To do another acquisition (stop the increment), quit the encoded B-scan.

Careful: In the A-scan, you only have to display on the screen the zone to control, otherwise, if the zone is too large, losses can appear during the acquisition.

TOFD calculator:

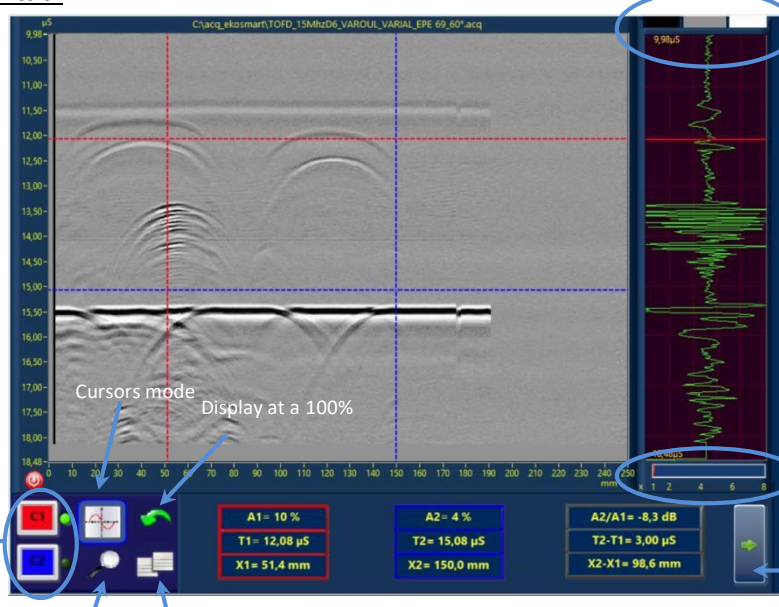


The interface is divided into four tabs: 'Initialisation / Init', 'Type de sauvegarde / Store type', 'Options', and 'T.O.F.D Calc.'. The 'T.O.F.D Calc.' tab is active, showing three input fields for parameters: 'Epaisseur Visée / Target Thickness (mm)' with value 15, 'Angle (°)' with value 60, and 'Vitesse / Velocity (m/s)' with value 6101,5. Below these are three result fields: 'Distance entre points d'émergence / Distance between Emergence points (mm)' with value 51,962, 'Temps de parcours de l'onde latérale / Time of lateral wave (µs)' with value 8,516, and 'Temps de vol echo de fond / Time of flight to the backwall (µs)' with value 9,834. A diagram at the bottom illustrates the TOFD geometry with a V-shaped wave path.

4.3.2 Analysis



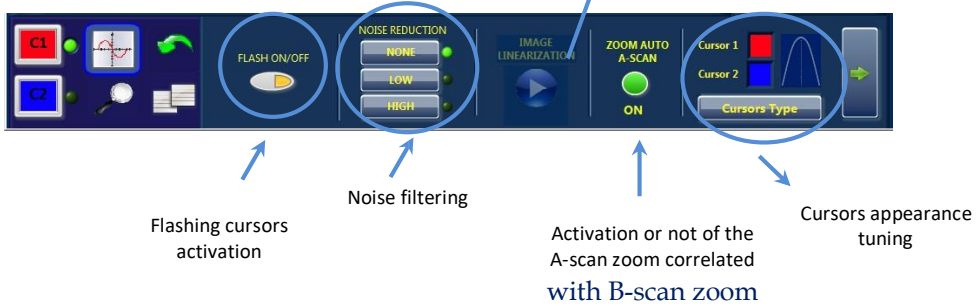
Cursors information tab:



The interface shows a TOFD image with a vertical cursor at 150 mm and a horizontal cursor at 12.08 µs. A zoomed-in waveform is shown on the right. The bottom panel displays cursor data: A1 = 10%, T1 = 12,08 µs, X1 = 51,4 mm; A2 = 4%, T2 = 15,08 µs, X2 = 150,0 mm; and A2/A1 = -8,3 dB, T2-T1 = 3,00 µs, X2-X1 = 98,6 mm. Annotations include: 'Access to the colour palette' pointing to the waveform, 'Gain Tuning' pointing to a slider, 'Next tab' pointing to a right arrow, 'Cursors Selection' (1 click: Move with the mouse, 2 clicks: Move with the arrows) pointing to the cursor controls, 'Zoom Activation' pointing to a magnifying glass icon, 'Window zoom displacement' pointing to a crosshair icon, and 'Cursors Data' pointing to the data display area.

Setting Tab:

Acquisition linearization to "rectify" the picture. Put C1 before the part entrance and C2 after. Then apply the linearization.



TOFD Tab:

