ISONIC 2010

Portable Ultrasonic Phased Array Flaw Detector and Recorder

Operating Manual

Revision 1.10

Sonotron NDT

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EC Declaration of Conformity

Council Directive 89/336/EEC on Electromagnetic Compatibility, as amended by Council Directive 92/31/EEC & Council Directive 93/68/EEC
Council Directive 73/23/EEC (Low Voltage Directive), as amended by Council Directive 93/68/EEC

We, **Sonotron NDT Ltd.**, 4 Pekeris Street, Rehovot, 76702 Israel, certify that the product described is in conformity with the Directives 73/23/EEC and 89/336/EEC as amended

ISONIC 2010

Portable Digital Phased Array Ultrasonic Flaw Detector and Recorder
32 channels phased array electronics and 1 independent channel for connection of conventional and TOFD probes

The product identified above complies with the requirements of above EU directives by meeting the following standards:

Safety

EN 61010-1:1993

EMC

EN 61326:1997
EN 61000-3-2:1995 /A1:1998 /A2:1998 /A14:2000
EN 61000-3-3:1995

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Declaration of Compliance

We, **Sonotron NDT Ltd.**, 4 Pekeris Street, Rehovot, 76702 Israel certify that the product described is in conformity with National and International Codes as amended

ISONIC 2010

Portable Digital Phased Array Ultrasonic Flaw Detector and Recorder
32 channels phased array electronics and 1 independent channel for connection of conventional and TOFD probes

The product identified above complies with the requirements of following National and International Codes:

- ASME Section I – Rules for Construction of Power Boilers
- ASME Section VIII, Division 1 – Rules for Construction of Pressure Vessels
- ASME Section VIII, Division 2 – Rules for Construction of Pressure Vessels. Alternative Rules
- ASME Section VIII Article KE-3 – Examination of Welds and Acceptance Criteria
- ASME Code Case 2235 Rev 9 – Use of Ultrasonic Examination in Lieu of Radiography
- ASME Code Case 2541 – Use of Manual Phased Array Ultrasonic Examination Section V
- ASME Code Case 2557 – Use of Manual Phased Array S-Scan Ultrasonic Examination Per Article 4 Section V
- ASME Code Case 2558 – Use of Manual Phased Array E-Scan Ultrasonic Examination Per Article 4 Section V
- Non-Destructive Examination of Welded Joints – Ultrasonic Examination of Welded Joints. – British and European Standard BS EN 1714:1998
- Non-Destructive Examination of Welds – Ultrasonic Examination – Characterization of Indications in Welds. – British and European Standard BS EN 1713:1998
- Calibration and Setting-Up of the Ultrasonic Time of Flight Diffraction (TOFD) Technique for the Detection, Location and Sizing of Flaws. – British Standard BS 7706:1993
- WI 00121377, Welding – Use Of Time-Of-Flight Diffraction Technique (TOFD) For Testing Of Welds. – European Committee for Standardization – Document # CEN/TC 121/SC 5/WG 2 N 146, issued Feb, 12, 2003
- ASTM E 2373 – 04 – Standard Practice for Use of the Ultrasonic Time of Flight iffraction (TOFD) Technique
- Non-Destructive Testing – Ultrasonic Examination – Part 5: Characterization and Sizing of Discontinuities. – British and European Standard BS EN 583-5:2001
- Non-Destructive Testing – Ultrasonic Examination – Part 2: Sensitivity and Range Setting. – British and European Standard BS EN 583-2:2001
- Manufacture and Testing of Pressure Vessels. Non-Destructive Testing of Welded Joints. Minimum Requirement for Non-Destructive Testing Methods – Appendix 1 to AD-Merkblatt HP5/3 (Germany).– Edition July 1989

FCC Rules

This **ISONIC 2010** ultrasonic phased array flaw detector and data recorder (hereinafter called **ISONIC 2010**) has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Safety Regulations

Please read this section carefully and observe the regulations in order to ensure your safety and operate the system as intended

Please observe the warnings and notes printed in this manual and on the unit

The **ISONIC 2010** has been built and tested according to the regulations specified in EN60950/VDE0805. It was in perfect working condition on leaving the manufacturer's premises

In order to retain this standard and to avoid any risk in operating the equipment, the user must make sure to comply with any hints and warnings included in this manual

Depending on the power supply the **ISONIC 2010** complies with protection class I /protective grounding/, protection class II, or protection class III

Exemption from statutory liability for accidents

The manufacturer shall be exempt from statutory liability for accidents in the case of non-observance of the safety regulations by any operating person

Limitation of Liability

The manufacturer shall assume no warranty during the warranty period if the equipment is operated without observing the safety regulations. In any such case, manufacturer shall be exempt from statutory liability for accidents resulting from any operation

Exemption from warranty

The manufacturer shall be exempt from any warranty obligations in case of the non-observance of the safety regulations
The manufacturer will only warrant safety, reliability, and performance of the **ISONIC 2010** if the following safety regulations are closely observed:

- Setting up, expansions, re-adjustments, alterations, and repairs must only be carried out by persons who have been authorized by manufacturer
- The electric installations of the room where the equipment is to be set up must be in accordance with IEC requirements
- The equipment must be operated in accordance with the instructions
- Any expansions to the equipment must comply with the legal requirements, as well as with the specifications for the unit concerned
- Confirm the rated voltage of your **ISONIC 2010** matches the voltage of your power outlet
- The mains socket must be located close to the system and must be easily accessible
- Use only the power cord furnished with your **ISONIC 2010** and a properly grounded outlet /only protection class I/
- Do not connect the **ISONIC 2010** to power bar supplying already other devices. Do not use an extension power cord
- Any interruption to the PE conductor, either internally or externally, or removing the earthed conductor will make the system unsafe to use /only protection class I/
- Any required cable connectors must be screwed to or hooked into the casing
- The equipment must be disconnected from mains before opening
- To interrupt power supply, simply disconnect from the mains
- Any balancing, maintenance, or repair may only be carried out by manufacturer authorized specialists who are familiar with the inherent dangers
- Both the version and the rated current of any replacement fuse must comply with specifications laid down
- Using any repaired fuses, or short-circuiting the safety holder is illegal
- If the equipment has suffered visible damage or if it has stopped working, it must be assumed that it can no longer be operated without any danger. In these cases, the system must be switched off and be safeguarded against accidental use
- Only use the cables supplied by manufacturer or shielded data cable with shielded connectors at either end
- Do not drop small objects, such as paper clips, into the **ISONIC 2010**
- Do not put the **ISONIC 2010** in direct sunlight, near a heater, or near water. Leave space around the **ISONIC 2010**
- Disconnect the power cord whenever a thunderstorm is nearby. Leaving the power cord connected may damage the **ISONIC 2010** or your property
- When positioning the equipment, external monitor, external keyboard, and external mouse take into account any local or national regulations relating to ergonomic requirements. For example, you should ensure that little or no ambient light is reflected off the external monitor screen as glare, and that the external keyboard is placed in a comfortable position for typing

- Do not allow any cables, particularly power cords, to trail across the floor, where they can be snagged by people walking past
- The voltage of the External DC Power Supply below 11 V is not allowed for the **ISONIC 2010** unit
- The voltage of the External DC Power Supply above 16 V is not allowed for the **ISONIC 2010** unit
- Charge of the battery for the **ISONIC 2010** unit is allowed only with use of the AC/DC converters / chargers supplied along with it or authorized by Sonotron NDT

Remember this before:

- balancing
- carrying out maintenance work
- repairing
- exchanging any parts

Please make sure batteries, rechargeable batteries, or a power supply with SELV output supplies power

Software (SW)

ISONIC 2010 is a SW controlled inspection device. Based on present state of the art, SW can never be completely free of faults. **ISONIC 2010** should therefore be checked before and after use in order to ensure that the necessary functions operate perfectly in the envisaged combination. If you have any questions about solving problems related to use the **ISONIC 2010**, please contact your local Sonotron NDT representative

1. Introduction

ISONIC 2010 uniquely combines phased array, conventional UT, and TOFD modalities providing 100% raw data recording and imaging. Along with superior portability, lightweight, and battery operation this makes it suitable for all kinds of every-day ultrasonic inspections

Phased array modality is performed by powerful 32:32 phased array electronics with independently adjustable emitting and receiving aperture, each may consist of 1 through 32 elements. Groups of phased array probe elements composing emitting and receiving aperture may be fully or partially matching or totally separated allowing flexible managing of incidence angles, focal distances, types of radiated and received waves including directly reflected and diffracted mode converted signals

Each channel is equipped with it's own A/D converter. Parallel firing, A/D conversion, and "on-the-fly" digital phasing are provided for every possible composition and size of the emitting and receiving aperture. Thus implementation of each focal law is completed within single pulsing/receiving cycle providing maximal possible inspection speed

ISONIC 2010 is additionally equipped with independent channel for conventional UT and TOFD inspection and recording capable for both single and dual modes of pulsing/receiving

High ultrasonic performance is achieved through firing phased array, TOFD, and conventional probes with bipolar square wave initial pulse with wide-range-tunable duration and amplitude. Maximal amplitude of bipolar square wave initial pulse is 300 V pp for phased array and 400 V pp for conventional channel. High stability of the amplitude and shape of the initial pulse, boosting of all it's leading and falling edges, and electronic damping are provided by the special circuit significantly improving signal to noise ratio and resolution. Thus analogue gain for each modality is controllable over 0…100 dB range

640X480 pixels 6.5" bright touch screen provides optimal resolution / power consumption rate for the outdoor operation

ISONIC 2010 is fully compliant with the following codes

- ASME Code Case 2541 – Use of Manual Phased Array Ultrasonic Examination Section V
- ASME Code Case 2557 – Use of Manual Phased Array S-Scan Ultrasonic Examination Section V per Article 4 Section V
- ASME Code Case 2558 – Use of Manual Phased Array E-Scan Ultrasonic Examination Section V per Article 4 Section V
- ASTM 1961– 06 – Standard Practice for Mechanized Ultrasonic Testing of Girth Welds Using Zonal Discrimination with Focused Search Units
- ASME Section I – Rules for Construction of Power Boilers
- ASME Section VIII, Division 1 – Rules for Construction of Pressure Vessels
- ASME Section VIII, Division 2 – Rules for Construction of Pressure Vessels. Alternative Rules
- ASME Section VIII Article KE-3 – Examination of Welds and Acceptance Criteria
- ASME Code Case 2235 Rev 9 – Use of Ultrasonic Examination in Lieu of Radiography
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- Calibration and Setting-Up of the Ultrasonic Time of Flight Diffraction (TOFD) Technique for the Detection, Location and Sizing of Flaws. – British Standard BS 7706:1993
- WI 00121377, Welding – Use Of Time-Of-Flight Diffraction Technique (TOFD) For Testing Of Welds. – European Committee for Standardization – Document # CEN/TC 121/SC 5/WG 2 N 146, issued Feb, 12, 2003
- ASTM E 2373 – 04 – Standard Practice for Use of the Ultrasonic Time of Flight Diffraction (TOFD) Technique
- Non-Destructive Testing – Ultrasonic Examination – Part 5: Characterization and Sizing of Discontinuities. – British and European Standard BS EN 583-5:2001
- Non-Destructive Testing – Ultrasonic Examination – Part 2: Sensitivity and Range Setting. – British and European Standard BS EN 583-2:2001
- Manufacture and Testing of Pressure Vessels. Non-Destructive Testing of Welded Joints. Minimum Requirement for Non-Destructive Testing Methods – Appendix 1 to AD-Merkblatt HP5/3 (Germany).– Edition July 1989

2. Technical Data

Phased Array

Number of Channels:	**32**
Pulse Type:	**Bipolar Square Wave with electronically controlled damping**
Initial Transition:	**≤7.5 ns (10-90% for rising edges / 90-10% for falling edges)**
Pulse Amplitude:	**Smoothly tunable (12 levels) 50V … 300 V pp into 50 Ω**
Half Wave Pulse Duration:	**50…600 ns controllable in 10 ns step**
Probe Types:	**Linear / Ring Array**
Emitting aperture:	**1…32**
Excitation:	**Parallel for every possible emitting aperture**
Phasing (emitting aperture):	**0…100 μs with 5 ns resolution**
Receiving Aperture:	**1…32**
Gain:	**0...100 dB controllable in 0.5 dB resolution**
Advanced Low Noise Design:	**85 μV peak to peak input referred to 80 dB gain / 25 MHz bandwidth**
Frequency Band:	**0.2 … 25 MHz Wide Band**
A/D Conversion:	**100 MHz 16 bit – parallel for every possible receiving aperture, no multiplexing involved**
Superimposing of receiving aperture signals:	**On-the-fly – parallel for every possible receiving aperture, no multiplexing involved**
Phasing (receiving aperture):	**On-the-fly 0…100 μs with 5 ns resolution**
A-Scan Display Modes:	**RF, Rectified (Full Wave / Negative or Positive Half Wave)**
DAC / TCG per focal law – for rectified and RF display:	**Theoretical – dB/mm (dB/")** **Experimental – through recording echoes from several reflectors** **46 dB Dynamic Range, Slope ≤ 20 dB/□s, Capacity ≤ 40 points**
Gates per focal law:	**2 Independent Gates / unlimitedly expandable**
Gate Start and Width:	**Controllable over whole variety of A-Scan Display Delay and A-Scan Range** **in 0.1 mm /// 0.001" resolution**
Gate Threshold:	**5…95 % of A-Scan height controllable in 1 % resolution**
Number of focal laws:	**8192**
Scanning and Imaging:	**B-Scan (E-Scan) – regular and True-To-Geometry** **Sector Scan (S-Scan) – regular and True-To-Geometry** **One-probe multi-group image composed from several B- and S-Scans** **Top (C-Scan), Side, End View imaging formed through encoded / time-based line scanning, 3D-Viewer**
Method of data storage:	**100% raw data capturing**

Conventional UT and TOFD

Number of Channels:	**1**
Pulse Type:	**Bipolar Square Wave with electronically controlled damping**
Initial Transition:	**≤7.5 ns (10-90% for rising edges / 90-10% for falling edges)**
Pulse Amplitude:	**Smoothly tunable (12 levels) 50V … 400 V pp into 50 Ω**
Half Wave Pulse Duration:	**50…600 ns independently controllable in 10 ns step**
Modes:	**Single / Dual**
Gain:	**0...100 dB controllable in 0.5 dB resolution**
Advanced Low Noise Design:	**85 μV peak to peak input referred to 80 dB gain / 25 MHz bandwidth**
Frequency Band:	**0.2 … 25 MHz Wide Band**
A/D Conversion:	**100 MHz 16 bit**
Digital Filter:	**32-Taps FIR band pass with controllable lower and upper frequency limits**
A-Scan Display Modes:	**RF, Rectified (Full Wave / Negative or Positive Half Wave), Signal's Spectrum (FFT Graph)**
DAC / TCG – for rectified and RF display:	**Theoretical – dB/mm (dB/")** **Experimental – through recording echoes from several reflectors** **46 dB Dynamic Range, Slope ≤ 20 dB/μs, Capacity ≤ 40 points**
DGS:	**Standard Library for 18 probes / unlimitedly expandable**
Gates:	**2 Independent Gates / unlimitedly expandable**
Gate Start and Width:	**Controllable over whole variety of A-Scan Display Delay and A-Scan Range** **in 0.1 mm /// 0.001" resolution**
Gate Threshold:	**5…95 % of A-Scan height controllable in 1 % resolution**
Measuring Functions – Digital Display Readout:	**27 automatic functions / expandable; Dual Ultrasound Velocity Measurement Mode for Multi-Layer Structures; Curved Surface / Thickness / Skip correction for angle beam probes; Ultrasound velocity and Probe Delay Auto-Calibration for all types of probes**
Freeze (A-Scans and Spectrum Graphs):	**Freeze All – A-Scans and Spectrum Graphs / Freeze Peak – A-Scans / All measurements functions, manipulating Gates, and ±6dB Gain varying are available for frozen signals**
Scanning and Imaging:	**Thickness Profile B-Scan, Cross-sectional B-Scan, Plane View CB-Scan, TOFD**
Standard Length of one Line Scanning record:	**50…20000 mm (2"…800"), automatic scrolling**
Method of data storage:	**100% raw data capturing**

General

PRF:	**10…5000 Hz controllable in 1 Hz resolution**
On-Board Computer CPU:	**AMD LX 800 - 500MHz**
RAM:	**1 Gigabyte**
Internal Flash Memory - Quasi HDD:	**4 Gigabytes**
Screen:	**Sun readable 6.5” touch screen 640 × 480**
Controls:	**Sealed keyboard and mouse**
Interface:	**2 × USB, Ethernet**
Operating System:	**Windows™XP Embedded**
Encoder interface:	**Incremental TTL encoder**
Standard Length of one Line Scanning record:	**50…20000 mm (2"…800"), automatic scrolling**
Housing:	**IP 53 rugged aluminum case with carrying handle**
Dimensions:	**265×156×101 mm (10.43"×6.14"×3.98") - without battery** **265×156×139 mm (10.43"×6.14"×5.47") - with battery**
Weight:	**2.500 kg (5.50 lbs) - without battery** **3.430 kg (7.55 lbs) - with battery**

3. ISONIC 2010 – Scope of Supply

#	Item	Order Code (Part #)	Note
1	**ISONIC 2010 – Portable Digital Phased Array Ultrasonic Flaw Detector and Recorder: 32 *channels PA electronics and 1 independent channel for connection of conventional and TOFD probes*** • **ISONIC 2010 Electronic unit** – including: > Internal PC (AMD LX 800 500 MHz, RAM-1G, Quazi-HDD Flash Memory Card 4G, Windows XP Embedded, Large 8.5" active TFT sVGA LCD High Color Sun-Readable Touch Screen, Built-In Interfaces: 2XUSB; Ethernet; PS/2; Front Panel Sealed Keyboard and Mouse; sVGA output) > 100 ... 250 VAC AC/DC converter > SE 254064 PA - 64-Channel PA Pulsing Receiving and Processing Card: ❑ Up to 300 Volt Peak to Peak Bipolar Square Wave – Tunable Width / Tunable Firing Level Pulser; Special Probe Protection Circuit to Prevent Probe Damage for Not Properly Adjusted Pulse Width; Freely Adjustable Emitting Aperture - up to 64 elements simultaneous firing ❑ Analogue Gain: 0...100 dB controllable in 0.5 dB resolution; Advanced Low Noise Design: 81μV peak to peak input referred to 80 dB gain / 25 MHz bandwidth; Frequency Band: 0.2 … 25 MHz Wide Band / 32-Taps FIR band pass digital filter with controllable lower and upper frequency limits; Freely Adjustable Receiving Aperture - up to 64 Elements, Parallel Analog to Digital Conversion - No Multiplexing Involved - For Any Size of Receiving Aperture ❑ Built-In Incremental Encoder Interface > SE 254016/1 - 1-Channel UDS 3-6 Pulser Receiver Card ❑ Up to 400 V Peak to Peak Bipolar Square Wave – Tunable Width / Tunable Firing Level Pulser; Single / Dual Modes of Operation; Special Probe Protection Circuit to Prevent Probe Damage for Not Properly Adjusted Pulse Width ❑ Gain: 0...100 dB controllable in 0.5 dB resolution; Advanced Low Noise Design: 81μV peak to peak input referred to 80 dB gain / 25 MHz bandwidth; Frequency Band: 0.2 … 25 MHz Wide Band / 32-Taps FIR band pass digital filter with controllable lower and upper frequency limits ❑ Built-In Incremental Encoder Interface • **Software** ❑ ISONIC 2010 Multi-Functional Package (SWA 99C10200) ● **PA Modality** ◆ **PA Probes Database** ⇨ Unlimitedly expandable database of PA probes - total aperture size, pitch and offset, wedge geometry and US Velocity / delay geometry and US Velocity, etc ⇨ Manual editing / update of PA probes, wedges and delays parameters or automatic importing of database from a file ⇨ Exporting of PA probes / wedges / delays database into a file ◆ **A-Scan** ⇨ Manual control of emitting/receiving aperture, incidence angle, type of ultrasonic wave, focal distance / focal depth, etc ⇨ A-Scan (Full Wave / Neg Wave / Pos Wave rectification; RF) ⇨ True-To-Geometry Ray Trace (Focal Law) Visualization ⇨ DAC, TCG ⇨ Smart Automatic Measurements of Gated Signals - Flank / Flank First / Top / Top First; Auto-Marking Measuring Points on A-Scan ⇨ Enhanced Signal Evaluation for Live and Frozen A-Scans including Gain Adjustments whilst in Freeze Mode ⇨ Generating Comprehensive Setup and A-Scan report **Cross-Sectional Scanning and Imaging:** ◆ **ABI-Scan (B-Scan or E-Scan as per ASME Case 2558)** ⇨ Linear electronically controlled scanning using predefined size of pulsing / receiving aperture, incidence angle, and type of ultrasonic wave within entire probe and automatic real time composing of **True-To-Geometry B-Scan** image with 100% raw data capturing ⇨ Unique Individual **Gain per Incidence Point / Gain per Focal Law Adjustment** to compensate: ● inequality of PA probe elements ● variety of wedge losses ◆ **Sector-Scan (S-Scan as per ASME Case 2557)** ⇨ Angular electronically controlled scanning using predefined pulsing / receiving aperture, and type of ultrasonic wave provided through steering of incidence angle and automatic real time composing of **regular Sector Scan (S-Scan)** or **True-To-Geometry Sector-Scan (S-Scan)** image with 100% raw data capturing	SA 804900	Standard Configuration # 1

#	Item	Order Code (Part #)	Note
	⇨ **Angle Gain Compensation:** Unique Individual **Gain per Incidence Angle / Gain per Focal Law Adjustment** compensating incidence angle-steering caused varieties of: ● transparency for probe - material boundary ● wedge losses ● effective size of emitting/receiving aperture Both above modes of electronically controlled cross sectional scanning and imaging are featured with: ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ Zoom In / Out ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report **Three-Dimensional Top - Side - End View Imaging Through Linear Scanning with PA Probes:** ◆ **ABI-Scan based C-Scan and 3D Data Presentation** ◆ **Sector-Scan based C-Scan and 3D Data Presentation** ⇨ Electromechanically encoded or time-based line scanning with PA probe ⇨ **3D presentation - Top, Side, End View** ⇨ Amplitude / Distance mode of C-Scan - Top View image ⇨ Thickness Profiling / Flaw Detection presentation of Side / End View ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Storing raw 3D data comprising all raw data B-Scans each accompanied with complete sequence of recorded raw data A-Scans into a file ⇨ Upload 3D data from a file ⇨ Comprehensive off-line analysis / postprocessing of 3D data featured with: ▶ **3D-Viewer** ▶ Off-line Recovery and Play-Back of A-Scans and Raw Data B-Scans ▶ Echo Dynamic Pattern Analysis; ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Gate Manipulation - Rebuild Top, Side, End views for various Gate Settings ▶ Off-line reconstruction of Top, Side, End views for various Gain / Reject level ▶ DAC normalization ▶ Slicing and Filtering Images ▶ Statistical Analysis ⇨ Generating Comprehensive Setup and Scanning Report ● **Conventional UT Modality - Single Channel Operation** ◆ **A-Scan** ⇨ A-Scan (Full Wave / Neg Wave / Pos Wave rectification; RF) ⇨ Selectable A-Scan color scheme ⇨ DAC, DGS, TCG ⇨ Auto Calibration for Straight Beam and Angle Beam Probes ⇨ Curved Surface / Wall Thickness / Skip - Correction for Angle Beam Inspection ⇨ Smart Automatic Measurements of Gated Signals - Flank / Flank First / Top / Top First; Auto-Marking Measuring Points on A-Scan ⇨ FFT (Frequency Domain Signal Presentation) - additional feature for defects evaluation and / or pattern recognition / probes characterization ⇨ Enhanced Signal Evaluation for Live and Frozen A-Scans including Gain Adjustments whilst in Freeze Mode		

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	⇨ Dual Ultrasound Velocity Multi-echo Measurements Mode ⇨ Generating Comprehensive Setup and A-Scan / FFT graph report **Pulse Echo Inspection, Recording, and Imaging Through Linear Scanning with Conventional Probes:** ◆ **Thickness Profile Imaging and Recording (Typical Application: Corrosion characterization)** ⇨ Continuous measuring of thickness value along probe trace and composing of **Thickness Profile B-Scan** with 100% raw data capturing ◆ **B-Scan cross-sectional imaging and recording of defects for longitudinal and shear wave inspection** ⇨ Continuous measuring of echo amplitudes and reflectors coordinates along probe trace and composing of **True-To-Geometry B-Scan** with 100% raw data capturing ◆ **CB-Scan horizontal plane-view imaging and recording of defects for shear, surface, and guided wave inspection** ⇨ Continuous measuring of echo amplitudes and reflectors coordinates along probe trace and composing of **True-To-Geometry CB-Scan** with 100% raw data capturing All above modes of linear scanning and imaging are featured with: ⇨ Electromechanically encoded or time-based data recording ⇨ Recording of complete sequence of A-Scans along scanning line ⇨ Off-line evaluation of images featured with: ▶ Sizing of defects at any location along stored image – coordinates and projection size (plus remaining thickness, thickness loss, and length of damage for Thickness B-Scan); ▶ Play-back and evaluation of A-Scans ▶ Echo dynamic pattern analysis ▶ Off-line reconstruction of image for various Gain / Gate setup ⇨ Generating Comprehensive Setup and Scanning Report **Time of Flight Diffraction Technology - TOFD:** ◆ **TOFD Inspection – RF B-Scan and D-Scan Imaging** ⇨ Electromechanically encoded or time-based data recording ⇨ Averaging recorded A-Scans ⇨ Recording of complete sequence of A-Scans ⇨ Off-line evaluation of TOFD Map featured with: ▶ Improving near to surface resolution through removal of lateral wave and back echo records from TOFD Map ▶ Linearization and straightening of TOFD Map ▶ Increasing contrast of TOFD images through varying Gain and rectification ▶ A-Scan sequence analysis ▶ Defects pattern recognition and sizing with use of interactive parabolic cursors ⇨ Generating Comprehensive Setup and Scanning Report • **Connectivity to Any Type of Windows Printer Through USB or LAN** • **USB Flash Drive for External Data Storage** • **12 months warranty period for the instrument** • **Lifetime free SW update**		
2	Rechargeable Battery Ni MH 9 AH / 12V	SK 2005102	Optional
3	Battery Charger	SK 2005103	Optional Required for battery charge
4	Silicon Rubber Jacket 	SK 2010111	Optional
5	Travel Hard Case	SK 2005104	Optional Allows safe cargo transportation

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6	Postprocessing SW Package for Office PC: **ISONIC PA PP** ⇨ comprehensive postprocessing of inspection results files captured by ISONIC 2009 UPA-Scope and ISONIC 2010 - PA Modality using Inspection SW Packages of any type ⇨ automatic creating of inspection reports	SWA 909844	Included into scope of supply of each **ISONIC 2010** instrument
7	**Wheels-Free** Compact One-Axis Mechanical Encoder for manual line scanning with **PA probes** and for TOFD / CHIME/ CB-Scan / Thickness Profile / Straight Beam B-Scan imaging with conventional probes	SK 2001108 PA	Optional
8	Inspection SW Utility for ISONIC 2010 - PA Modality: **KIs - Delta Technique** ⇨ Single probe insonification of defects with receiving and evaluation of direct and mode converted echoes for the distinguishing between volumetric and sharp defects ⇨ Generating Comprehensive Setup and Evaluation Report	SWA 910801	Optional
9	Inspection SW Package for ISONIC 2010 - PA Modality: **Horizontal Plane Top View CB-Scan - Lateral Scanning** **Scanning Technique # 1** ⇨ Electronically controlled scanning using predefined pulsing / receiving aperture and type of ultrasonic wave provided through **swiveling of ultrasonic beam** with predefined incidence angle and automatic real time composing of **Top View CB-Scan** image with 100% raw data capturing ⇨ **Swiveling Angle Gain Compensation:** Unique Individual **Gain per Swiveling Angle / Gain per Focal Law Adjustment** compensating swiveling angle-steering caused varieties of: ● wedge losses ● effective size of emitting/receiving aperture **Scanning Technique # 2** ⇨ Electronically controlled scanning using predefined size of pulsing / receiving aperture, incidence and swiveling angle, and type of ultrasonic wave through **linear motion of ultrasonic beam** within entire probe and automatic real time composing of **Top View CB-Scan** image with 100% raw data capturing ⇨ Unique Individual **Gain per Incidence Point / Gain per Focal Law Adjustment** to compensate: ● inequality of PA probe elements Both electronically controlled scanning techniques are featured with: ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report	SWA 910803	Optional
10	Inspection SW Package for ISONIC 2010 - PA Modality: **EXPERT - Weld Inspection (planar and circumferential butt welds, nozzle welds, fillet welds)** **Cross-Sectional Scanning and Imaging Uniquely Representing Real Distribution Of Ultrasonic Beams In the Weld and Parent Material with True-To-Location Visualization of Defects and Weld Geometry:** ◆ **ABI-Scan (B-Scan or E-Scan as per ASME Case 2558)** ⇨ Linear electronically controlled scanning using predefined size of pulsing / receiving aperture, incidence angle, and type of ultrasonic wave within entire probe and automatic real time composing of **True-To-Geometry B-Scan** image with 100% raw data capturing ⇨ Unique Individual **Gain per Incidence Point / Gain per Focal Law Adjustment** to compensate: ● inequality of PA probe elements ● variety of wedge losses ⇨ Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator ◆ **Sector-Scan (S-Scan as per ASME Case 2557)**	SWA 910804	Optional

#	Item	Order Code (Part #)	Note
	⇨ Angular electronically controlled scanning using predefined pulsing / receiving aperture, and type of ultrasonic wave provided through steering of incidence angle and automatic real time composing of **True-To-Geometry Sector-Scan (S-Scan)** image with 100% raw data capturing ⇨ **Angle Gain Compensation:** Unique Individual **Gain per Incidence Angle / Gain per Focal Law Adjustment** compensating incidence angle-steering caused varieties of: ● transparency for probe - material boundary ● wedge losses ● effective size of emitting/receiving aperture Both modes of electronically controlled cross sectional scanning are featured with: ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report **Three-Dimensional Top - Side - End View Imaging of Weld and Heat Affected Zone Through Linear Scanning with PA Probes:** ◆ **ABI-Scan based C-Scan and 3D Data Presentation** ◆ **Sector-Scan based C-Scan and 3D Data Presentation** ⇨ Electromechanically encoded or time-based line scanning with PA probe ⇨ **3D presentation - Top, Side, End View** ⇨ Amplitude / Distance mode of C-Scan - Top View image ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Storing raw 3D data comprising all raw data B-Scans each accompanied with complete sequence of recorded raw data A-Scans into a file ⇨ Upload 3D data from a file ⇨ Comprehensive off-line analysis / postprocessing of 3D data featured with: ▶ **3D-Viewer** ▶ Off-line Recovery and Play-Back of A-Scans and Raw Data B-Scans ▶ Echo Dynamic Pattern Analysis; ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Gate Manipulation - Rebuild Top, Side, End views for various Gate Settings ▶ Off-line reconstruction of Top, Side, End views for various Gain / Reject level ▶ DAC normalization ▶ Slicing and Filtering Images ▶ Statistical Analysis ⇨ Generating Comprehensive Setup and Scanning Reporting		
11	Inspection SW Package for ISONIC 2010 - PA Modality: **EXPERT CU - Weld Inspection (longitudinal welds in tubes; nozzle, fillet, TKY, etc welds for curved components)** **Cross-Sectional Scanning and Imaging Uniquely Representing Real Distribution Of Ultrasonic Beams In the Weld and Parent Material with True-To-Location Visualization of Defects and Weld Geometry:** ◆ **Sector-Scan (S-Scan as per ASME Case 2557)** ⇨ Angular electronically controlled scanning using predefined pulsing / receiving aperture, and type of ultrasonic wave provided through steering of incidence angle and automatic real time composing of **True-To-Geometry Sector-Scan (S-Scan)** image with 100% raw data capturing ⇨ **Angle Gain Compensation:** Unique Individual **Gain per Incidence Angle / Gain per Focal Law Adjustment** compensating incidence angle-steering caused varieties of: ● transparency for probe - material boundary ● wedge losses ● effective size of emitting/receiving aperture ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator**	SWA 910805	Optional

#	Item	Order Code (Part #)	Note
	⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report **Three-Dimensional Top - Side - End View Imaging of Weld and Heat Affected Zone Through Linear Scanning with PA Probes:** ◆ **Sector-Scan based C-Scan and 3D Data Presentation** ⇨ Electromechanically encoded or time-based line scanning with PA probe ⇨ **3D presentation - Top, Side, End View** ⇨ Amplitude / Distance mode of C-Scan - Top View image ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Storing raw 3D data comprising all raw data B-Scans each accompanied with complete sequence of recorded raw data A-Scans into a file ⇨ Upload 3D data from a file ⇨ Comprehensive off-line analysis / postprocessing of 3D data featured with: ▶ **3D-Viewer** ▶ Off-line Recovery and Play-Back of A-Scans and Raw Data B-Scans ▶ Echo Dynamic Pattern Analysis; ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Gate Manipulation - Rebuild Top, Side, End views for various Gate Settings ▶ Off-line reconstruction of Top, Side, End views for various Gain / Reject level ▶ DAC normalization ▶ Slicing and Filtering Images ▶ Statistical Analysis ⇨ Generating Comprehensive Setup and Scanning Report		
12	Inspection SW Package for ISONIC 2010 - PA Modality: **VLFS – Vertical Line Focusing Scanning and Imaging (typical application: inspection of planar and circumferential ER welds, welded rails, etc)** **Cross-Sectional Scanning and Imaging Uniquely Representing Real Distribution Of Ultrasonic Beams In the Selected Region of Interest (ROI) with True-To-Location Visualization of Defects:** ◆ **ABI-Scan (B-Scan or E-Scan as per ASME Case 2558)** ⇨ Linear electronically controlled scanning using predefined size of pulsing / receiving aperture, incidence angle, and type of ultrasonic wave within entire probe and automatic real time composing of **True-To-Geometry B-Scan** image with 100% raw data capturing ⇨ Unique Individual **Gain per Incidence Point / Gain per Focal Law Adjustment** to compensate: ● inequality of PA probe elements ● variety of wedge losses ◆ **Sector-Scan (S-Scan as per ASME Case 2557)** ⇨ Angular electronically controlled scanning using predefined pulsing / receiving aperture, and type of ultrasonic wave provided through steering of incidence angle and automatic real time composing **True-To-Geometry Sector-Scan (S-Scan)** image with 100% raw data capturing ⇨ **Angle Gain Compensation:** Unique Individual **Gain per Incidence Angle / Gain per Focal Law Adjustment** compensating incidence angle-steering caused varieties of: ● transparency for probe - material boundary ● wedge losses ● effective size of emitting/receiving aperture Both modes of electronically controlled cross sectional scanning are featured with: ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including:	SWA 910806	Optional

#	Item	Order Code (Part #)	Note
	▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report **Three-Dimensional Top - Side - End View Imaging of Weld and Heat Affected Zone Through Linear Scanning with PA Probes:** ◆ **ABI-Scan based C-Scan and 3D Data Presentation** ◆ **Sector-Scan based C-Scan and 3D Data Presentation** ⇨ Electromechanically encoded or time-based line scanning with PA probe ⇨ **3D presentation - Top, Side, End View** ⇨ Amplitude / Distance mode of C-Scan - Top View image ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Storing raw 3D data comprising all raw data B-Scans each accompanied with complete sequence of recorded raw data A-Scans into a file ⇨ Upload 3D data from a file ⇨ Comprehensive off-line analysis / postprocessing of 3D data featured with: ▶ **3D-Viewer** ▶ Off-line Recovery and Play-Back of A-Scans and Raw Data B-Scans ▶ Echo Dynamic Pattern Analysis; ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Gate Manipulation - Rebuild Top, Side, End views for various Gate Settings ▶ Off-line reconstruction of Top, Side, End views for various Gain / Reject level ▶ DAC normalization ▶ Slicing and Filtering Images ▶ Statistical Analysis ⇨ Generating Comprehensive Setup and Scanning Report		
13	Inspection SW Package for ISONIC 2010 - PA Modality: **VLFS CU – Vertical Line Focusing Scanning and Imaging of Tubular Objects (typical application: inspection of longitudinal ERW in tubes and similar objects)** **Cross-Sectional Scanning and Imaging Uniquely Representing Real Distribution Of Ultrasonic Beams In the Selected Region of Interest (ROI) with True-To-Location Visualization of Defects:** ◆ **Sector-Scan (S-Scan as per ASME Case 2557)** ⇨ Angular electronically controlled scanning using predefined pulsing / receiving aperture, and type of ultrasonic wave provided through steering of incidence angle and automatic real time composing of **True-To-Geometry Sector-Scan (S-Scan)** image with 100% raw data capturing ⇨ **Angle Gain Compensation:** Unique Individual **Gain per Incidence Angle / Gain per Focal Law Adjustment** compensating incidence angle-steering caused varieties of: ● transparency for probe - material boundary ● wedge losses ● effective size of emitting/receiving aperture ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report **Three-Dimensional Top - Side - End View Imaging of Weld and Heat Affected Zone Through Linear Scanning with PA Probes:** ◆ **Sector-Scan based C-Scan and 3D Data Presentation** ⇨ Electromechanically encoded or time-based line scanning with PA probe	SWA 910807	Optional

#	Item	Order Code (Part #)	Note
	⇨ **3D presentation - Top, Side, End View** ⇨ Amplitude / Distance mode of C-Scan - Top View image ⇨ **Automatic coupling monitoring / inspection for laminations whilst using wedged linear array probes – optionally activated / deactivated by operator** ⇨ Storing raw 3D data comprising all raw data B-Scans each accompanied with complete sequence of recorded raw data A-Scans into a file ⇨ Upload 3D data from a file ⇨ Comprehensive off-line analysis / postprocessing of 3D data featured with: ▶ **3D-Viewer** ▶ Off-line Recovery and Play-Back of A-Scans and Raw Data B-Scans ▶ Echo Dynamic Pattern Analysis; ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Gate Manipulation - Rebuild Top, Side, End views for various Gate Settings ▶ Off-line reconstruction of Top, Side, End views for various Gain / Reject level ▶ DAC normalization ▶ Slicing and Filtering Images ▶ Statistical Analysis ⇨ Generating Comprehensive Setup and Scanning Report		
14	Inspection SW Utility for ISONIC 2010 - PA Modality: **Multi-Group – Implementation of Several (up to 3) Various Insonification Schemes Simultaneously with Use of Differently Configured Groups of Elements of Wedged Linear Array Probe** ◆ **Multi-Group Composer – Creating Insonification Scheme with Use of up to 3 (Three) Different Sector Scan and/or ABI Scan COVERAGE files created for the same probe in the following modes:** ⇨ ISONIC 2010 Multi-Functional Package (SWA 99C10200) or ISONIC 2009 UPA-Scope Multi-Functional Package (SWA 99C09200) – on case of use ≤ 32 elements linear arrays ⇨ ISONIC 2010 EXPERT Optional SW Package (SWA 910804) or ISONIC 2009 UPA-Scope EXPERT Optional SW Package (SWA 909804) – on case of use ≤ 32 elements linear arrays ⇨ ISONIC 2010 VLFS Optional SW Package (SWA 910806) or ISONIC 2009 UPA-Scope VLFS Optional SW Package (SWA 909806) – on case of use ≤ 32 elements linear arrays ⇨ ISONIC 2010 EXPERT CU Optional SW Package (SWA 910805) or ISONIC 2009 UPA-Scope EXPERT CU Optional SW Package (SWA 909805) – on case of use ≤ 32 elements linear arrays ⇨ ISONIC 2010 VLFS CU Optional SW Package (SWA 910807) or ISONIC 2009 UPA-Scope VLFS CU Optional SW Package (SWA 909807) – on case of use ≤ 32 elements linear arrays ◆ **Multi-Group Cross Sectional Inspection Implementation of Insonification According to the Scheme Created by Multi-Group Composer, for Each Group Implemented and for All of Them Together it is Provided:** ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report ◆ **Multi-Group Three-Dimensional Top - Side - End View Imaging Through Linear Scanning, for Each Group Implemented and for All of Them Together it is Provided:** ◆ **Sector Scan and/or ABI Scan based C-Scan and 3D Data Presentation** ⇨ Electromechanically encoded or time-based line scanning with PA probe ⇨ **3D presentation - Top, Side, End View** ⇨ Amplitude / Distance mode of C-Scan - Top View image ⇨ Storing raw 3D data comprising all raw data B-Scans each accompanied with complete sequence of recorded raw data A-Scans into a file ⇨ Upload 3D data from a file ⇨ Comprehensive off-line analysis / postprocessing of 3D data featured with: ▶ **3D-Viewer**	SWA 910810	

#	Item	Order Code (Part #)	Note
	▶ Off-line Recovery and Play-Back of A-Scans and Raw Data B-Scans ▶ Echo Dynamic Pattern Analysis; ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Gate Manipulation - Rebuild Top, Side, End views for various Gate Settings ▶ Off-line reconstruction of Top, Side, End views for various Gain / Reject level ▶ DAC normalization ▶ Slicing and Filtering Images ▶ Statistical Analysis ⇨ Generating Comprehensive Setup and Scanning Reporting		
15	Inspection SW Package for ISONIC 2010 - PA Modality: **RODScan – Inspection of solid and hollow shafts, axles, and the like – longitudinal wave sector scan insonification combined with circumferential scanning and complete cross section image reconstruction** **Cross-Sectional Scanning and Imaging Uniquely Representing Real Distribution Of Ultrasonic Beams In the Solid or Hollow Rods with True-to-Geometry Visualization of Defects and Rod Profile:** ◆ **Sector-Scan (S-Scan as per ASME Case 2557)** ⇨ Angular electronically controlled scanning using predefined pulsing / receiving aperture, and type of ultrasonic wave provided through steering of incidence angle and automatic real time composing of **True-To-Geometry Sector-Scan (S-Scan)** image with 100% raw data capturing ⇨ 2 types of Sector Scan strategy of the rod – fixed focal distance / fixed focal depth ⇨ **Angle Gain Compensation:** Unique Individual **Gain per Incidence Angle / Gain per Focal Law Adjustment** compensating incidence angle-steering caused varieties of: ● transparency for probe - material boundary ● wedge losses ● effective size of emitting/receiving aperture ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report ◆ **Unique Whole-Rod Cross Sectional View through Superimposing of Sector-Scan Images Obtained through Encoded / Time Based Circumferential Scanning with Linear Array Probe** ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report	SWA 910811	
16	Inspection SW Package for ISONIC 2010 - PA Modality: **RADIUS-Scan – Inspection of corner areas of various parts made of composites, metals, etc using linear array probes equipped with specially designed wedges contoured according to inner corner surface** **Cross-Sectional Scanning and Imaging Uniquely Representing Real Distribution Of Ultrasonic Beams In the Corner-Shaped Profile:**	SWA 910812	

#	Item	Order Code (Part #)	Note
	◆ **True-to-Geometry Corner B-Scan** ⇨ Combined angular / linear electronically controlled scanning using floating pulsing / receiving aperture providing guiding of ultrasonic beam along inner surface of cornered profile with 0-degree hitting at every excitation point and automatic real time composing of **True-To-Geometry Corner B-Scan** image with 100% raw data capturing ⇨ **Gain Per Shot Compensation:** Unique Individual **Gain per Incidence per focal law adjustment** compensating varieties of: ● wedge losses ● effective size of emitting/receiving aperture ● efficiency of excitation ⇨ Freeze / Unfreeze of live image ⇨ Live A-Scan for the selected beam of live / frozen image, smart signal evaluation using conventional gating of ultrasonic signals ⇨ Versatile user configurable color palette for defects imaging, DAC normalization, reject threshold, noise suppression, etc ⇨ Zoom In / Out ⇨ Storing raw data image along with complete sequence of recorded A-Scans into a file ⇨ Upload raw data image from file ⇨ Off-line image evaluation including: ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Play-back and evaluation of A-Scans sourcing the image ▶ Echo-dynamic pattern analysis ▶ Defects outlining and pattern recognition based on A-Scan sequence analysis ▶ Off-line reconstruction of the images for various Gain / Reject level ▶ DAC normalization ⇨ Generating Comprehensive Setup and Scanning Report **Three-Dimensional Top - Side - End View Imaging of Cornered Parts Through Linear Scanning with PA Probes:** ◆ **Corner B-Scan based C-Scan and 3D Data Presentation** ⇨ Electromechanically encoded or time-based line scanning with PA probe ⇨ **3D presentation - Top, Side, End View** ⇨ Amplitude / Distance mode of C-Scan - Top View image ⇨ Storing raw 3D data comprising all raw data B-Scans each accompanied with complete sequence of recorded raw data A-Scans into a file ⇨ Upload 3D data from a file ⇨ Comprehensive off-line analysis / postprocessing of 3D data featured with: ▶ **3D-Viewer** ▶ Off-line Recovery and Play-Back of A-Scans and Raw Data B-Scans ▶ Echo Dynamic Pattern Analysis; ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Gate Manipulation - Rebuild Top, Side, End views for various Gate Settings ▶ Off-line reconstruction of Top, Side, End views for various Gain / Reject level ▶ DAC normalization ▶ Slicing and Filtering Images ▶ Statistical Analysis ⇨ Generating Comprehensive Setup and Scanning Report		
17	Postprocessing SW Package for Office PC: **ISONIC PA PP –** ⇨ comprehensive postprocessing of inspection results files captured by **ISONIC 2009 UPA-Scope** and **ISONIC 2010** - PA Modality using Inspection SW Packages of any type ⇨ automatic creating of inspection reports	SWA909844	Delivered with every **ISONIC 2010** instrument
18	Postprocessing SW Package for Office PC: **ISONIC PA ABIScan Puzzle** ⇨ composing PUZZLE file comprising raw data from several ABIScan based top view scanning files providing large area coverage with/without overlap ⇨ comprehensive off-line analysis / postprocessing of 3D PUZZLE data featured with: ▶ **Top, Side, End Puzzle Composed Views of Large Area** ▶ **3D-Viewer** ▶ Off-line Recovery and Play-Back of A-Scans ▶ Echo Dynamic Pattern Analysis; ▶ Sizing of defects – coordinates and projection size - gate based and image based ▶ Gate Manipulation - Rebuild Top, Side, End views for various Gate Settings ▶ Off-line reconstruction of Top, Side, End views for various Gain / Reject level ▶ DAC normalization ▶ Slicing and Filtering Images ▶ Statistical Analysis ⇨ generating comprehensive Setup and Scanning Report	SWA 909845	Option
19	Postprocessing SW Package for Office PC: **IOFFICE - ISONIC Office** ⇨ comprehensive postprocessing of inspection results files captured by ISONIC 2001, ISONIC 2005, ISONIC 2006, ISONIC 2007, ISONIC 2008, ISONIC 2009 UPA-Scope, ISONIC 2010 instruments using conventional and TOFD probes and Inspection SW Packages of any type ⇨ generating comprehensive inspection reports in MS Word® format	SWA99C0203	Optional

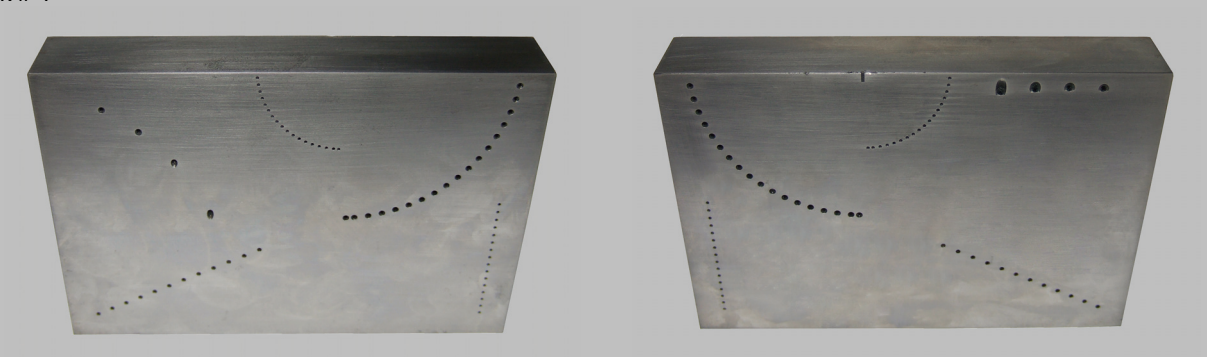
#	Item	Order Code (Part #)	Note
20	Dual Channel TOFD preamplifier package including: ⇨ Dual Channel TOFD preamplifier ⇨ Set of 2 low noise coaxial cables (10 meters length each) for connection to the signal input of ISONIC instrument	SA 80442	Optional Improves long cable connection to conventional and TOFD ultrasonic probes
21	ISONIC Alarmer - standard firmware configuration and hardware platform including: ⇨ Internal Speaker functioning according to alarm logic settings of conventional channel(s) in ISONIC 2005, 2006, 2007, 2008, 2009 UPA-Scope, 2010 instruments ⇨ Speaker Volume Control Wheel ⇨ Headphone Connector ⇨ 25-pin programmable Input / Output interface (blank) ⇨ USB port and cable for connecting to the instrument	SE 554780987	Optional
22	Set of test blocks for phased array inspection; material - low carbon steel	S 8001 PA	See photos below
23	Set of test blocks for phased array inspection; material - stainless steel ASTM 304	S 8001ASTM304 PA	See photos below
24	Set of test blocks for phased array inspection; material - stainless steel ASTM 316	S 8001ASTM316 PA	See photos below
25	Ultrasonic PA, conventional, and TOFD probes, fixtures, scanners, cables and other accessories depending on the inspection tasks to be resolved		Optional

ⓘ

Information about typical PA probes, wedges, delay lines is available in the chapters 5.3.1, 5.4, 5.5.2.5 of this Operating Manual

S 8001 PA, S 8001ASTM304 PA, and S 8001ASTM316 PA sets consist of two blocks each made of low carbon steel, stainless steel ASTM 304, and stainless steel ASTM 316 correspondingly

Block # 1



Block # 2

4. Operating ISONIC 2010

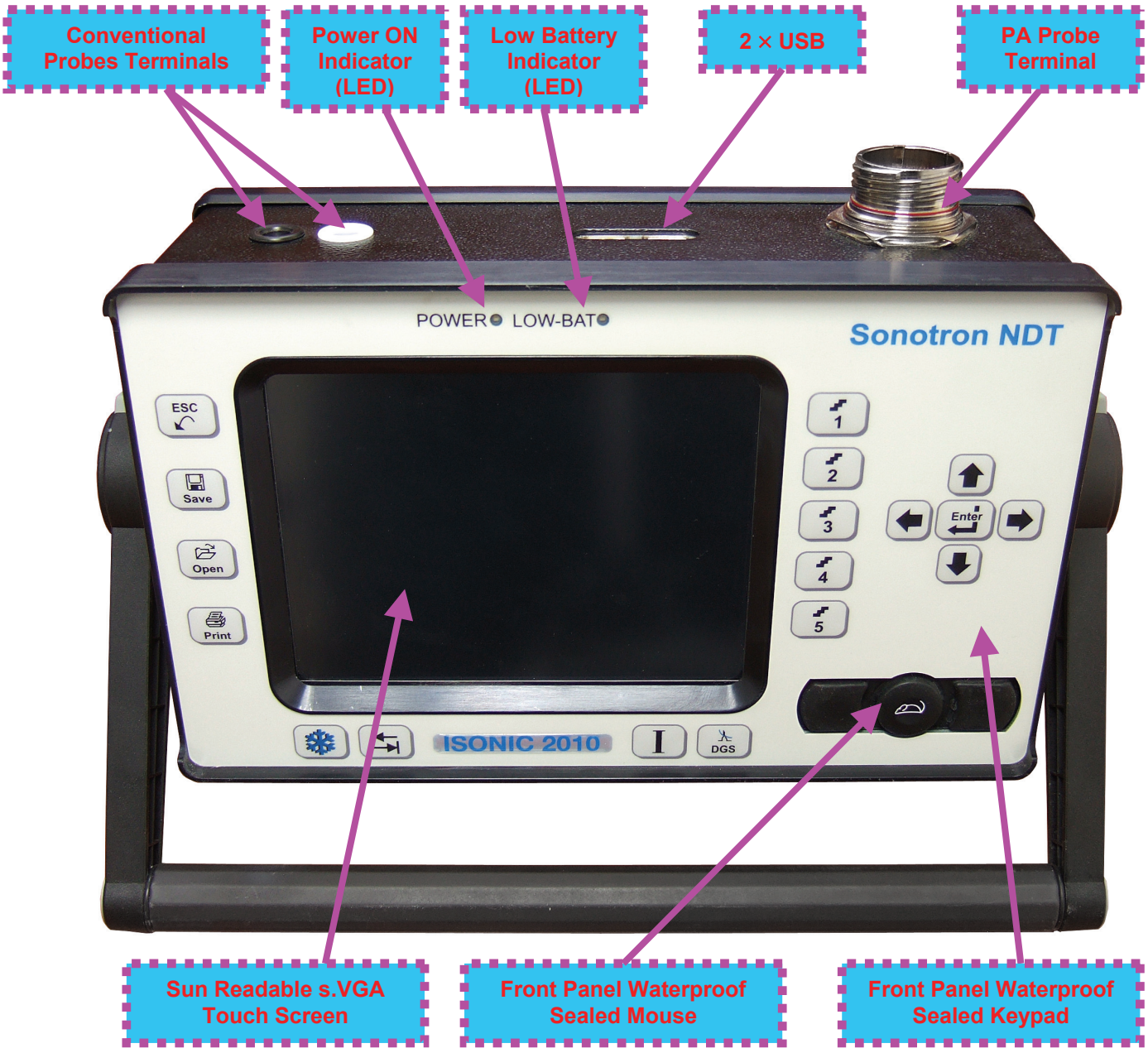
Please read the following information before you use **ISONIC 2010**. It is essential to read and understand the following information so that no errors occur during operation, which could lead damaging of the unit or misinterpretation of inspection results

4.1. Preconditions for ultrasonic testing with ISONIC 2010

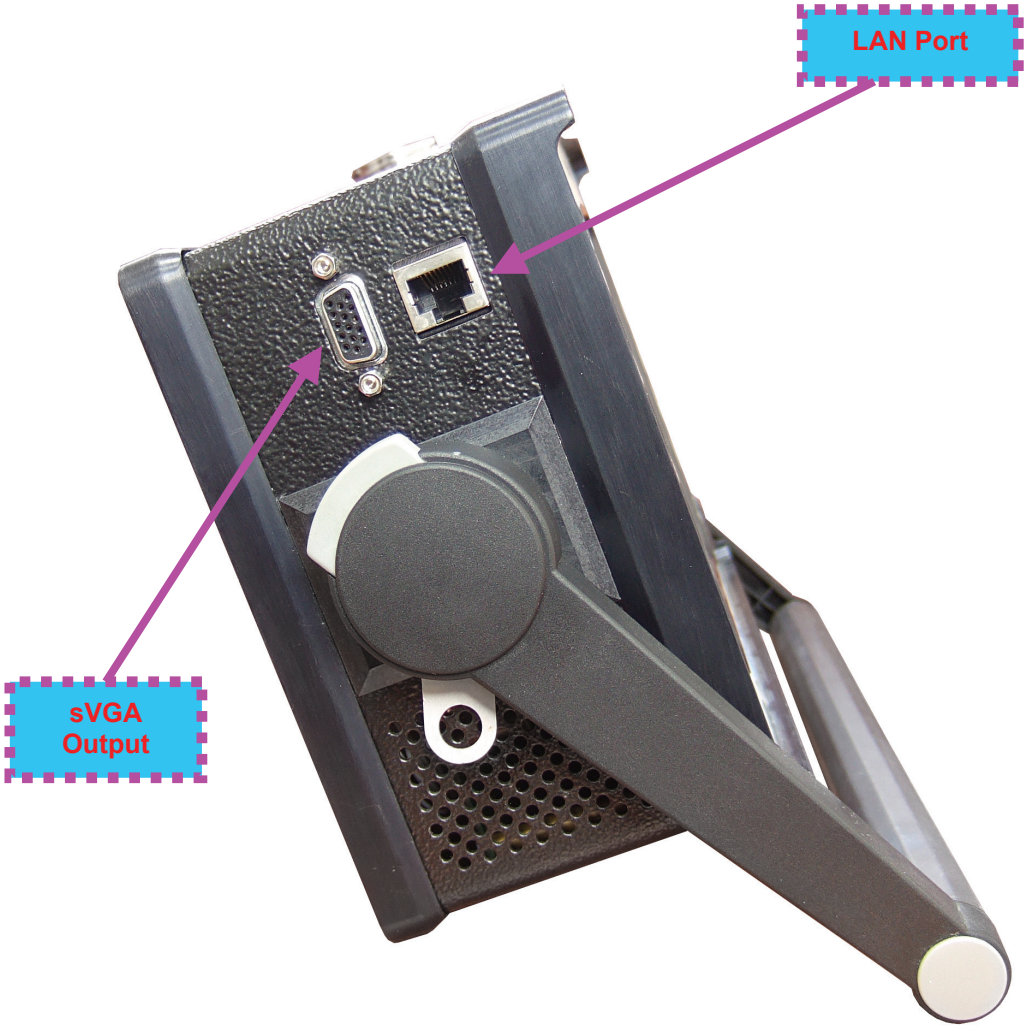
Operator of **ISONIC 2010** must be certified as at least *Level 2 Ultrasonic Examiner* additionally having the adequate knowledge of

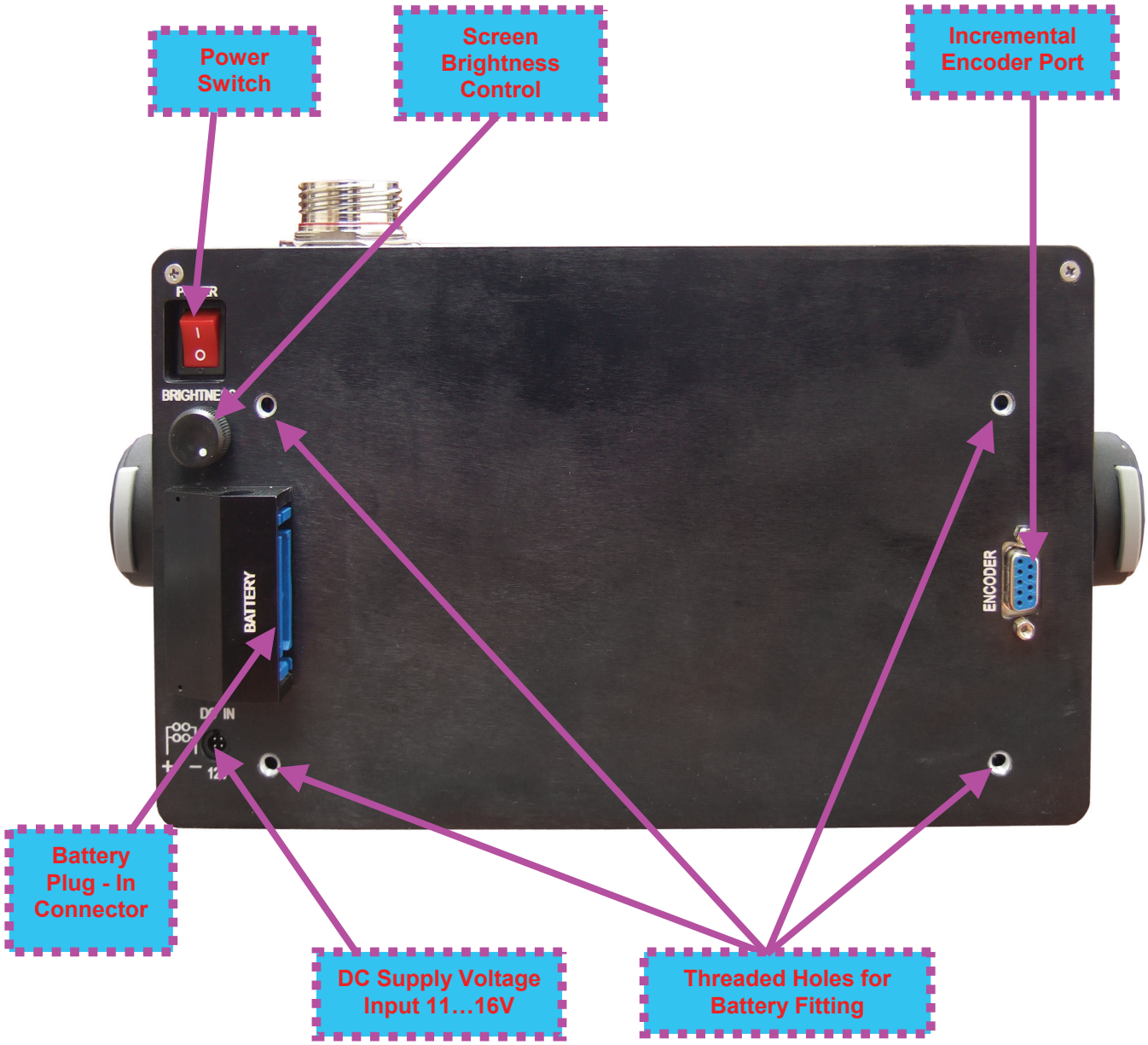
- operating digital ultrasonic flaw detector
- basics of computer operating in the **Windows™** environment including turning computer on/off, keyboard, touch screen and mouse, starting programs, saving and opening files

4.2. ISONIC 2010 Controls and Terminals



Probe Terminal	Pulser Mode: Dual	Pulser Mode: Single
Black	Receiver Input	Firing Output / Receiver Input
White	Firing Output	Not Used


LAN Port
sVGA
Output


Power Switch
Screen Brightness Control
Incremental Encoder Port
BRIGHTNESS
BATTERY
ENCODER
Battery Plug - In Connector
DC Supply Voltage Input 11…16V
Threaded Holes for Battery Fitting

4.3. Turning On / Off

ISONIC 2010 may be powered from:

- 100…250 VAC through external AC/DC converter
- External 11…16V DC source (12V – typical)
- Rechargeable battery (optionally)

AC Power Supply

- Ensure that power switch is in **O** position before connecting power cords
- Connect one end of AC power cord to AC/DC converter and plug another end into AC mains
- Connect DC power cord with suppression filter outgoing from AC/DC converter to DC Supply Voltage Input of **ISONIC 2010**

External DC Power Supply

- Ensure DC mains do supply voltage between 11 V and 16 V
- Ensure that power switch is in **O** position before connecting power cord
- Connect one end of DC power cord with suppression filter to DC Supply Voltage Input of **ISONIC 2010** and plug another end into DC mains

Battery

- Ensure that power switch is in **O** position
- Plug in battery and fix it using 4 screws

Power-Up and Turn Off

To Power-Up **ISONIC 2010** set power switch into **I** position. An automatic system test program will then be executed; during this test various texts and information appear followed by the screen as below while booting up

Wait until **ISONIC 2010 Start Screen** becomes active automatically upon boot up is completed

Click on 1 ISONIC 2010 or press 1 (F1) to run PA modality – refer to Chapter 5 of this Operating Manual

Click on 2 ISONIC 2005 or press 2 (F2) to operate instruments with conventional and TOFD probes – refer to Chapter 6 of this Operating Manual

Click on 3 Exit To Windows or press 3 (F3) to proceed with Windows XP Embedded settings of **ISONIC 2010** instrument, such as for example setting up drivers for external devices (printers, USB memory card, and the like), connecting to LAN, quasi-disk management, etc – refer to paragraph 8.4 of this Operating Manual

To turn **ISONIC 2010** off click on 4 Shut Down or press 4 (F4) then wait until the screen as below appears:

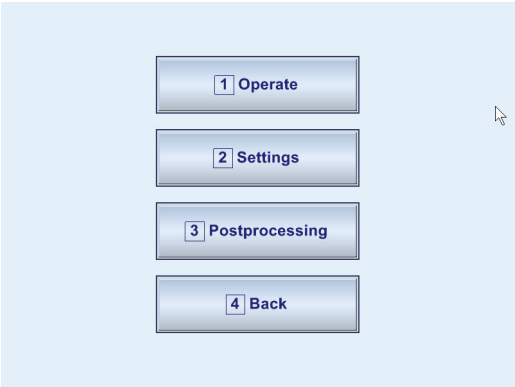
Set power switch into **O** position upon

After turning **ISONIC 2010 OFF** wait at least 10…30 seconds before switching it **ON** again

5. PA Modality

5.1. PA Modality Start Menu

The screen as below appears on selecting to run **ISONIC 2010** in PA modality



Click on 

or press 

(**F1**) to start operation

Click on 

or press 

(**F2**) to proceed with instrument settings

Click on 

or press 

(**F3**) to open instrument's explorer allowing uploading of all setup and inspection files captured while running PA modality

Click on 

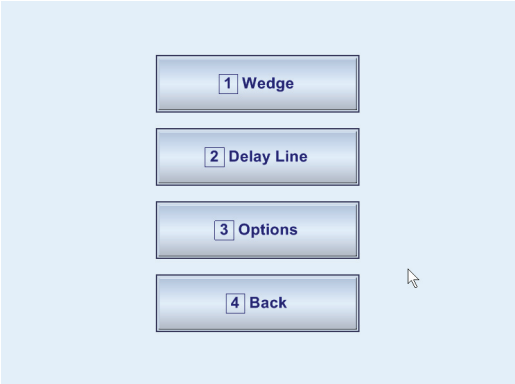
or press 

(**F4**) or 

(**Esc**) to return to **ISONIC 2010 Start Screen**

5.2. Standard and Optional Modes Of Operation

The following screen appears upon clicking on [1 Operate] in the PA modality start menu as per paragraph 5.1 of this Operating Manual):



Click on [1 Wedge] or press [1] (**F1**) to run PA modality with use of linear array probes mounted onto wedges in standard modes featuring each instrument

Click on [2 Delay Line] or press [2] (**F2**) to run PA modality with use of linear array probes mounted onto straight delay lines or applied directly to the object under test in standard modes featuring each instrument

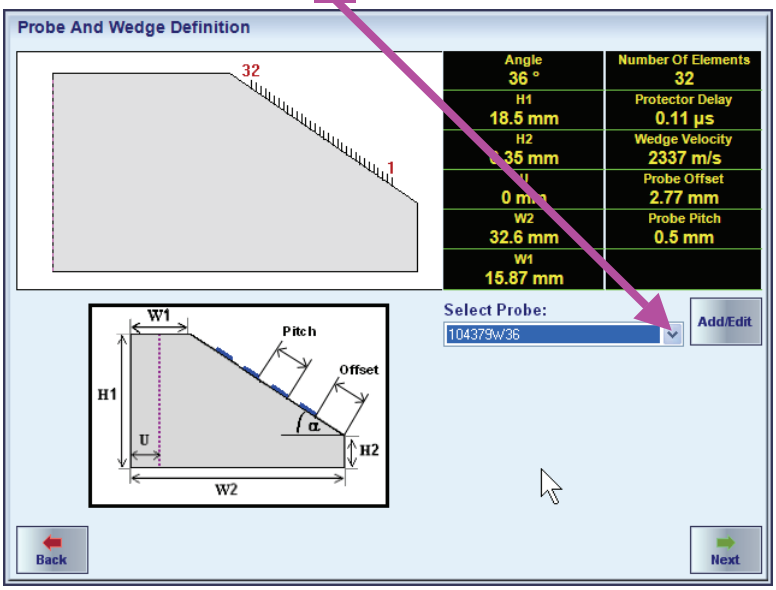
Click on [3 Options] or press [3] (**F3**) to run PA modality with use of various PA probes (linear and matrix arrays) in combination with wedges or delay lines in accordance with optional modes, which may vary from instrument to instrument

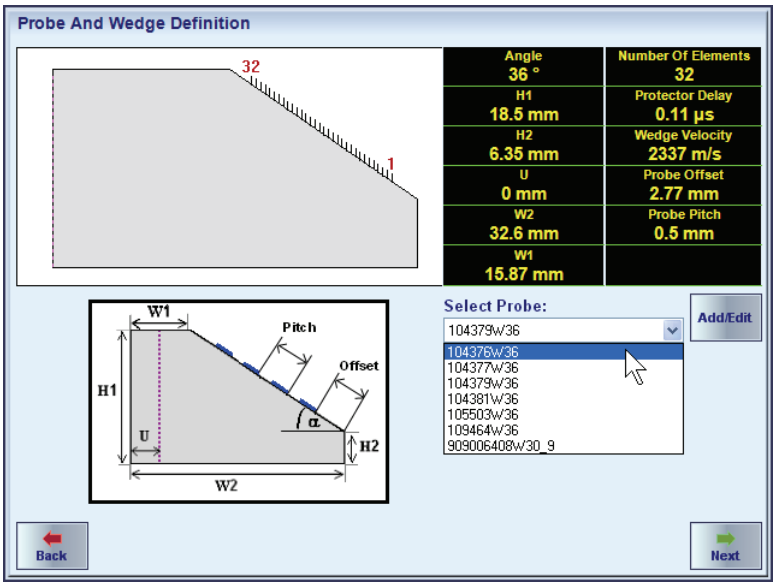
Click on [4 Back] or press [4] (**F4**) or [ESC] (**Esc**) to return to PA modality start menu

5.3. Wedged Linear Array Probes – Standard Modes of Operation

5.3.1. Wedged Linear Array Probes Database

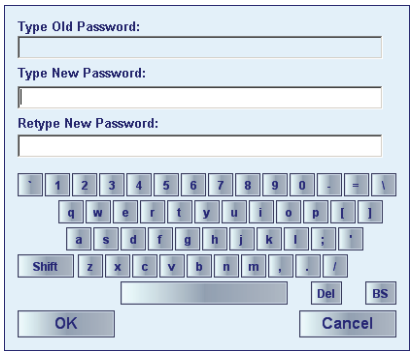
It is necessary to define new wedged linear array probe or select an existing one in the instrument's database for further operation. To proceed click on. On completion click on Next or press I





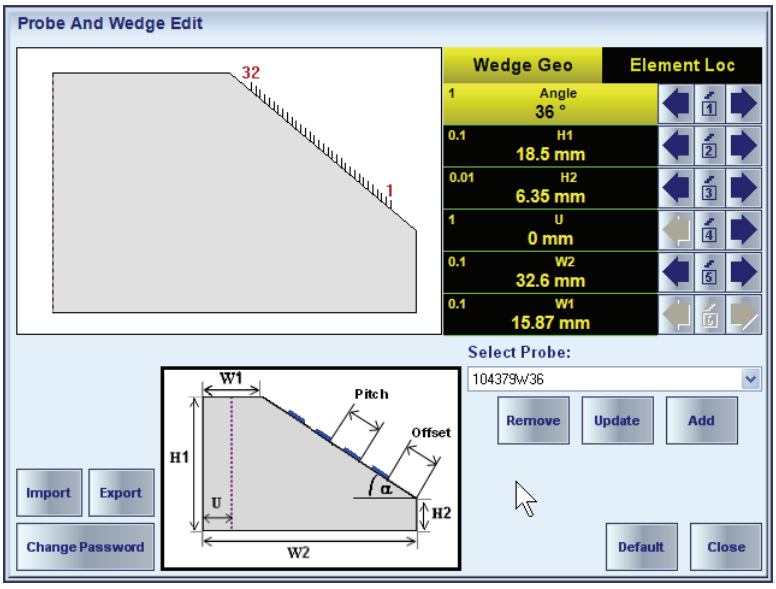
To return to the Modes of Operation Menu for PA modality click on Back or press ESC (Esc)

To enter new probe into the database of modifying data about existing mode click on Add/Edit. This operation is password protected - for the first time new password to be entered by the supervisor so the contents of the database will not be affected unexpectedly in the future

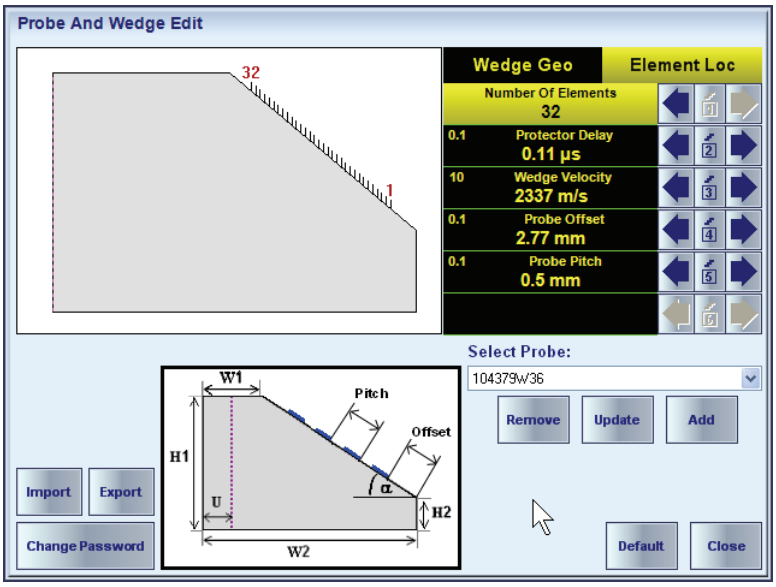


For keying in password it may be used either top panel or virtual keyboard generated on the instrument's screen

There are 2 groups of parameters to be defined for each probe / wedge, namely **Wedge Geo**metry



and **Element Loc**ation, to select a group for keying in / modifying click on it's name



For most of the parameters their meaning is obviously clear from the sketch indicated on the instrument's screen; among them there are just two parameters requiring more explanation:

- α – is designation of **Angle** (Wedge Angle)
- **U** – is part of the wedge that may not be used for forming ultrasonic field in the material, for example protective metallic shield on the front surface of the wedge

To modify / key in parameter value refer to paragraph 5.3.2 of this Operating Manual

Other controls:

- Export – export probes database from instrument into a file
- Import – import of probes database into instrument from a file
- Change Password – managing passwords for authorized access to database entries

- Remove – remove probe data from the database
- Default – call up the factory default to start with for newly entered probe data
- Add – add new probe's data to database (new name to be keyed in first upon clicking on that button)
- Update – confirming modified data for the probe existing in the database (probe name to be confirmed)

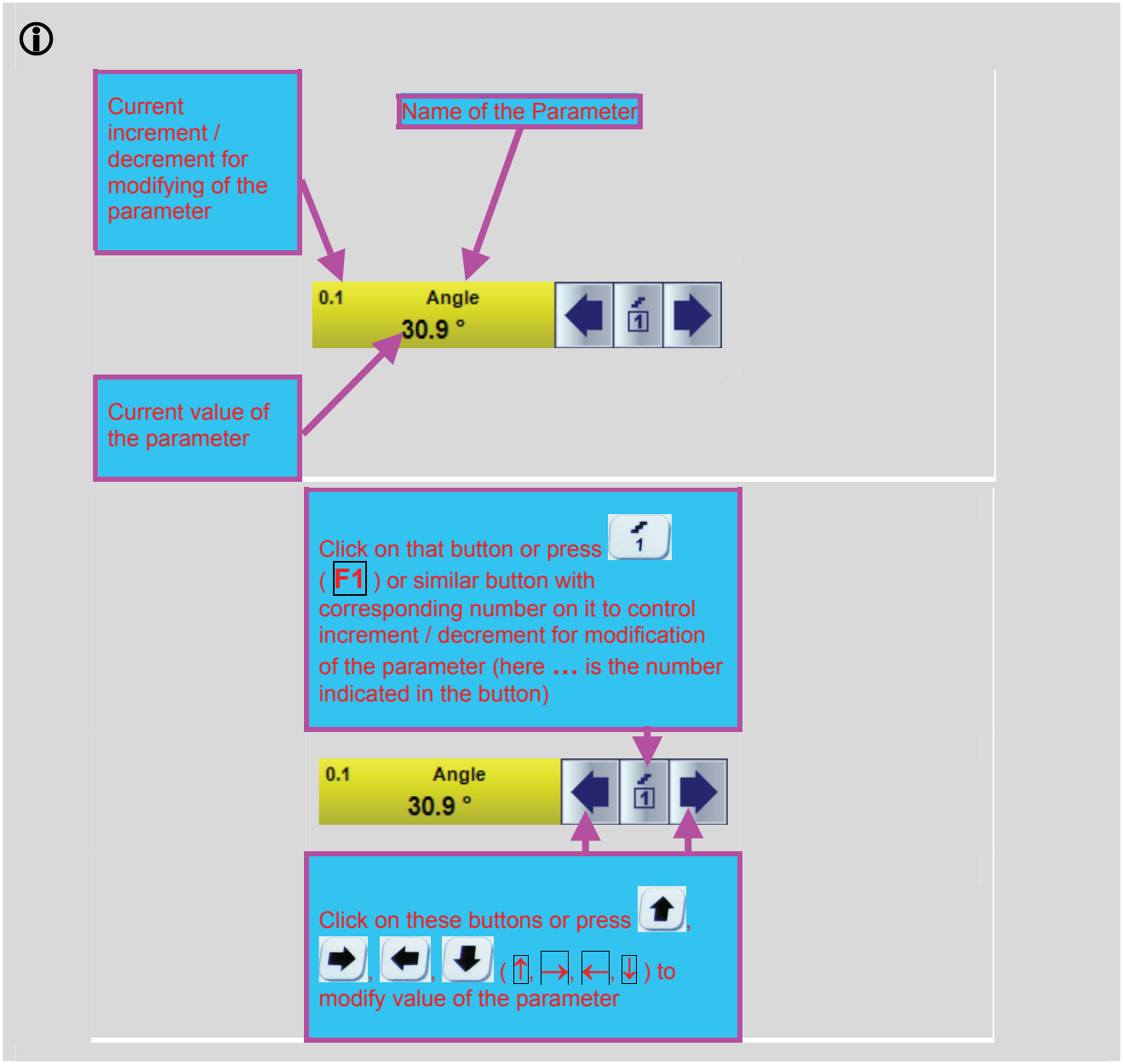
To return to previous **Probe and Wedge Definition** screen click on Close or press ESC (**Esc**)

Typical linear array probes and corresponding wedges are listed below

#	*Item*	*Order Code (Part ##)*	*Note*
1	**PA-2M8E1P** - LINEAR ARRAY Frequency: **2 MHz** Pitch Size: **1 mm** Number of Elements: **8** Elevation: **9 mm**	S 4922104376	Mark on the probe 104376
2	**PA-4M16E0.5P** - LINEAR ARRAY Frequency: **4 MHz** Pitch Size: **0.5 mm** Number of Elements: **16** Elevation: **9 mm**	S 4922104377	Mark on the probe 104377
3	**VKPA-8/16** - 36° wedge (55° central angle for shear wave in low carbon steel) for S 4922104376 and S 4922104377 probes	S 4922104378	Suitable for flat surfaces and curved surfaces with OD ≥ 1000 mm Linear array probes equipped with that wedge are defined in the instrument database as ☐ 104378W36 ☐ 104377W36
4	**VKPA-8/16 CU XXX** - 36° wedge (55° central angle for shear wave in low carbon steel) - axially contoured for XXX mm OD /// for S 4922104376 and S 4922104377 probes	S 4922104378 CU XXX	Suitable for OD < 1000 mm Linear array probes equipped with that wedge are defined in the instrument database as ☐ 104378W36CUxxx ☐ 104377W36 CUxxx whereas xxx is OD expressed in mm
5	**PA-5M32E0.5P** - LINEAR ARRAY Frequency: **5 MHz** Pitch Size: **0.5 mm** Number of Elements: **32** Width (Elevation): **10 mm**	S 4922104379	Mark on the probe 104379
6	**PA-5M16E1P** - LINEAR ARRAY Frequency: **5 MHz** Pitch Size: **1 mm** Number of Elements: **16** Elevation: **10 mm**	S4922105503	Mark on the probe 105503
7	**PA-7.5M32E0.5P** - LINEAR ARRAY Frequency: **7.5 MHz** Pitch Size: **0.5 mm** Number of Elements: **32** Elevation: **10 mm**	S 4944109464	Mark on the probe 109464
8	**VKPA-32** - 36° wedge (55° central angle for shear wave in low carbon steel) for S 4922104379, S4922105503, and S 4944109464 probes	S 4922104380	Suitable for flat surfaces and curved surfaces with OD ≥ 1000 mm Linear array probes equipped with that wedge are defined in the instrument database as ☐ 104379W36 ☐ 105503W36 ☐ 109464W36
9	**VKPA-32 CU XXX** - 36° wedge (55° central angle for shear wave in low carbon steel) – axially contoured for XXX mm OD /// for S 4922104379, S4922105503, and S 4944109464 probes	S 4922104380 CU XXX	Suitable for OD < 1000 mm Linear array probes equipped with that wedge are defined in the instrument database as ☐ 104379W36CUxxx ☐ 105503W36CUxxx ☐ 109464W36CUxxx whereas xxx is OD expressed in mm

#	*Item*	*Order Code (Part ##)*	*Note*
10	**PA-2.25M16E1P** - LINEAR ARRAY Frequency: **2.25 MHz** Pitch Size: **1 mm** Number of Elements: **16** Elevation: **13 mm**	S 4922105504	Mark on the probe 105504
11	**VKPA-16/1** - 36° wedge (55° central angle for shear wave in low carbon steel) for S 4922105504 probe	S 4922104679	Suitable for flat surfaces and curved surfaces with OD ≥ 1000 mm Linear array probe equipped with that wedge are defined in the instrument database as ☐ 105504W36
12	**VKPA-16/1 CU XXX** - 36° wedge (55° central angle for shear wave in low carbon steel) – axially contoured for XXX mm OD /// for S 4922105504 probe	S 4922104679 CU XXX	Suitable for OD < 1000 mm Linear array probe equipped with that wedge are defined in the instrument database as ☐ 105504W36CUxxx whereas xxx is OD expressed in mm
13	**PA-2.25M16E1.5P** - LINEAR ARRAY Frequency: **2.25 MHz** Pitch Size: **1.5 mm** Number of Elements: **16** Elevation: **19 mm**	S 4922105505	Mark on the probe 105505
14	**VKPA-16/1.5** - 36° wedge (55° central angle for shear wave in low carbon steel) for S 4922105505 probe	S 4922104680	Suitable for flat surfaces and curved surfaces with OD ≥ 1000 mm Linear array probe equipped with that wedge are defined in the instrument database as ☐ 105505W36
15	**VKPA-16/1.5 CU XXX** - 36° wedge (55° central angle for shear wave in low carbon steel) – axially contoured for XXX mm OD /// for S 4922105505 probe	S 4922104680 CU XXX	Suitable for OD < 1000 mm Linear array probe equipped with that wedge are defined in the instrument database as ☐ 105505W36CUxxx whereas xxx is OD expressed in mm
16	**PA-1.5M16E1P** - LINEAR ARRAY Frequency: **1.5 MHz** Pitch Size: **1 mm** Number of Elements: **16** Elevation: **12 mm**	S 4922107553	Mark on the probe 107553
17	**VPKA-38-16-1-21** - 38° wedge (59° central angle for shear wave in low carbon steel) for S 4922107553 probe	S 4944262021	Suitable for flat surfaces and curved surfaces with OD ≥ 1000 mm Linear array probe equipped with that wedge are defined in the instrument database as ☐ 107553W39-21
18	**VPKA-38-16-1-12** - 38° wedge (59° central angle for shear wave in low carbon steel) for S 4922107553 probe	S 4944262012	Suitable for flat surfaces and curved surfaces with OD ≥ 1000 mm Linear array probe equipped with that wedge are defined in the instrument database as ☐ 107553W39-12
19	**VPKA-38-16-1-21 CU XXX** - 38° wedge (59° central angle for shear wave in low carbon steel) – axially contoured for XXX mm OD /// for S 4922107553 probe	S 4944262021 CU XXX	Suitable for OD < 1000 mm Linear array probe equipped with that wedge are defined in the instrument database as ☐ 107553W39-21CUxxx whereas xxx is OD expressed in mm
20	**VPKA-38-16-1-12 CU XXX** - 38° wedge (59° central angle for shear wave in low carbon steel) – axially contoured for XXX mm OD /// for S 4922107553 probe	S 4944262012 CU XXX	Suitable for OD < 1000 mm Linear array probe equipped with that wedge are defined in the instrument database as ☐ 107553W39-12CUxxx whereas xxx is OD expressed in mm

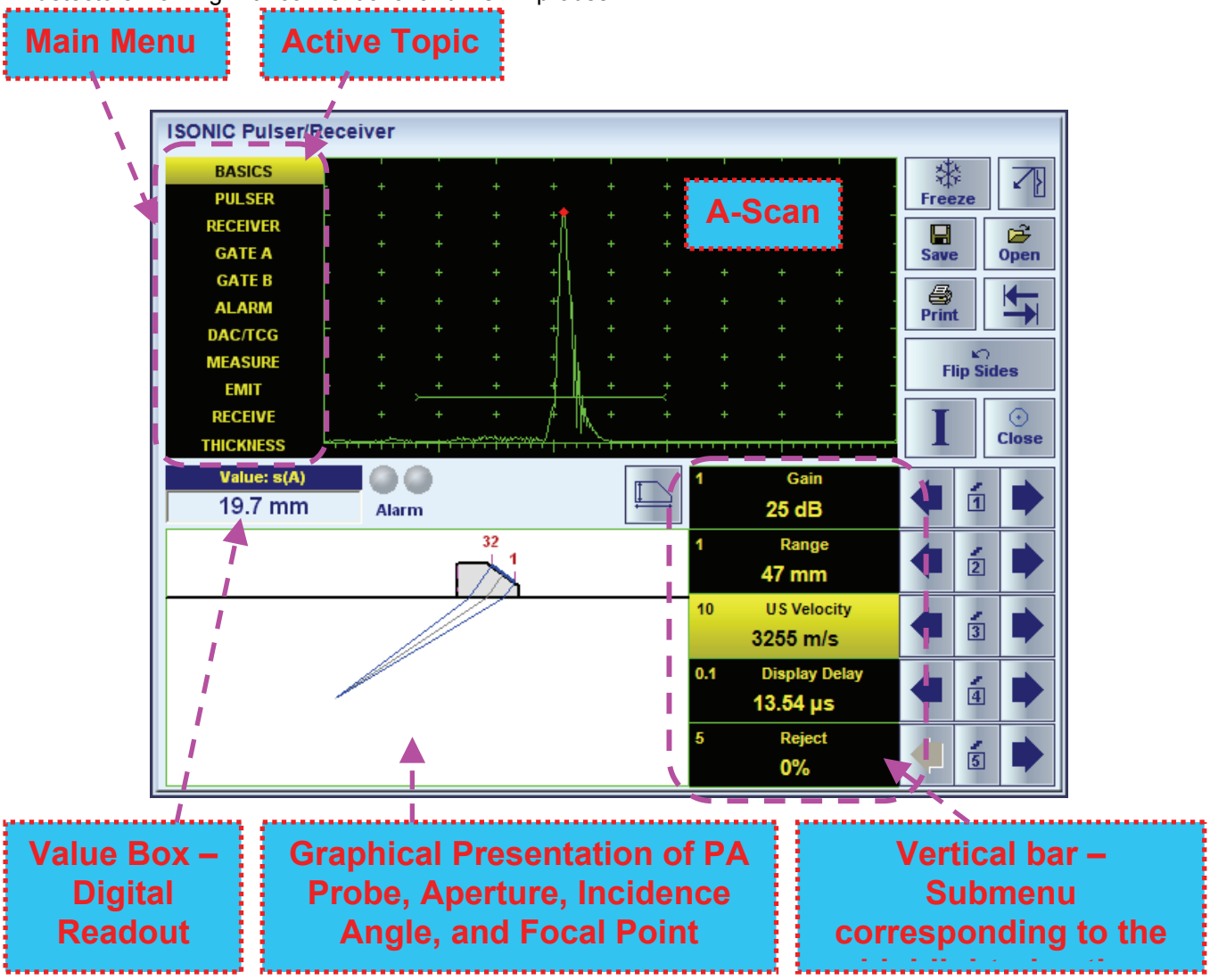
5.3.2. General Rule for Keying In / Modifying Parameter



5.3.3. ISONIC PA Pulser Receiver – Wedged Linear Array Probes

5.3.3.1. Operating Surface

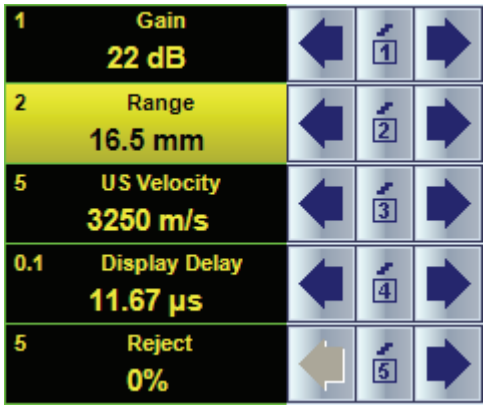
ISONIC 2010 comprises 32 identical pulser receiver channels, which may be used in any combination to form ultrasonic beams in the material and receive echoes with use of PA probes. Manual control is implemented through main operating SW, which is similar to the operating surface of Sonontron NDT's flaw detectors working with conventional and TOFD probes



The **Main Menu** consists of eleven topics; each topic is associated with corresponding **submenu** appearing as vertical bar showing names for five parameters or modes of operation, their current settings and current value of increment/decrement for a parameter. The active topic is highlighted. To select a topic click on its name or on  or press 

To modify parameter or mode within the active topic proceed according to paragraph 5.3.2 of this Operating Manual

5.3.3.2. Sub Menu BASICS



All settings controllable through **BASICS** sub menu are typical for conventional ultrasonic flaw detector and have the same meaning for the PA modality. To modify the desired setting proceed according to paragraph 5.3.2 of this Operating Manual. Also please refer to the below notes

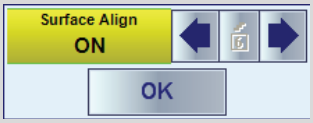
Gain and Range
Modifying of **Gain** and **Range** settings is also possible through a number of other submenus

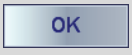
US Velocity
Like in regular ultrasonic flaw detectors (conventional modality) proper **US Velocity** setting is important for correct:

- A-Scan time base setting
- Automatic measurements of reflector coordinates

Whilst implementing PA modality proper **US Velocity** setting is additionally important for correct forming of focal laws for the emitting and receiving signals. Hence **US Velocity** to be keyed in precisely for the desired type of wave to be generated in the material and for the expectedly received signals

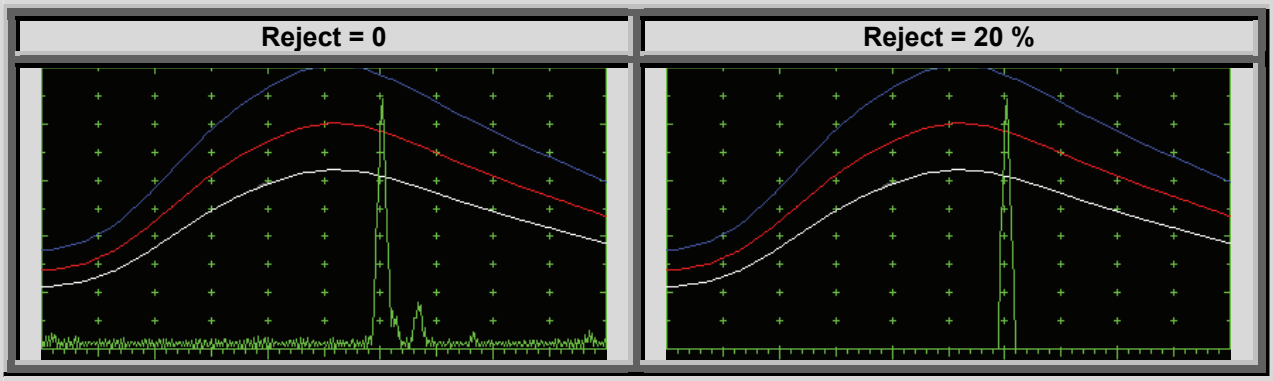
Display Delay
Display Delay may be controlled manually as in the regular ultrasonic flaw detector. However **Probe Delay** of PA probe is depending on plenty of factors such as emitting and receiving aperture and focal law to be implemented – refer to paragraphs 5.3.3.9, 5.3.3.10, and 5.3.3.11 of this Operating Manual. And for practical use very often it is important to equalize **Display Delay** and **Probe Delay** so start point of the A-Scan will correspond to the material surface. To activate / deactivate automatic performing of such equalizing (**Surface Align**) click on  :



then click on  or  or press ↑, →, ←, ↓ then click on  or press **Enter** or **Esc**. Automatic **Surface Align** will be deactivated automatically upon performing manual modifying of **Display Delay**

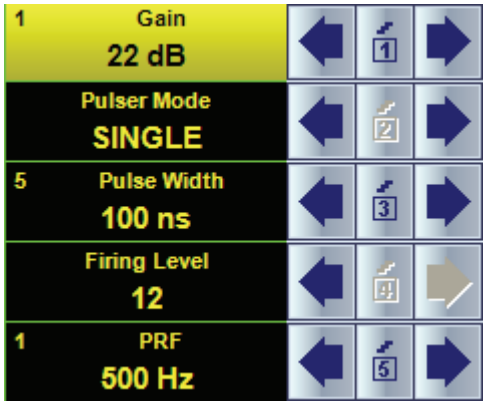
Reject

- Signals below **Reject** level (small signals) are suppressed
- Signals exceeding **Reject** level (large signals) are presented on the A-Scan without affecting their original height
- Part of large signal wave form below **Reject** level is suppressed



- **Reject** level may be applied to rectified signals only (Display Modes **Full**, **NegHalf** and **PosHalf** - refer to paragraph 5.3.3.4 of this Operating Manual)
- **Reject** setup is also possible through a number of other submenus following the same rules as above

5.3.3.3. Sub Menu PULSER



All settings controllable through **PULSER** sub menu are typical for conventional ultrasonic flaw detector and have the same meaning for the PA modality. To modify the desired setting proceed according to paragraph 5.3.2 of this Operating Manual. Also please refer to the below notes

ⓘ

Pulser Modes

There are two Pulser Modes available:

- **SINGLE** – for that mode emitting and receiving aperture within entire PA probe are fully matching; focal point, incidence angle, and type of wave for the receiving and emitting aperture are identical and controlled synchronously
- **DUAL** – for that mode emitting and receiving aperture within entire PA probe may be either fully matching or fully mismatching or partially matching; focal point, incidence angle, and type of wave are controlled separately

Refer to paragraphs 5.3.3.4 of this Operating Manual

Pulse Width

- **Pulse Width** (Duration of Half Wave of Bipolar Square Wave Initial Pulse) is tunable between 50 ns to 600 ns in 5 ns steps
- Durations of positive and negative half wave of the initial pulse are varying synchronously
- Attempt to decrease **Pulse Width** below 50 ns switches initial pulse OFF and channel may be used then as receiver only

Firing Level

There are 12 grades (1 through 12) for setting **Firing Level –** amplitude of initial pulse is controlled from 100 V peak to peak (**Firing Level = 1**) to 300 V peak to peak (**Firing Level = 12**)

PRF

PRF is indicated for single pulsing / receiving cycle (single focal law)

5.3.3.4. Sub Menus EMIT, RECEIVE, and THICKNESS

5.3.3.4.1. Definitions

Emitting **Aperture** – quantity of elements of linear array probe involved into emitting of ultrasonic wave

Receiving **Aperture** – quantity of elements of linear array probe involved into receiving of ultrasonic signals

Start – number of the first element of the emitting / receiving aperture

Focal Distance – material travel distance between incidence point and focal point

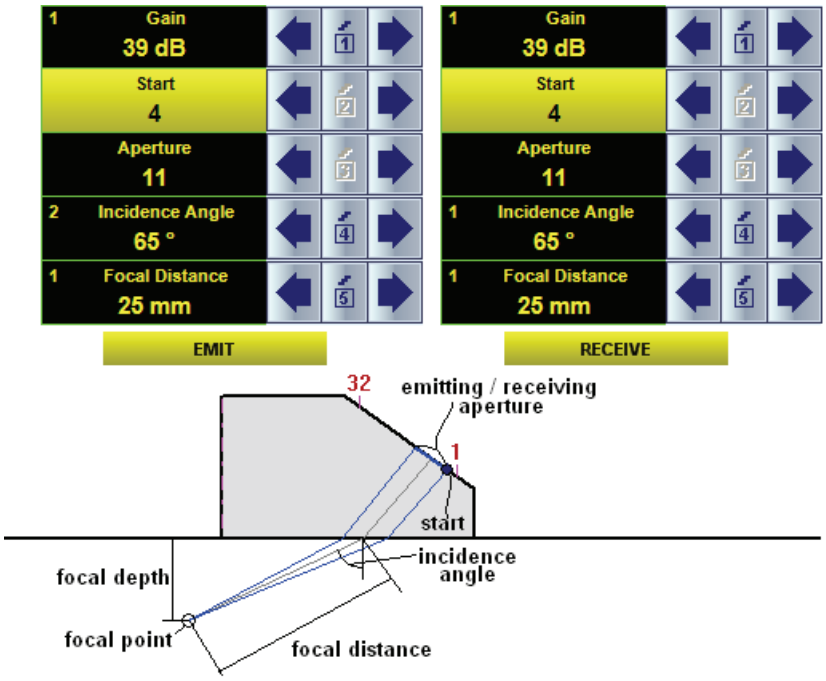
Focal Depth – depth of the focal point measured relatively contact surface of the material

Ultrasonic wave in the material is formed through superimposing of waves generated by all elements of the emitting aperture. The incidence angle and focal distance (depth) for the emitted ultrasonic wave are controlled electronically through phasing of initial pulses generated by the instrument on the elements of emitting aperture

Every element of the receiving aperture receives ultrasonic pulses from the material independently on others and converts them into electrical signals. Electrical signals from all elements of the receiving aperture are gained and digitized independently on each other then superimposed mathematically with use of digital phasing providing control of incidence angle and focal distance (depth) for the superimposed signal

5.3.3.4.2. Pulser Mode = SINGLE – Full Matching of Emitting and Receiving Aperture

For **Pulser Mode = SINGLE** emitting and receiving aperture within entire PA probe are fully matching; focal point, incidence angle, and type of wave for the receiving and emitting aperture are identical and controlled synchronously

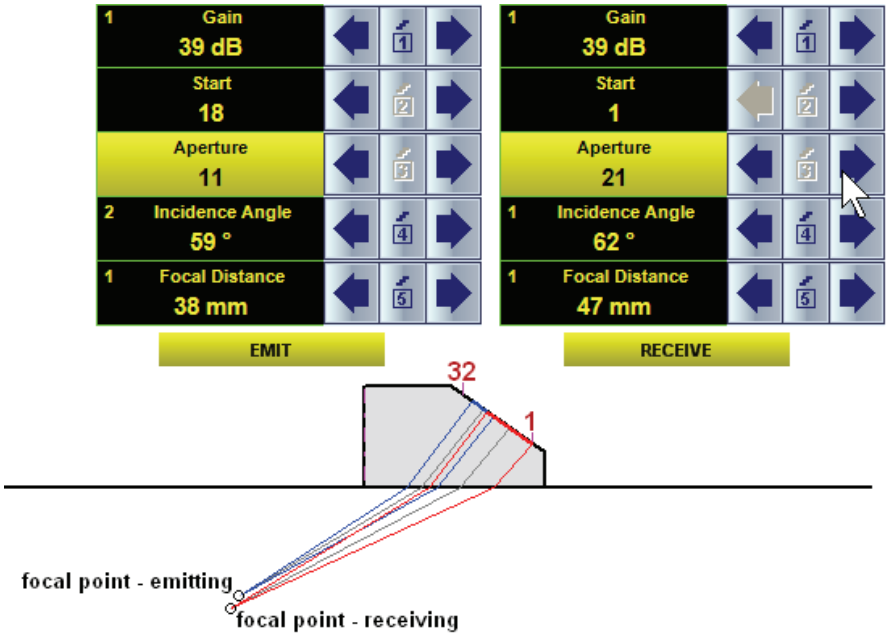


5.3.3.4.3. Pulser Mode = DUAL – Partial Matching of Emitting and Receiving Aperture

For **Pulser Mode = DUAL** emitting and receiving aperture within entire PA probe may be:

- fully matching
- fully mismatching
- partially matching

For all above the focal point, incidence angle, and type of wave are controlled separately separately from each other for the emitting and receiving aperture

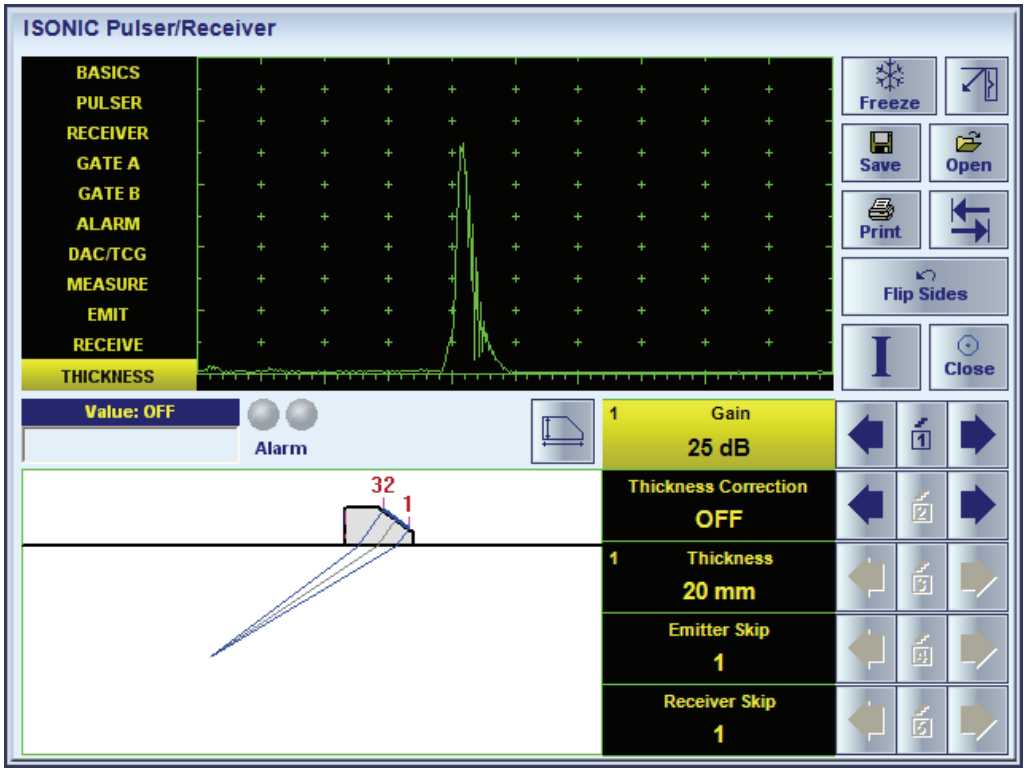


5.3.3.4.4. Material Thickness

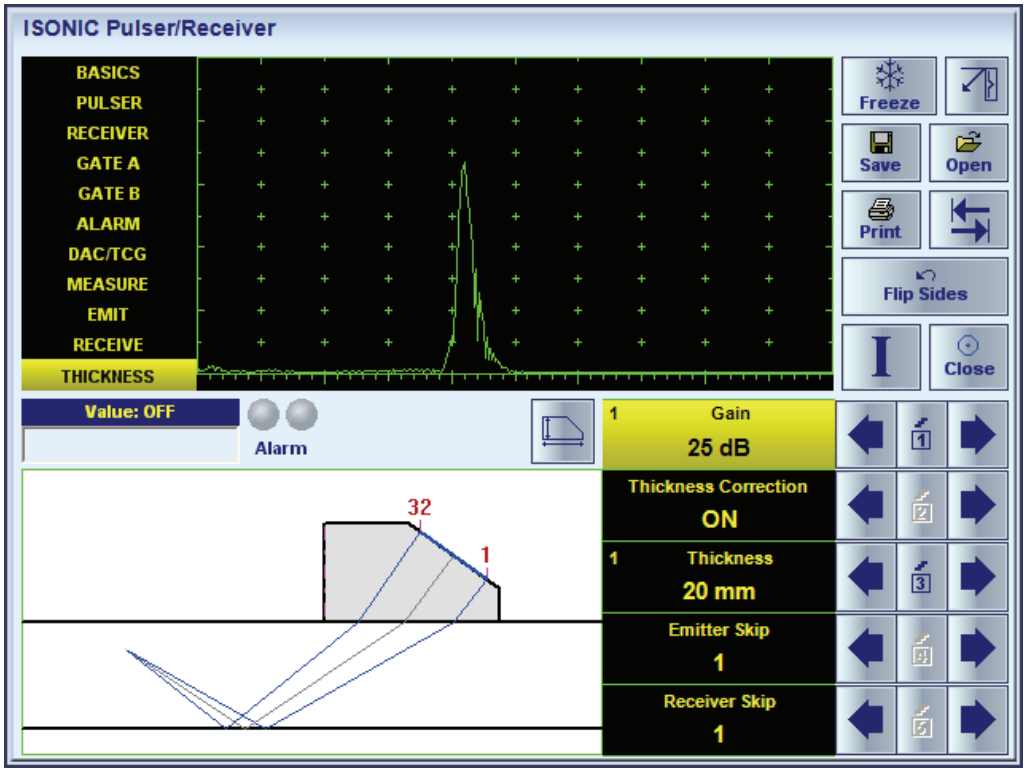
The are two modes of pulsing / receiving – with (**Thickness Correction = ON**) and without (**Thickness Correction = OFF**) considering thickness of the material

Thickness Correction = OFF	**Thickness Correction = ON**
Parameter of focusing is **Focal Distance**: For the given **Focal Distance** varying of incidence angle will cause varying of **Focal Depth** – refer to paragraph 5.3.3.4.1 of this Operating Manual	Parameter of focusing is **Focal Depth**: For the given **Focal Depth** varying of incidence angle will cause varying of **Focal Distance** – refer to paragraph 5.3.3.4.1 of this Operating Manual; i.e. focusing is performed along horizontal line parallel to the contact surface of the material
Imaging of the ultrasonic beam is implemented as for semi-finite space, the reflections from the walls are ignored	Imaging of the ultrasonic beam is implemented through considering of **Skips**, **Incidence Angle**, and material **Thickness**

Thickness Correction = OFF
Parameters **Thickness**, **Emitter Skip**, **Receiver Skip** ignored
Focusing is defined through keying in **Focal Distance**

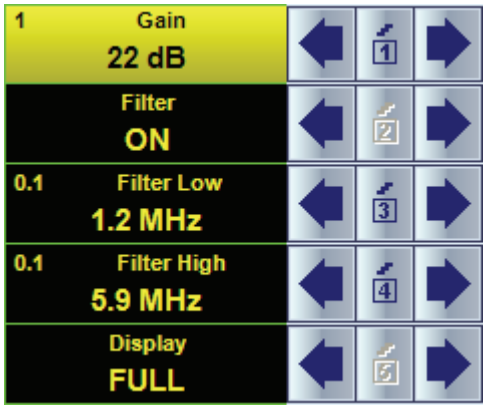


Thickness Correction = ON
Parameters **Thickness**, **Emitter Skip**, **Receiver Skip** are considered
Focusing is defined through keying in **Focal Distance**



To modify the desired setting (**Thickness Correction**, **Thickness**, **Emitter Skip**, **Receiver Skip**) proceed according to paragraph 5.3.2 of this Operating Manual

5.3.3.5. Sub Menu RECEIVER



All settings controllable through **RECEIVER** sub menu are typical for conventional ultrasonic flaw detector and have the same meaning for the PA modality. To modify the desired setting proceed according to paragraph 5.3.2 of this Operating Manual. Also please refer to the below notes

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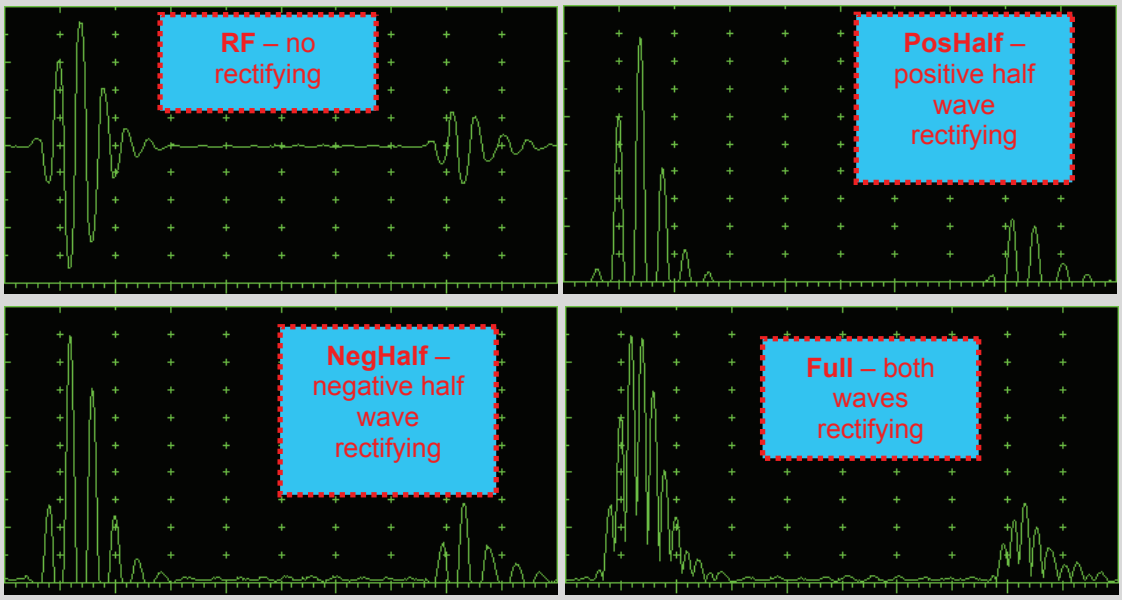
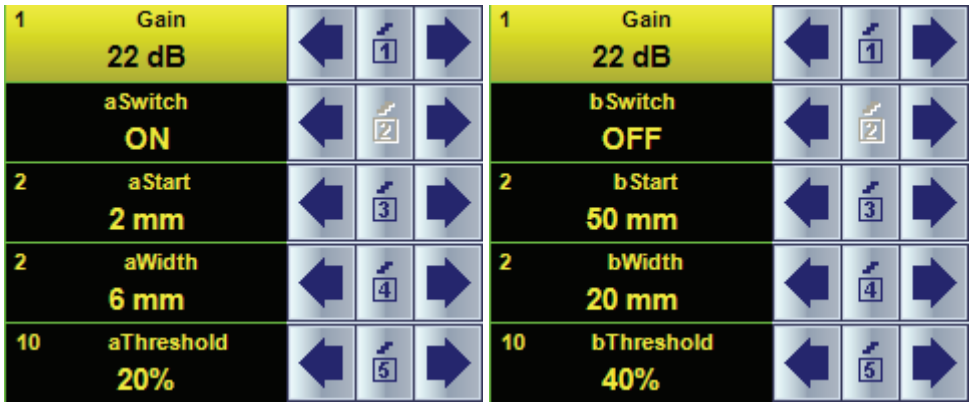
Display Mode

There are four **Display modes** for *time domain signal presentation*:

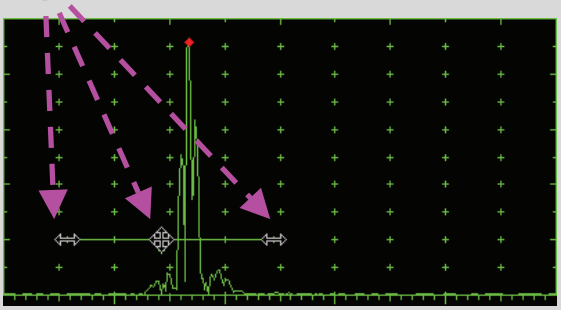


5.3.3.6. Sub Menus GATE A and GATE B



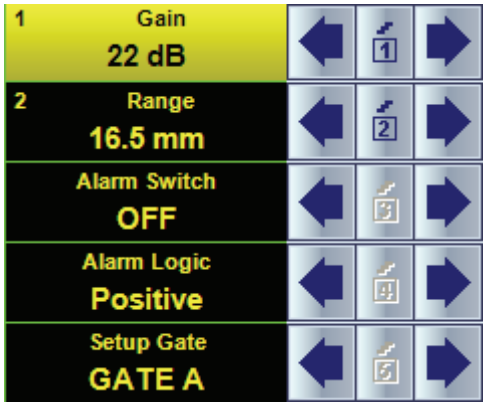
All settings controllable through **GATE A** and **GATE A** sub menus are typical for conventional ultrasonic flaw detector and have the same meaning for the PA modality. To modify the desired setting proceed according to paragraph 5.3.2 of this Operating Manual. Also please refer to the below notes

- **aStart** setup is also possible through a number of other submenus following the same rules as above
- Counting of **aStart** value starts after completing count of **Probe Delay** – refer to paragraphs 5.2.12 and 5.2.13 of this Operating Manual
- Counting of **bStart** value starts after finishing of **Probe Delay** count (refer to paragraph 5.2.12 and 5.2.13 of this Operating Manual)
- **Gates A** and **B** may be manipulated through **Drag and Drop** provided that they are visible in the **A-Scan** area. Mouse pointer changes shape upon placing it above appropriate part of the gate



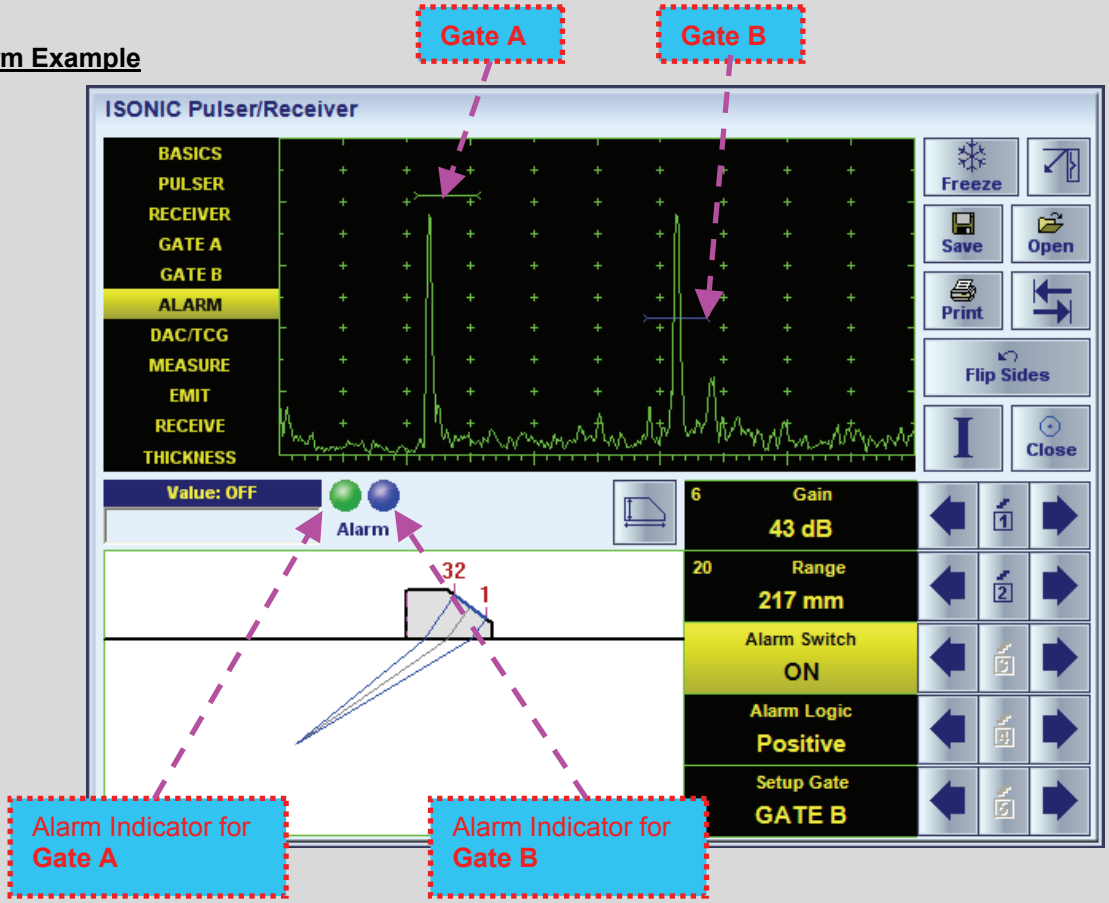
To control gate press and hold left mouse button or touch screen with stylus the and drag and drop through releasing of left mouse button or touch screen stylus

5.3.3.7. Sub Menu ALARM



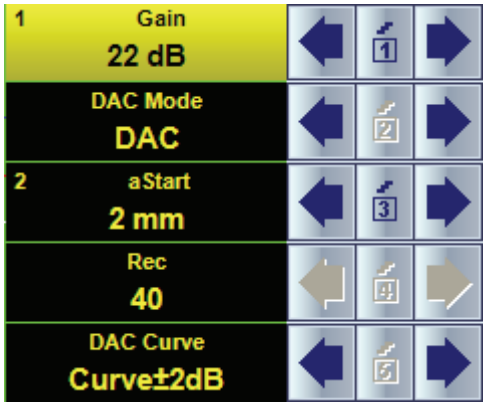
All settings controllable through **ALARM** sub menu are typical for conventional ultrasonic flaw detector and have the same meaning for the PA modality. To modify the desired setting proceed according to paragraph 5.3.2 of this Operating Manual. Also please refer to the below notes

Alarm Example



- There is a pulse matching with **Gate A** and not exceeding its threshold; the **Alarm Logic** setting for **Gate A** is **Negative** ⇒ **Alarm Indicator** for **Gate A** is active
- There is a pulse matching with **Gate B** and exceeding its threshold; the **Alarm Logic** setting for **Gate B** is **Positive** ⇒ **Alarm Indicator** for the **Gate B** is active

5.3.3.8. Sub Menu DAC/TCG



All settings controllable through **DAC/TCG** sub menu are typical for conventional ultrasonic flaw detector and have the same meaning for the PA modality. To modify the desired setting proceed according to paragraph 5.3.2 of this Operating Manual. Also please refer to the below notes

ⓘ

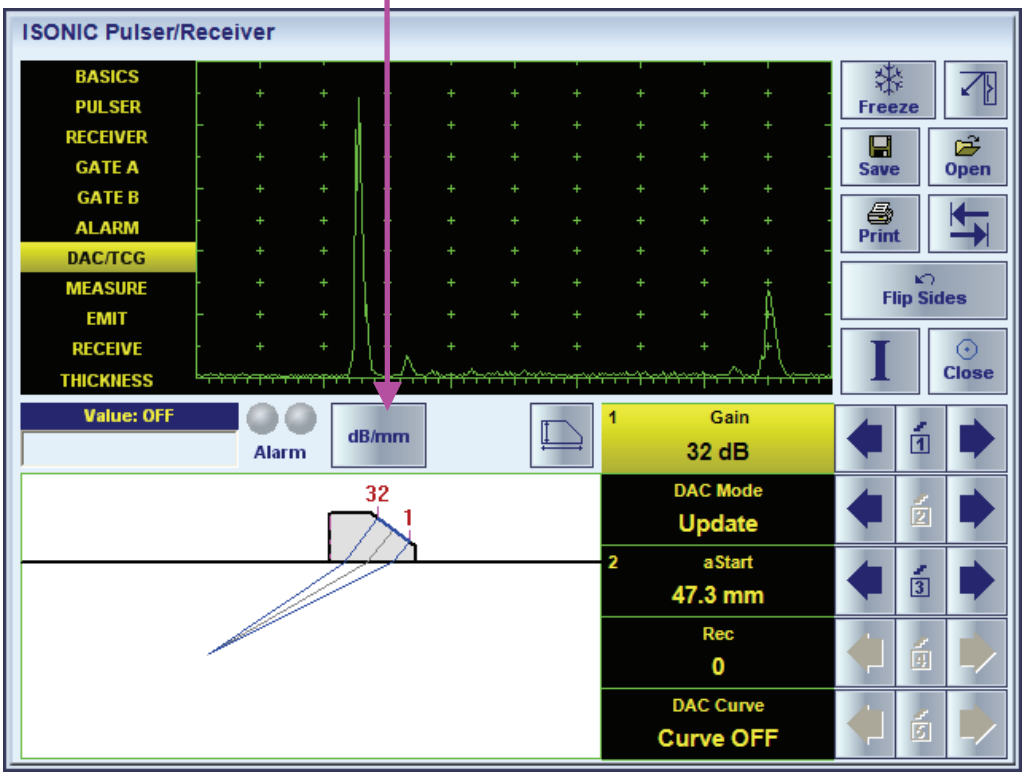
- There are four possible modes for **DAC/TCG**:
  - There are four possible modes for **DAC/TCG**:
    - **OFF** - **DAC Curve** switches automatically to **OFF** while in **OFF**
    - **DAC** - available if quantity of stored echoes is 2 (two) or more. **DAC Curve** switches automatically to **ON** while in **DAC** mode. Both experimental and theoretical methods for creating **DAC** are available
    - **TCG** - available if quantity of stored echoes is 2 (two) or more. **DAC Curve** switches automatically to **OFF** while in **TCG** mode
    - **Update** - allows to create/update new/existing **DAC**. **Update** of existing **DAC** performed through erasing of a number of sequentially recorded echoes, starting from the latest one, and/or recording of new echoes. The maximal number of echoes recorded into the one **DAC** is 40 (forty). **DAC Curve** switches automatically to **ON** if the number of recorded echoes is 2 (two) or more and switches automatically to **OFF** if number of recorded echoes is less than 2 (two) while in **Update** mode
- It is possible to Create / Modify / Activate **DAC** and **TCG** for all **Display** modes (**RF**, **Full**, **Negative**, and **Positive**)
- To create / modify **DAC/TCG** refer to paragraph 5.3.3.8 of this Operating Manual

5.3.3.9. Create / Modify DAC

5.3.3.9.1 Theoretical DAC: dB/mm (dB/in)

Theoretical **DAC** represents exponential law for distance amplitude curve determined by **dB/mm** (**dB/in**) factor applied to pure material travel distance. The start point of **DAC** is contact surface and at that point DAC starts at 100% of A-Scan height. Theoretical **DAC** count starts immediately upon completion of **Probe Delay** count – refer to paragraphs 5.3.3.9 of this Operating Manual

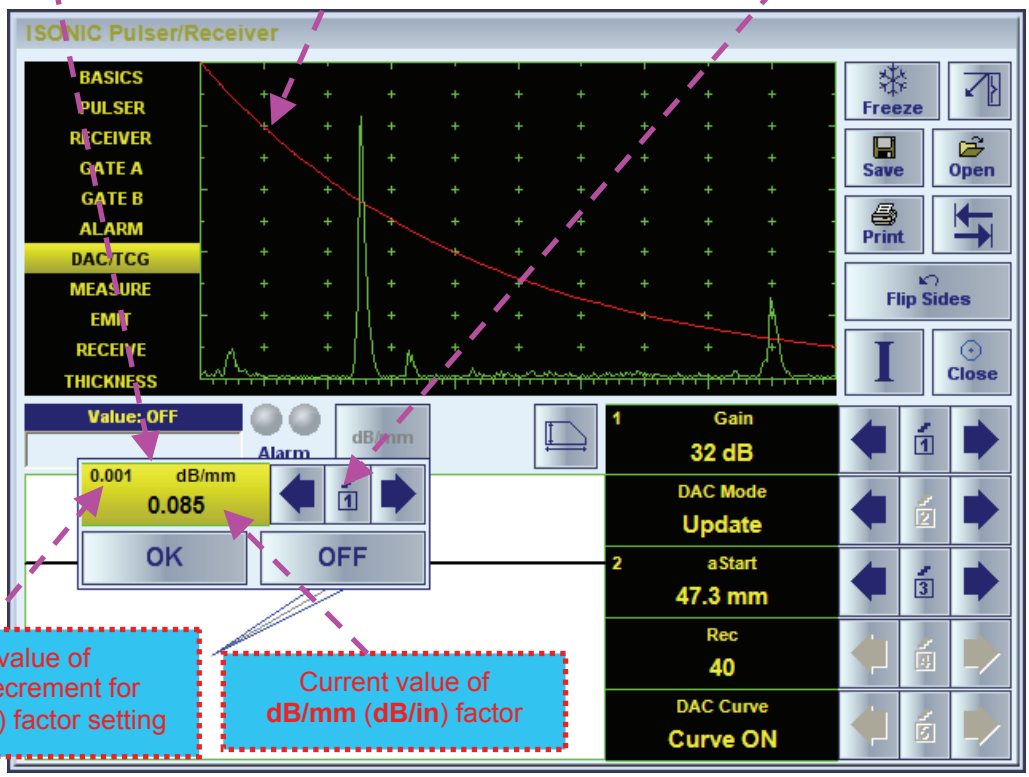
Set **DAC/TCG/DGS** to **Update** then click on



Theoretical **DAC** according to entered **dB/mm** (**dB/in**) factor

Click on this button or press 1 (F1) to select value of increment/decrement for **dB/mm** (**dB/in**) factor setting

Popup dalogue appears:



Current value of increment/decrement for **dB/mm** (**dB/in**) factor setting

Current value of **dB/mm** (**dB/in**) factor

To control **dB/mm** (**dB/in**) factor click on ◄ or ► or press ▲, ►, ◄, ▼ then click on OK or press Enter or ESC. This will return to main operating surface and activate theoretical **DAC**.

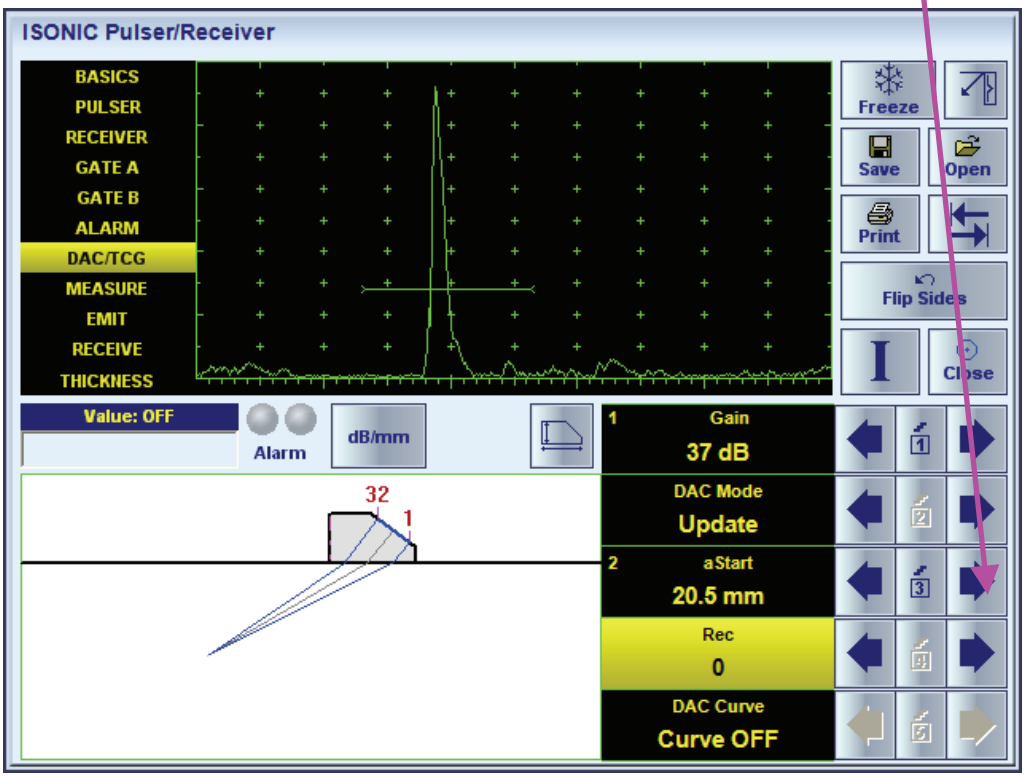
Button dB/mm obtains dark gray color upon while theoretical **DAC** setup is completed

Set **DAC/TCG/DGS** to **DAC** to activate theoretical **DAC** or to **TCG** if it is necessary to perform time correction of gain in accordance with exponential law

To modify or switch theoretical **DAC** off set **DAC/TCG/DGS** to **Update** then click on dB/mm. In the appeared popup dialogue set new value for **dB/mm** (**dB/in**) factor or click on OFF. On completion click on OK or press Enter or ESC.

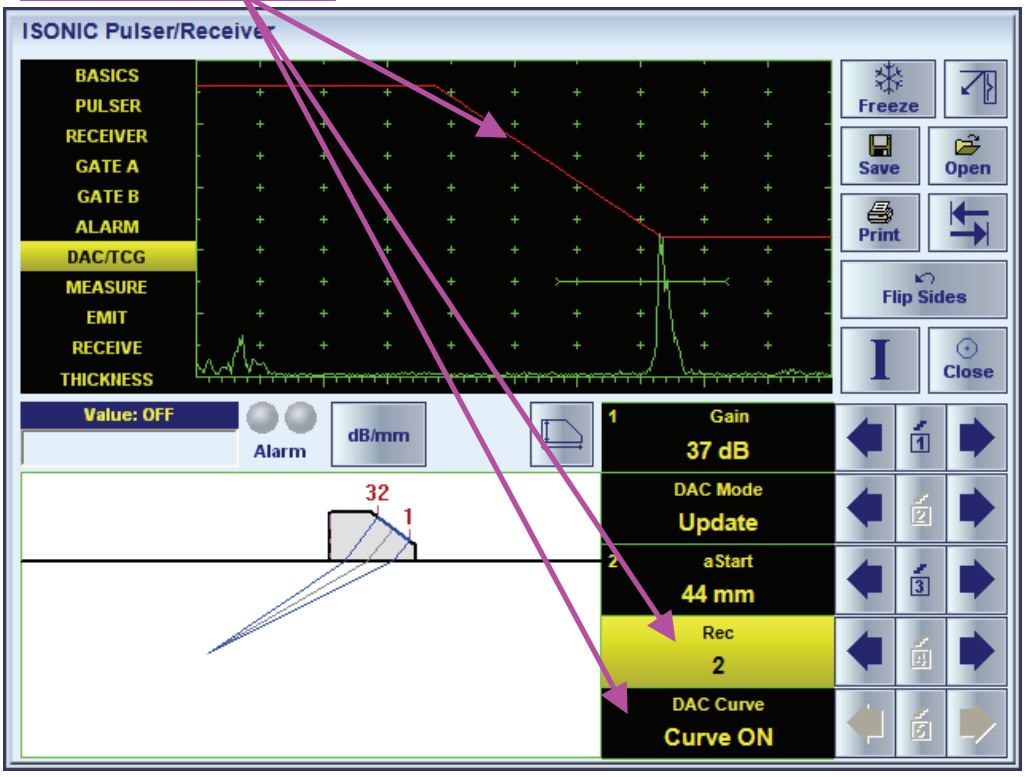
5.3.3.9.2 Experimental DAC: Recording Signals From Variously Located Reflectors

Prior to building experimental **DAC** switch theoretical **DAC** off and **Gate A** on. Set **DAC/TCG** to **Update**. Place probe onto **DAC** calibration block and maximize echo from the reflector closest to the probe (first echo) then place **Gate A** over received signal and capture first *DAC echo* through click on or press  , 

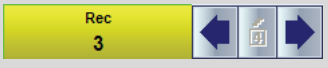


As a result the *first DAC echo* will be stored accompanied with corresponding indication: 

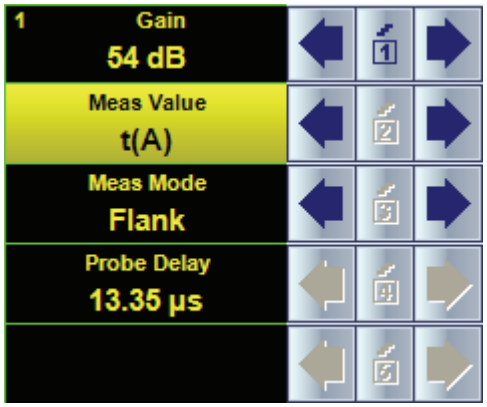
Place probe onto DAC calibration block and maximize echo from next reflector then place **Gate A** over received signal and capture *next DAC echo.* As result next *DAC echo* will be stored causing appropriate modifying of corresponding indications



- The highest echo in the **Gate A** will be stored said echo may either exceed **Gate A** threshold level or not
- Stored echo must be below 100% of **A-Scan** height
- A total number of 40 echoes may be stored one by one by the same way as described above
- After creating a **DAC** (2 or more echoes stored) the **DAC** and / or **TCG** may be activated
- There are two styles of **DAC** indication in the **DAC** mode: **Main Curve Only** and **Main Curve ± N dB**, where **N** may be setup between ±1 and ±14 dB with 1 dB increment: 

- It's possible to erase the last stored echo from the **DAC**. To proceed set the **DAC/TCG** to **Update** and switch on **Gate A** then click on click on  or press  : 

5.3.3.10. Sub Menu MEASURE



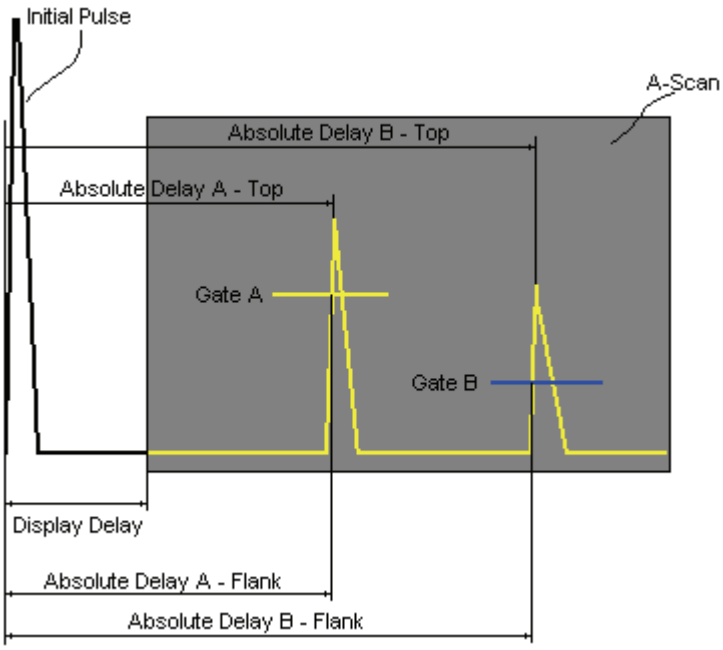
All settings controllable through **MEASURE** sub menu are typical for conventional ultrasonic flaw detector and have the same meaning for the PA modality. To modify the desired setting proceed according to paragraph 5.3.2 of this Operating Manual. Also please refer to the below notes

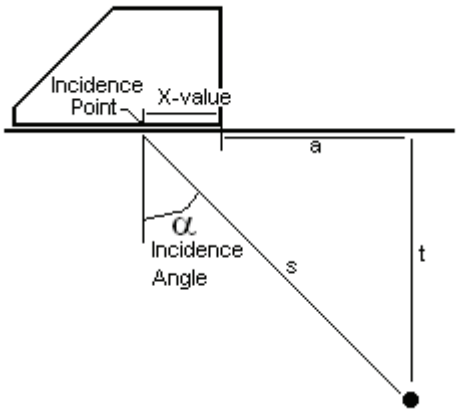
- Refer to paragraph 5.3.3.11 of this Operating Manual for information about values available for automatic measurement and indication in the **Value Box (Digital Readout)**
- There are four Measurement Modes possible:
  - Flank
  - Top
  - Flank-First
  - Top-First
- Probe Delay is determined by instrument automatically for all possible combinations of the following parameters:

Pulser Mode = SINGLE	**Pulser Mode = DUAL**
Aperture **Start** **Incidence Angle** **Focal Distance** (for **Thickness Correction = ON**) or **Focal Depth** (for **Thickness Correction = OFF**) **USVelocity** **Wedge Velocity**	**EMIT Aperture** **EMIT Start** **EMIT Incidence Angle** **RECEIVE Aperture** **RECEIVE Start** **RECEIVE Incidence Angle** **Focal Distance** (for **Thickness Correction = ON**) or **Focal Depth** (for **Thickness Correction = OFF**) **USVelocity** **Wedge Velocity**

5.3.3.11. A-Scan Based Measurements

5.3.3.11.1. Measured Values





Value 1: T(A) / Value 2: T(B)

Time of Flight - **µs** of an echo matching with **Gate A** / **Gate B** measured respectfully *Incidence Point*:

T(A) = Absolute Delay A - Probe Delay
T(B) = Absolute Delay B - Probe Delay

Value 3: s(A) / Value 4: s(B)

Material Travel Distance - **mm** or **in** of an echo matching with **Gate A** / **Gate B** measured respectfully *Incidence Point*:

s(A) = ½ · T(A) · US Velocity
s(B) = ½ · T(B) · US Velocity

Value 5: a(A) / Value 6: a(B)

Projection Distance - **mm** or **in** of reflector returning an echo matching with **Gate A** / **Gate B**, measured respectfully front surface of the PA probe with taking into account migration of *Incident Point* and varying X-*Value* in accordance with varying *Incidence Angle* α:

a(A) = s(A) · sin (α) – X-value
a(B) = s(B) · sin (α) – X-value

Value 7: t(A) / Value 8: t(B)

Depth - **mm** or **in** of reflector returning an echo matching with **Gate A** / **Gate B**:

t(A) = s(A) · cos (α)
t(B) = s(B) · cos (α)

Value 9: ΔT - **µs**:

ΔT = T(B) – T(A)

Value 10: Δs - **mm** or **in**:

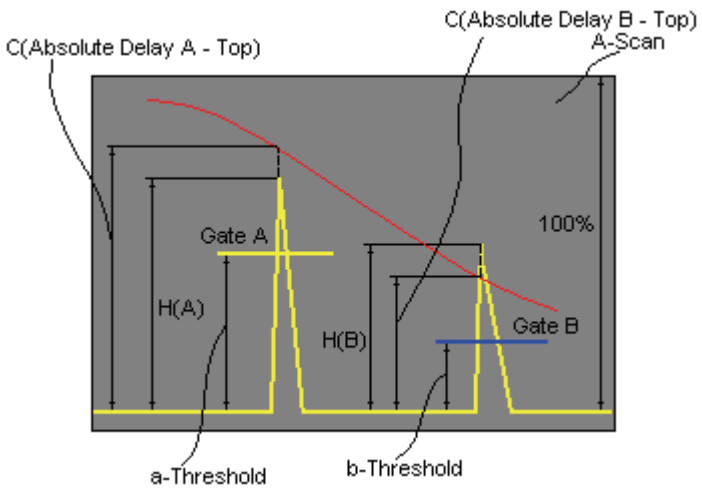
Δs = s(B) – s(A)

Value 11: Δa - **mm** or **in**:

Δa = a(B) – a(A)

Value 12: Δt - **mm** or **in**:

Δt = t(B) – t(A)



Value 13: H(A) / Value 14: H(B)

Amplitude - **% of A-Scan height** of an echo matching with **Gate A** / **Gate B**

Value 15: V(A) / Value 16: V(B)

Amplitude - **dB** of an echo matching with **Gate A** / **Gate B** with respect to **aThreshold**:

$$V(A) = 20 \cdot \log_{10} (H(A) / aThreshold)$$

$$V(B) = 20 \cdot \log_{10} (H(B) / bThreshold)$$

Value 17: ΔV - dB:

$$\Delta V = V(B) - V(A)$$

Value 18: ΔVC(A) (dB to DAC) – dB:

$$\Delta VC(A) = 20 \cdot \log_{10} (H(A) / C (Absolute Delay A\_Top))$$

Value 19: ΔVC(B) (dB to DAC) – dB:

$$\Delta VC(B) = 20 \cdot \log_{10} (H(B) / C (Absolute Delay B\_Top))$$

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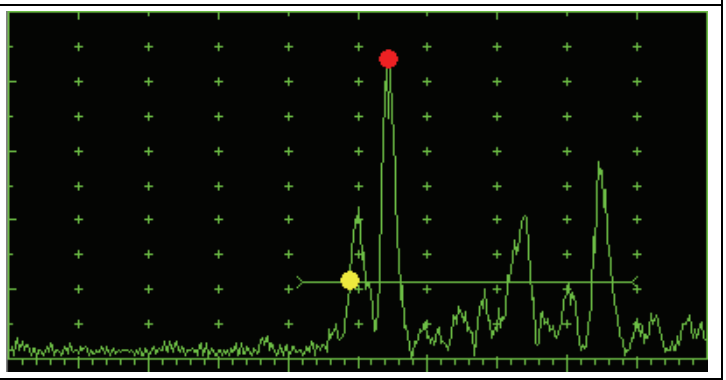
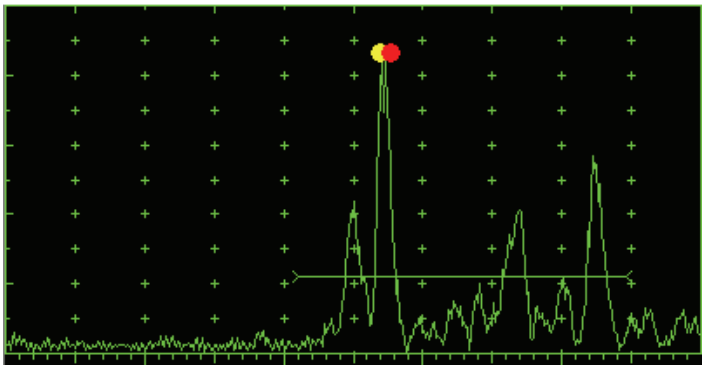
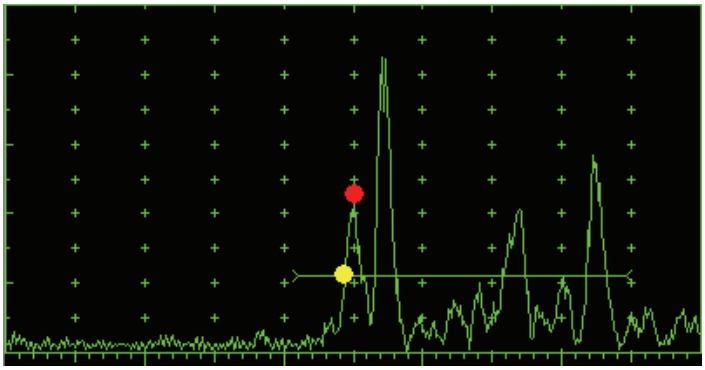
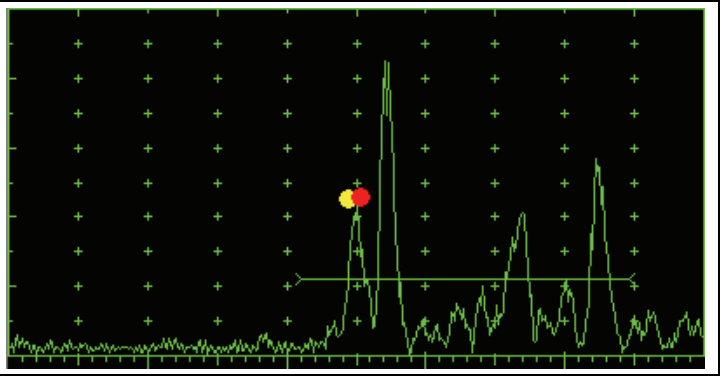
- To proceed the corresponding **Gate** or both **Gates** to be active
- **ΔVC(A)** (**dB to DAC**) measurements require active **DAC**
- Amplitude measurements of echoes may be performed provided their heights don't exceed 130% of **A-Scan** height
- For 2 and more echoes matching with the **Gate** - refer to paragraph 5.3. 3.11.2 of this Operating Manual

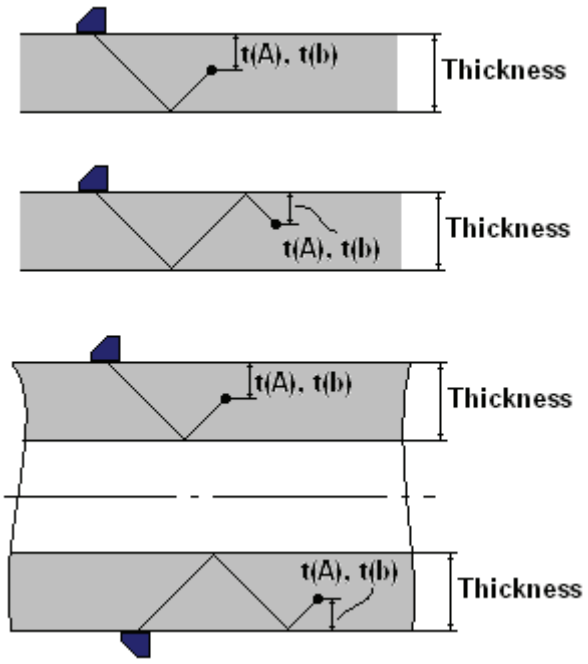
5.3.3.11.2. Measuring Modes

The table below represents distinguishing points on an **A-Scan**, which will be taken for automatic measurements depending on **Meas Mode** setting

Meas Mode setting	**A-Scan**
Meas Mode Flank ● - T(A), T(B), s(A), s(B), t(A), t(B), a(A), a(B), ΔT, Δs, Δt, Δa ● - V(A), V(B), H(A), H(B), ΔV, ΔVC(A), ΔVC(B)	
Meas Mode Top ● - T(A), T(B), s(A), s(B), t(A), t(B), a(A), a(B), ΔT, Δs, Δt, Δa ● - V(A), V(B), H(A), H(B), ΔV, ΔVC(A), ΔVC(B)	
Meas Mode Flank-First ● - T(A), T(B), s(A), s(B), t(A), t(B), a(A), a(B), ΔT, Δs, Δt, Δa ● - V(A), V(B), H(A), H(B), ΔV, ΔVC(A), ΔVC(B)	
Meas Mode Top-First ● - T(A), T(B), s(A), s(B), t(A), t(B), a(A), a(B), ΔT, Δs, Δt, Δa ● - V(A), V(B), H(A), H(B), ΔV, ΔVC(A), ΔVC(B)	

5.3.3.11.3. Thickness Correction

The sketch below represents positioning of PA Probe on the plate and on the tube wall (longitudinal insonification).



With reference to paragraph 5.3.3.4.4 of this Operating Manual on case of

Thickness Correction = ON

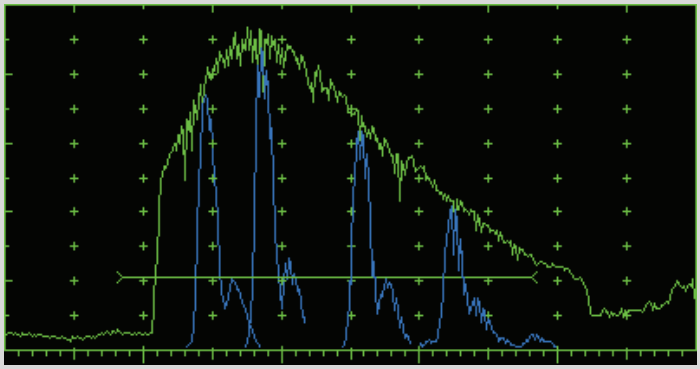
for half skip, full skip, and multi skip insonification **t(A)**, **t(B)** readings will represent actual depth of the targeted reflector provided the **Thickness** is entered properly

5.3.3.12. Freeze A-Scan

To freeze / freeze peak / unfreeze the **A-Scan** click on 

or press 

- **Freeze Peak** mode allows representing of Hilbert envelop for sequence of echoes obtained while manipulating probe over some reflector. This function may be useful for localization of echo maximum whilst in the A-Scan mode:



- **Freeze Peak** mode may not be activated for **RF** signal presentation

- Appearing of  at the upper left corner of **A-Scan** indicates that it is frozen (**Freeze**)

- Appearing of  at the upper left corner of **A-Scan** indicates that **Freeze Peak** mode is active

- The following operations are available for the frozen **A-Scan**:
  - Varying **Gain** in ± **6 dB** range
  - Manipulating **Gates A** and **B**
  - Varying **Alarm** mode
  - Selecting parameter (**Meas Value**) for automatic measurements and obtaining corresponding digital readout

- Caption of appropriate button changes window upon freeze / freeze peak / unfreeze **A-Scan**:

5.3.3.13. Save A-Scan and Calibration Data Into a File

Click on 

or press 

5.3.3.14. Load A-Scan and Calibration Data From a File

Click on 

or press 

5.3.3.15. Print A-Scan Settings List

Click on 

or press 

5.3.3.16. Preview Current PA Probe in Use

Click on 

5.3.3.17. Direction of Graphical Presentation

Click on 

5.3.3.18. Activate Main Recording Menu

Click on 

or press 

5.3.3.19. Return to Linear Array Probes Database

Click on 

or press 

5.3.4. Main Recording Menu

Click on 

or press 

to proceed with ABI Scan (other known names – B-Scan and E-Scan) based inspections

Click on 

or press 

to proceed with Sector Scan (S-Scan) based inspections

Click on 

or press 

or 

to return to **ISONIC PA Pulser Reciver**

5.3.4.1. ABI Scan (B-Scan, E-Scan)

Refer to paragraph 5.3.4.1 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at http://www.sonotronndt.com/PDF/OM2009/om2009.pdf

5.3.4.2. Sector Scan (S-Scan)

Refer to paragraph 5.3.4.2 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at http://www.sonotronndt.com/PDF/OM2009/om2009.pdf

5.4. Linear Array Probes With Straight Delay Line – Standard Modes of Operation

Use of linear array probe with straight delay line with **ISONIC 2010** is based on the same principles and controls as for wedged linear array probes. The following modes of functioning are possible:

- Selecting of PA probe from database, editing existing and adding new PA probe data, exportation and importation of PA probe data base to/from another instrument – refer to paragraph 5.3.1 of this Operating Manual
- PA Pulser Receiver – refer to paragraph 5.3.3 of this Operating Manual. The difference is in the incidence angle manipulation range only: **–89…+89 deg** for linear array equipped / not equipped with delay line vs **35…80 deg** for wedged linear array
- Imaging and recording – B-Scan cross sectional imaging and 3D data recording through linear scanning (C-Scan, Top, and Side Views) – refer to paragraph 5.3.4.1 of this Operating Manual. It is necessary just to note that incidence angle may be manipulated over wider range and dual mode of Pulsing / Receiving with partially of fully separated emitting and receiving aperture is allowed for linear array equipped / not equipped with delay line vs wedged linear array
- Imaging and recording – Sector Scan cross sectional imaging and 3D data recording through linear scanning (C-Scan, Top, and Side Views) – refer to paragraph 5.3.4.1 of this Operating Manual. It is necessary just to note that incidence angle may be manipulated over wider range and dual mode of Pulsing / Receiving with partially of fully separated emitting and receiving aperture is allowed for linear array equipped / not equipped with delay line vs wedged linear array

Typical PA probes and delay lines are listed below

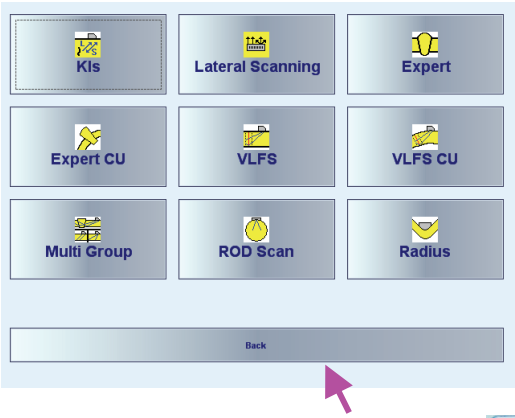
#	*Item*	*Order Code (Part ##)*	*Note*
1	**PA-2M8E1P** - LINEAR ARRAY Frequency: **2 MHz** Pitch Size: **1 mm** Number of Elements: **8** Elevation: **9 mm**	S 4922104376	Mark on the probe 104376
2	**PA-4M16E0.5P** - LINEAR ARRAY Frequency: **4 MHz** Pitch Size: **0.5 mm** Number of Elements: **16** Elevation: **9 mm**	S 4922104377	Mark on the probe 104377
3	**V20PA-8/16** - 20 mm delay line for S 4922104376 and S 4922104377 probes	S 4922104681	
4	**V40PA-8/16** - 40 mm delay line for S 4922104376 and S 4922104377 probes	S 4922104700	
5	**PA-5M32E0.5P** - LINEAR ARRAY Frequency: **5 MHz** Pitch Size: **0.5 mm** Number of Elements: **32** Width (Elevation): **10 mm**	S 4922104379	Mark on the probe 104379
6	**PA-5M16E1P** - LINEAR ARRAY Frequency: **5 MHz** Pitch Size: **1 mm** Number of Elements: **16** Elevation: **10 mm**	S4922105503	Mark on the probe 105503
7	**PA-7.5M32E0.5P** - LINEAR ARRAY Frequency: **7.5 MHz** Pitch Size: **0.5 mm** Number of Elements: **32** Elevation: **10 mm**	S 4944109464	Mark on the probe 109464
8	**V20PA-32** - 20 mm delay line for S 4922104379, S4922105503, and S 4944109464 probes	S 4922104682	
9	**V40PA-32** - 40 mm delay line for S 4922104379, S4922105503, and S 4944109464 probes	S 4922104701	

#	*Item*	*Order Code (Part ##)*	*Note*
10	**PA-2.25M16E1P** - LINEAR ARRAY Frequency: **2.25 MHz** Pitch Size: **1 mm** Number of Elements: **16** Elevation: **13 mm**	S 4922105504	Mark on the probe 105504
11	**V20PA-16/1** - 20 mm delay line for S 4922105504 probe	S 4922104684	
12	**PA-2.25M16E1.5P** - LINEAR ARRAY Frequency: **2.25 MHz** Pitch Size: **1.5 mm** Number of Elements: **16** Elevation: **19 mm**	S 4922105505	Mark on the probe 105505
13	**V20PA-16/1.5** - 20 mm delay line for S 4922105505 probe	S 4922104685	

5.5. Optional SW Packages and Utilities

5.5.1. Options Menu

Options menu screen is presented below



To run selected optional SW package click on it's icon. Click on or press ESC to return to the menu of PA modalities modes

5.5.2. Linear Array PA Probes

5.5.2.1. K_{ls} Optional SW Utility – Delta Technique

Refer to paragraph 5.5.2.1 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at http://www.sonotronndt.com/PDF/OM2009/om2009.pdf

5.5.2.2. Lateral Scanning Optional Inspection SW Package

Refer to paragraph 5.5.2.3 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at http://www.sonotronndt.com/PDF/OM2009/om2009.pdf

5.5.2.3. EXPERT – Optional Inspection SW Package For Welds

Refer to paragraph 5.5.2.4 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at http://www.sonotronndt.com/PDF/OM2009/om2009.pdf

5.5.2.4. EXPERT CU – Optional Inspection SW Package For Tubular Objects, Rods, and Welds

Refer to paragraph 5.5.2.5 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at http://www.sonotronndt.com/PDF/OM2009/om2009.pdf

5.5.2.5. VLFS – Optional Inspection SW Package

Refer to paragraph 5.5.2.6 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at http://www.sonotronndt.com/PDF/OM2009/om2009.pdf

5.5.2.6. VLFS CU – Optional Inspection SW Package

Refer to paragraph 5.5.2.7 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at http://www.sonotronndt.com/PDF/OM2009/om2009.pdf

5.5.2.7. Multi-Group – Optional Inspection SW Utility

Multi-Group optional SW package of **ISONIC 2010** instrument allows implementation of several (up to 3) various insonification schemes simultaneously with use of differently configured groups of elements of wedged linear array probe. Each insonification scheme to be implemented with the same filter settings of **ISONIC PA Pulser Receiver**. Geometry settings (thickness, weld, curvature) if any, probe position, and **USVelocity** in the material as to be identical for all insonification schemes. Calibration for each insonification scheme to be performed in advance and the appropriate **B-Scan** / **Sector-Scan** files

either **TTGI** or not to be stored in advance in accordance with procedures described in the paragraphs 5.3.4.1, 5.3.4.2, 5.5.2.4 through 5.5.2.7 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at **http://www.sonotronndt.com/PDF/OM2009/om2009.pdf**. Movie illustrating typical composing and implementation of multi-group insonification is available for viewing / download at **http://www.sonotronndt.com/PDF/OM2009/MULTI_GROUP.wmv**

5.6. Viewing And Processing Of Recorded Files – PA Modality

Refer to paragraph 5.6 of **ISONIC 2009 UPA-Scope Operating Manual**. The latest version of this document is available for download at **http://www.sonotronndt.com/PDF/OM2009/om2009.pdf**

6. Conventional PE and TOFD Modalities

To operate conventional channel of **ISONIC 2010** in conventional PE and TOFD modalities refer to **ISONIC 2008 Operating Manual**. The latest version of this document is available for download at **http://www.sonotronndt.com/pdf/om2008.pdf**

The following chapters of **ISONIC 2008 Operating Manual** are applicable: **5, 6, 8, 9,** and **10**

7. Incremental Encoders

Various encoders for may be used with **ISONIC 2010**. For appropriate encoder data cable and connector pin-out contact

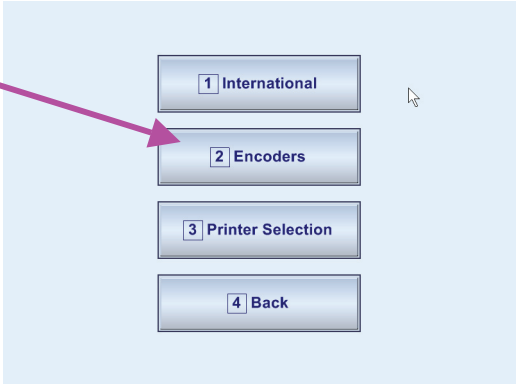
- Nearest Sonotron NDT representative

OR

- Directly to Sonotron NDT – e-mail to **support@sonotronndt.com** with subject **ISONIC 2010 encoder connection**

Improper cable out-coming from custom made encoder for proprietary inspection tasks may lead to warranty exempted damaging ISONIC 2010 instrument

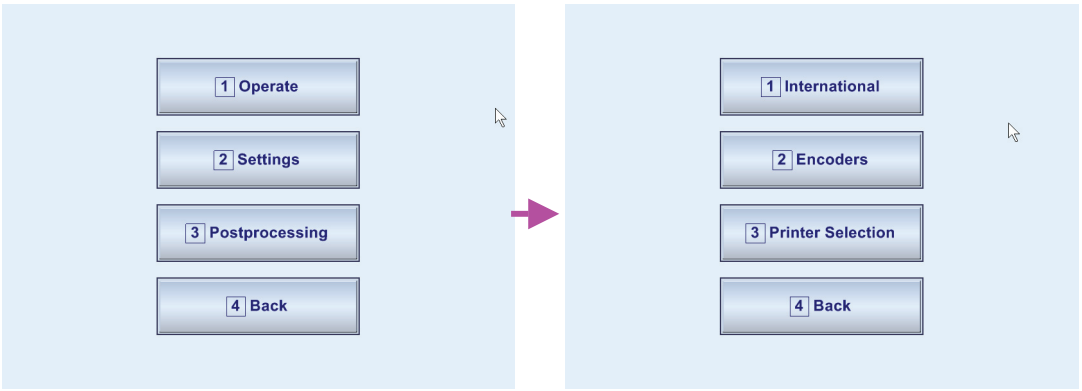
To calibrate / add to database / encoder click on



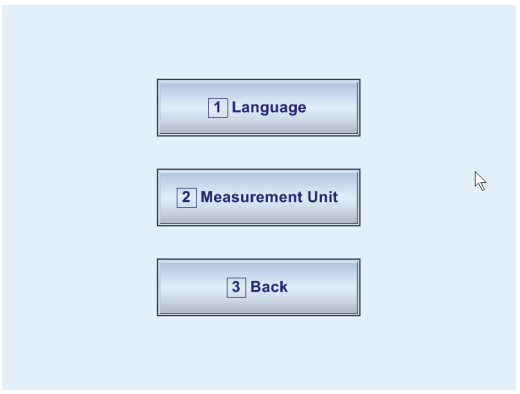
The proceed according to paragraph 8.4 of **ISONIC 2008 Operating Manual**. The latest version of this document is available for download at **http://www.sonotronndt.com/pdf/om2008.pdf**

8. Miscellaneous

8.1. International Settings

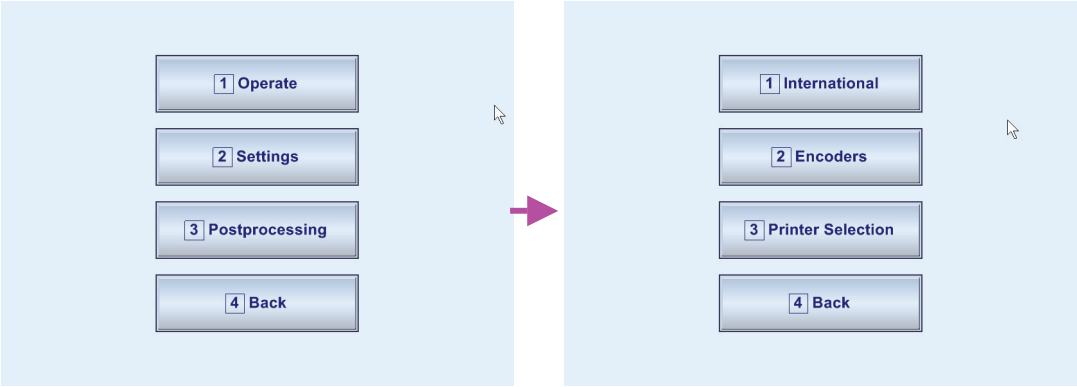


In the PA Modality Start Menu slick on 2 Settings or press 2 then click on 1 International or press 1:

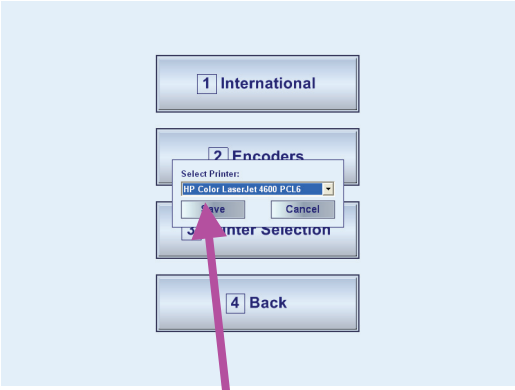


This will allow setting of dialogue language (English, Chinese, Portuguese, etc) and measuring units (metric or imperial)

8.2. Printer Selection



In the PA Modality Start Menu slick on 2 Settings or press 2 then click on 3 Printer Selection or press 3:



Select printer among available in the list then click on

8.3. Exit to Windows

In the **ISONIC 2010 Start Screen** click on  or press  to proceed with Windows XP Embedded settings of **ISONIC 2010** instrument. To return to **ISONIC 2010 Start Screen** double click on icon  located in the Windows Desktop

Exit to Windows is required for:

- Connection to network
  - Printing inspection results to network printer
  - Transferring data to / from remote PC
- Installing printer driver(s)
- Quasi-disk management

In order to prevent overloading of **ISONIC 2010** quasi-disk and memory with data and non **ISONIC 2010** SW that may affect instrument performance it's not allowed to install non **ISONIC 2010** SW except drivers noted above. Affecting of instrument performance through installing on non **ISONIC 2010** SW except drivers noted above is the warranty exemption damage

8.4. Connection to Network

To connect **ISONIC 2010** to local area network use Ethernet connector (refer to paragraph 4.2 of this Operating Manual). Default factory settings are made for most typical connection to DHCP enabled network with obtaining IP automatically

8.5. External USB Devices

8.5.1. Mouse

Use one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual). **ISONIC 2010** founds and registers external USB mouse automatically through standard Windows routine. Microsoft optical mouse is recommended

8.5.2. Keyboard

Use one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual). **ISONIC 2010** founds and registers USB keyboard automatically through standard Windows routine. Microsoft keyboard is recommended

8.5.3. Memory Stick (Disk on Key)

Use one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual). **ISONIC 2010** running founds and registers USB memory stick (disk on key) automatically through standard Windows routine

8.5.4. Printer

Use one of 2 USB Connectors (refer to paragraph 4.2 of this Operating Manual). Preliminary driver setup is required. To install driver use network connection or USB memory stick (disk on key)

8.6. External VGA screen / VGA projector

Connect to appropriate connector (refer to paragraph 4.2 of this Operating Manual) while at least one of 2 devices either **ISONIC 2010** or external screen / projector is switched OFF then switch on one or both devices

8.7. SW Upgrade

Refer to **http://www.sonotronndt.com/support.htm** in the Internet

8.8. Charging Battery

Battery of **ISONIC 2010** may be charged while disconnected from the unit. The special charger is required (refer to Chapter 3 of this Operating Manual). Connect charger to the battery as it is shown below

There is **Charge** LED on the charger. While charging the battery this LED emits solid light. **Charge** LED starts flashing upon charge is completed

ⓘ

If a battery is new and almost completely discharged then "boiling" effect in the electrolyte may start earlier than battery is fully charged. In order to prevent battery charger stops on detecting boiling "boiling" effect:

- If temperature inside battery does not exceed 60^{o}C deg limit then **Charge** LED starts flashing – for such case it is necessary to disconnect charger from mains for few minutes and to connect it to mains again. The normal charging will continue
- If temperature inside battery exceeds 60^{o}C deg limit then **Temp** LED starts flashing – for such case it is necessary to disconnect charger from mains for at least 2 hours and to connect it to mains again. The normal charging will continue

After few charge / discharge cycles battery becomes "trained" and probability of "boiling" effect decreases to almost zero

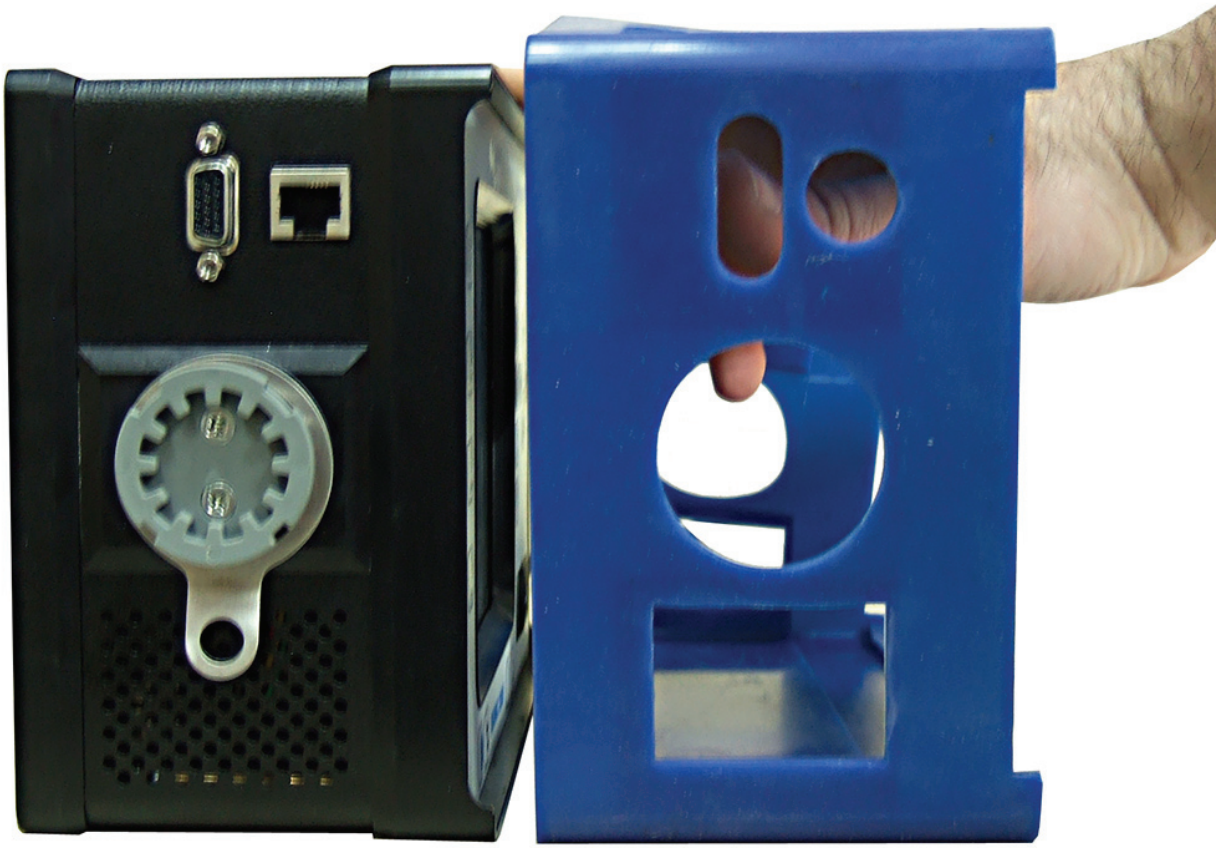
8.9. Silicon Rubber Jacket

1. Establishing Image:

2. Push the gray buttons of the handle on both sides, and rotate the handle until it is released:

3. Lift-up and remove the handle:

4. Place the Silicone Rubber Jacket so that the holes match the ports of the ISONIC machine:



5. Slip the Silicone Rubber Jacket around the machine until it fits properly and covers all edges:

6. A view from the back:

7. Put the handle back in position and twist it until it locks in place:

8. DONE!