

ISONIC PA AUT.....

**Super Powerful All-Weather-Operation Platform / Core Component
for the Integration of Automatic Ultrasonic Inspection Systems
Combining Phased Array, Conventional UT, and TOFD Modalities**



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ISONIC PA AUT is the application based super powerful all-weather-operation platform designed to serve as a core component of the integrated Automatic Ultrasonic Inspection (AUT) systems combining Phased Array (PA), conventional UT, and TOFD modalities

Typical applications:

- Inspection of girth welds according to ASTM-1961
- Inspection of heavy thickness welds in the pressure vessels, reactors, etc in accordance with the radiography replacement codes and norms
- Inspection of the railway axles and wheels
- Inspection of forgings
- Immersion Ultrasonic Testing (IUT) of various materials and parts
- Full body inspection of pipes, tubular and solid shafts
- IUT validation of the results obtained by various AUT machines
- General Purpose Desktop PAUT workstation

The main features of **ISONIC PA AUT** platform:

- Fully parallel **128:128 (2 X 64:64 / 4 X 32:32)** PA and **16** independent conventional / TOFD channels carried by portable light weight unit controllable either over Ethernet OR directly using the standard PC keyboard and mouse connected to the unit
- Expandable to **256:256 (2 X 128:128 / 4 X 64:64)** PA functionality
- Operating up to **4 PA probes** and **16 conventional probes / pairs of probes** simultaneously
- Up to **4096 PA** and **512 conventional / TOFD** channels functionality thanks to the ability of multiple units operation (up to 32) controlled from one computer
- Parallel A/D conversion and on-the-fly digital phasing and superimposing of PA elements signals, no multiplexing involved
- Free settling of emitting and receiving aperture
- Hardware / software synchronization
- 3 motor powering and control terminals
- 3 encoder terminals
- Built-in UPS (uninterruptible power supply)
- Emergency stop button
- Rugged IP 67-sealed scanner-mountable
- **All-Weather-Operation: -50°C ... +60°C**
- No intake air
- No water or other type of cooling required
- <9 kg weight

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In-Construction Inspection of Girth Welds



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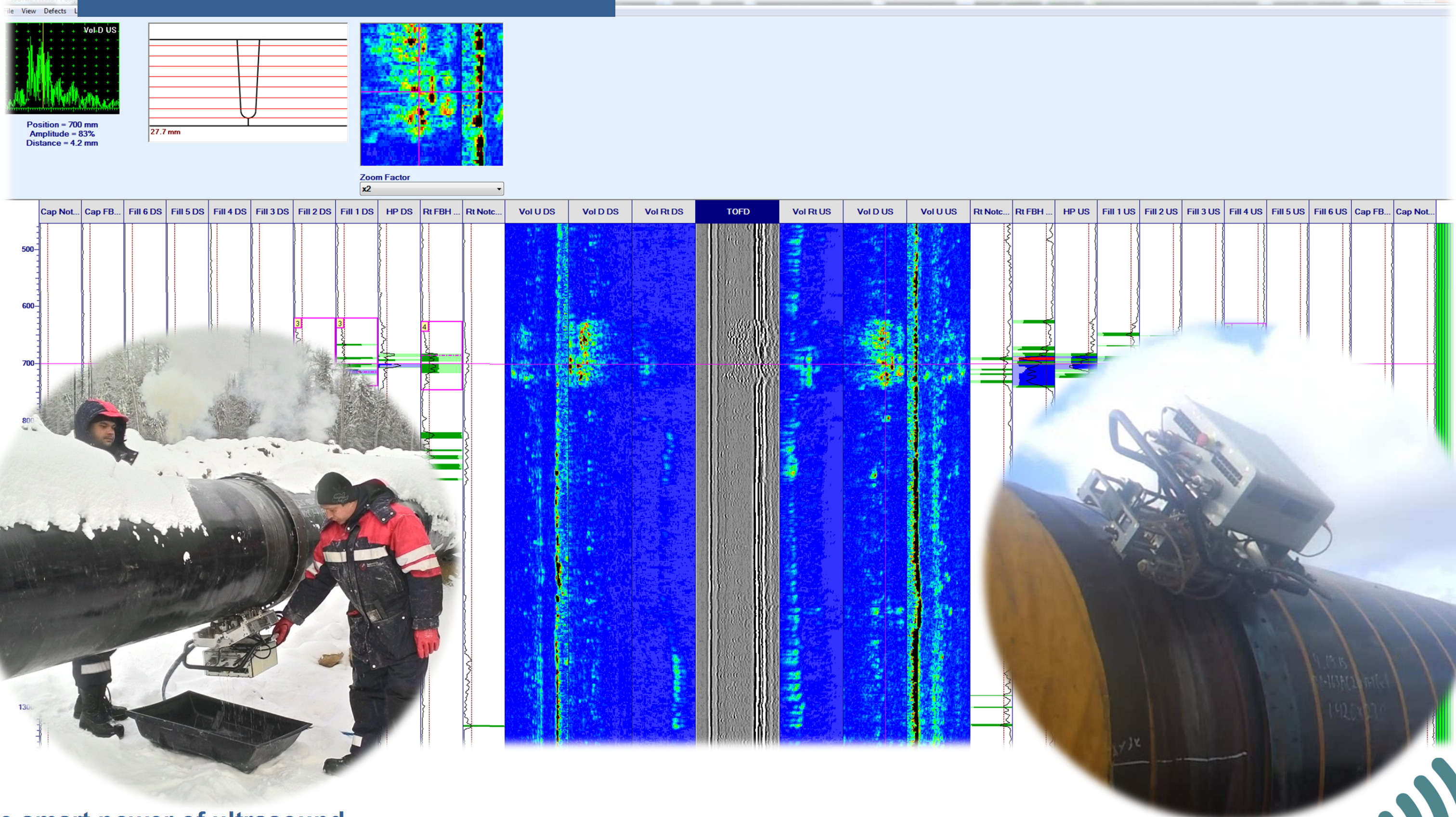
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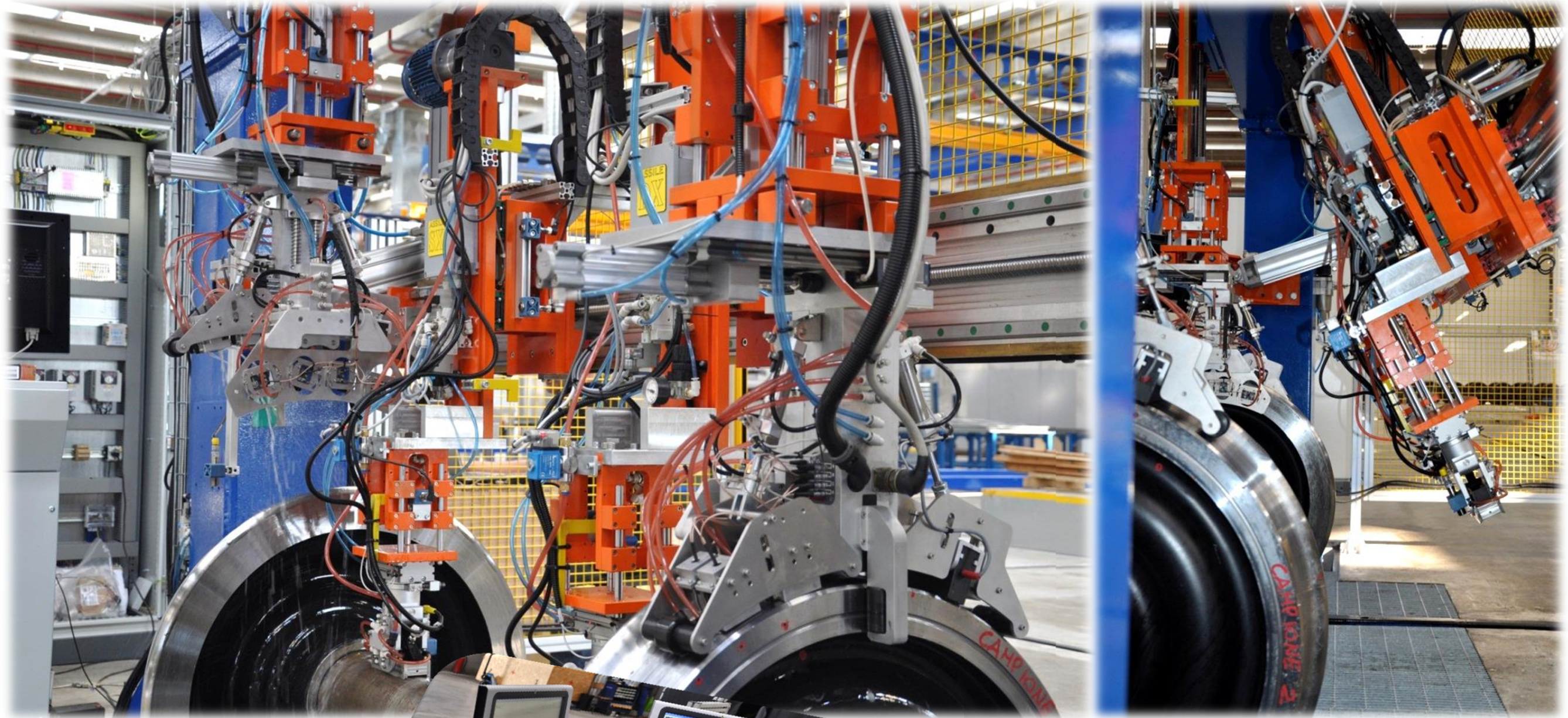
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Inspection of Railway Shaft and Wheels



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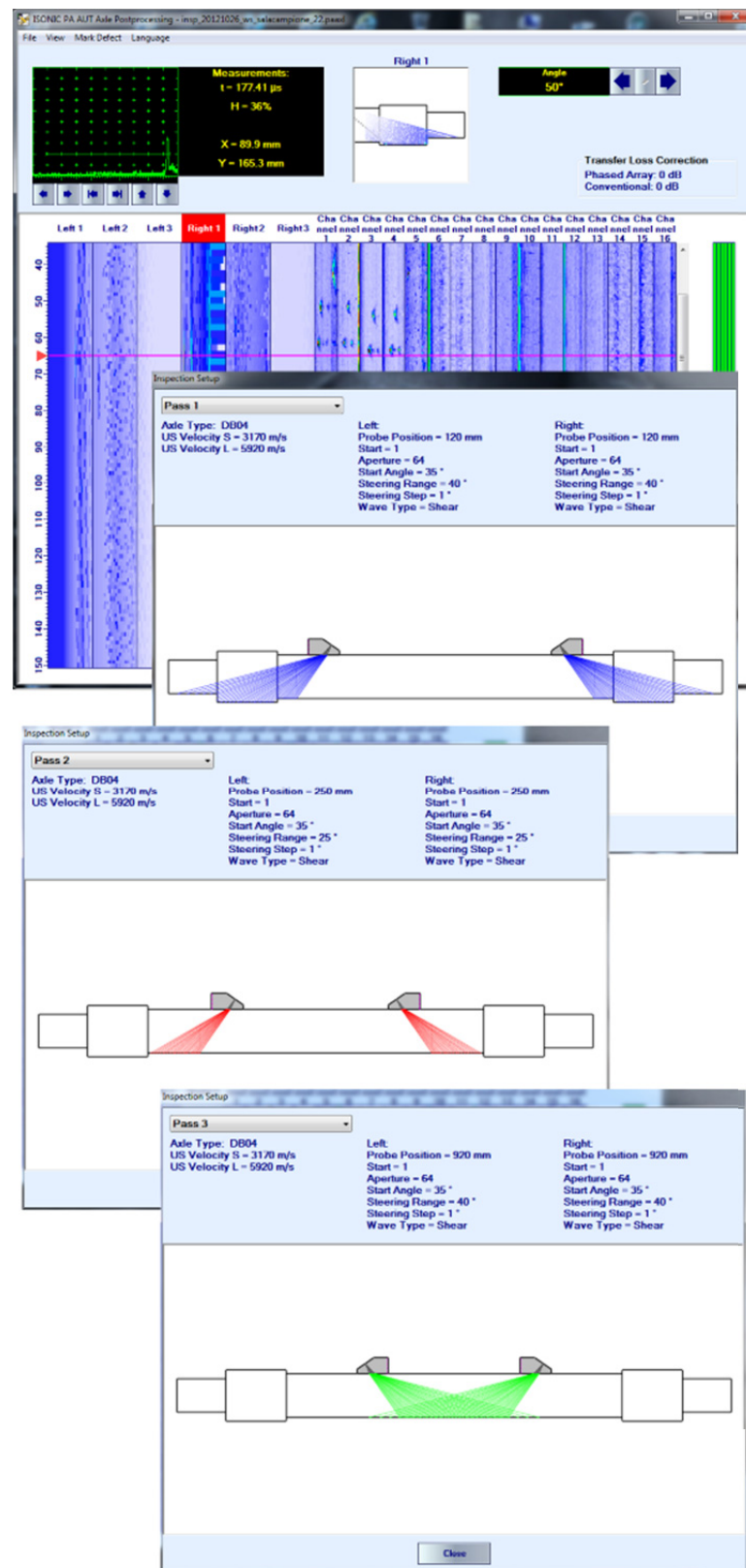
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ISONIC PA AUT - Technical Data

PA Modality

Structure:	<ul style="list-style-type: none">• 1 X 128:128 / 2 X 64:64 / 4 X 32:32• 1 X 256:256 / 2 X 128:128 / 4 X 64:64 - with use of the corresponding extension terminals
Initial Pulse:	Bipolar Square Wave with Boosted Rising and Falling Edges, Guaranteed Shell Stability, and Active Damping
Transition:	≤7.5 ns (10-90% for rising edges / 90-10% for falling edges)
Amplitude:	Smoothly tunable (12 levels) 50V ... 300 V peak to peak into 50 Ω
Half Wave Duration:	50...600 ns controllable in 5 ns step
Emitting aperture:	1...32/64/128/256* adjustable as fully or partially matching OR mismatching with the receiving aperture * - with use of the corresponding extension terminals
Receiving Aperture:	1...32/64/128/256* adjustable as fully or partially matching OR mismatching with the emitting aperture * - with use of the corresponding extension terminals
Phasing - emitting and receiving:	0...100 μs with 5 ns resolution independently controllable
Analogue 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
A/D Conversion:	100 MHz 16 bit
Digital Filter:	32-Taps FIR band pass with controllable lower and upper frequency limits; non-linear acoustics technique supported
Superimposing of receiving aperture signals:	On-the-fly, no multiplexing involved
Phasing (receiving aperture):	On-the-fly 0...100 μs with 5 ns resolution
Dynamic Focusing:	Supported
FMC, TFM, Back Diffraction Technique with / without and Mode Conversion:	Supported
A-Scan:	<ul style="list-style-type: none">• RF• Rectified (Full Wave / Negative or Positive Half Wave)• Signal's Spectrum (FFT Graph)
Reject:	0...99 % of screen height controllable in 1% resolution
Material Ultrasound Velocity:	300...20000 m/s (11.81...787.4 "/ms) controllable in 1 m/s (0.1 "/ms) resolution
Time Base - Range:	0.5...7000 μs - controllable in 0.01 μs resolution
Time Base - Display Delay:	0...400 μs - controllable in 0.01 μs resolution

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Probe Delay:	Automatically settled depending on the PA probe / wedge / delay line in use according to the desired: <ul style="list-style-type: none">• Aperture(s)• Incidence Angle• Focal Point Position• etc
DAC / TCG:	<ul style="list-style-type: none">• One Per Focal Law• Multi-curve• Slope ≤ 20 dB/μs• Available for the rectified and RF A-Scans• Theoretical – through entering dB/mm (dB/") factor• Experimental – through recording echoes from several reflectors; capacity - up to 40 points
Automatic Gain Correction:	Complimentary Mechanism Independent on DAC / TCG: <ul style="list-style-type: none">• AGC - Angle Gain Compensation for the sectorial scan coverage• GPSC - Gain Shot (Focal Law) Correction for other types of coverage
EquPAS - Equalized PA Inspection Sensitivity:	Provided for every desired type of reference reflector: <ul style="list-style-type: none">• SDH (Side Drilled Hole)• FBH (Flat Bottom Hole)• EDM Notch• etc
Gates:	2 Independent gates per focal law controllable over entire time base in 0.1 mm /// 0.001" resolution
Threshold:	5...95 % of A-Scan height controllable in 1 % resolution
Phased Array Probes:	<ul style="list-style-type: none">• 1D Array – linear (LA), rings (RA), and the like• Dual Linear Array (DLA)• Matrix Array (MA)• Dual Matrix Array (DMA)
Focal Laws:	<ul style="list-style-type: none">• 8192 in total• Independently adjustable gain / time base / apertures / pulsing receiving modes, etc for each focal law among the plurality of implemented within a frame composing sequence• On-the-fly focal law editing ability

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Scanning and Imaging:	<ul style="list-style-type: none">• Cross-Sectional B-Scan (E-Scan) – regular and/or Volume Overlay True-To-Geometry• Cross-Sectional Sector Scan (S-Scan) – regular and/or Volume Overlay and True-To-Geometry• Multi-group image composed of several cross-sectional B- and S-Scans• Horizontal Plane S-Scan• FMC/TFM synthetic aperture images• Back-diffraction image• FD B-Scan (Frequency Domain B-Scan)• Strip Chart<ul style="list-style-type: none">◦ Zonal Discrimination Amplitude / TOF◦ Map◦ TOFD◦ Coupling• TOFD Map out of a pair of PA probes• Top (C-Scan), Side, End View imaging formed through encoded / time-based line scanning, 3D-Viewer• Top (C-Scan), Side, End View imaging formed through encoded XY- scanning, 3D-Viewer
Data Storage:	100% raw data capturing
Postprocessing:	<ul style="list-style-type: none">• Built-in means and freely distributable viewers for the comprehensive postprocessing in the corresponding AUT software applications• ISONIC PA Office - freely distributable postprocessing package for the computer running under W'XP, W'7, W'8, W'10

Conventional UT and TOFD

Number of Channels:	16
Pulsing/Receiving (multi-channel operation):	<ul style="list-style-type: none">• Parallel - all channels do fire, receive, digitize, and record signals simultaneously• Sequential – cycles of firing, receiving, digitizing, and recording signals are separated in time in a sequence loop for:<ul style="list-style-type: none">◦ Each channel◦ Each group of channels working at parallel
Initial Pulse:	Bipolar Square Wave with Boosted Rising and Falling Edges, Guaranteed Shell Stability, and Active Damping
Transition:	≤7.5 ns (10-90% for rising edges / 90-10% for falling edges)
Amplitude:	Smoothly tunable (12 levels) 50 ... 400 Vpp into 50 Ω
Half Wave Duration:	50...600 ns controllable in 10 ns step
Modes:	Single / Dual

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Analogue 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:	<ul style="list-style-type: none">• RF• Rectified (Full Wave / Negative or Positive Half Wave)• Signal's Spectrum (FFT Graph)
Reject:	0...99 % of screen height controllable in 1% resolution
Material Ultrasound Velocity:	300...20000 m/s (11.81...787.4 "/ms) controllable in 1 m/s (0.1 "/ms) resolution
Time Base - Range:	0.5...7000 µs - controllable in 0.01 µs resolution
Time Base - Display Delay:	0...400 µs - controllable in 0.01 µs resolution
Probe Angle:	0...90° controllable in 1° resolution
Probe Delay:	0...70 µs controllable in 0.01µs resolution
DAC / TCG:	<ul style="list-style-type: none">• Multi-curve• Slope ≤ 20 dB/µs• Available for the rectified and RF A-Scans• Theoretical – through entering dB/mm (dB/") factor• Experimental – through recording echoes from several reflectors; capacity - up to 40 points
DGS:	Standard Library for 18 probes / unlimitedly expandable
Gates:	2 Independent Gates controllable over entire time base in 0.1 mm /// 0.001" resolution
Threshold:	5...95 % of A-Scan height controllable in 1 % resolution
HW Gates:	Standard Option
Interface Echo:	Standard Option
Digital Readout:	<ul style="list-style-type: none">• 27 automatic functions• 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-Scan:	<ul style="list-style-type: none">• Freeze All• Freeze Peak <p>Note: signal evaluation, manipulating Gates and Gain is possible for the frozen A-Scans as for live</p>

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Scanning and Imaging - Single Channel:	<ul style="list-style-type: none">• Thickness Profile B-Scan• True-To-Geometry Angle / Skip Corrected Cross-sectional B-Scan• High Resolution B-Scan• Horizontal Plane View CB-Scan• TOFD
Scanning and Imaging - Multi Channel:	<ul style="list-style-type: none">• Strip Chart - strips of 4 types, namely P/E Amplitude/TOF; Map; TOFD; Coupling• Stripped C-Scan
Data storage:	100% raw data capturing
Postprocessing:	<ul style="list-style-type: none">• Built-in means and freely distributable viewers for the comprehensive postprocessing in the corresponding AUT software applications• ISONIC Office L - freely distributable postprocessing package for the computer running under W'XP, W'7, W'8, W'10

General

PRF:	10...5000 Hz controllable in 1 Hz resolution
On-Board Computer CPU:	<ul style="list-style-type: none">• Dual Core Intel Atom N2600 CPU 1.6 GHz / units manufactured after 2018-03-01• AMD LX 800 - 500MHz / units manufactured on or before 2018-03-01
RAM:	<ul style="list-style-type: none">• 2 GB / units manufactured after 2018-03-01• 1 GB / units manufactured on or before 2018-03-01
Quasi HDD:	<ul style="list-style-type: none">• SSD Card 64 GB / units manufactured after 2018-03-01• CF Card 4 GB / units manufactured on or before 2018-03-01
Standard Ports:	<ul style="list-style-type: none">• 2 x USB (optionally expandable up to 8)• Ethernet• sVGA
Controls:	<ul style="list-style-type: none">• Standard USB Keyboard and Mouse connected directly to the instrument along with the sVGA screen• Remote control from an external PC over LAN (Ethernet) or internet
Operating System:	<ul style="list-style-type: none">• W'7PRO / units manufactured after 2018-03-01• W'XPEmb / units manufactured on or before 2018-03-01
Encoder:	<ul style="list-style-type: none">• 3 independent ports for connection to the incremental TTL encoders• Multi-Axis (>=4) Incremental TTL Encoder - Optional
Motors:	<ul style="list-style-type: none">• 3 independent outputs• DC powering: 48VDC• RS 232 control - stepped motor• Other type of motor / PC power voltage / Extra-motors - on request

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Power:	<ul style="list-style-type: none">• Mains - 100...240 VAC, 40...70 Hz, auto-switch• 36...72 VDC• Built-in UPS (uninterruptible power supply)
Ambient Temperature:	<ul style="list-style-type: none">• -50°C ... +60°C (operation)• -50°C ... +60°C (storage)
Housing:	<ul style="list-style-type: none">• Rugged aluminum case mountable on scanner• IP 67• No air intake• No external cooling required
Dimensions of electronic box:	305X160X380 mm (12.00"x6.30"x14.96")
Weight:	8.890 kg (19.56 lbs)

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