Ready for the future, caring for the customer

Ultrasonic Products

SONIA®
An Advanced Ultrasonic System

www.tecnatom-ndt.com
SONIA An Advanced Ultrasonic System

MAIN FEATURES

- UT Electronics for Automated Inspections: It’s designed to be remotely operated.
- Conventional (pulse-echo, through-transmission and TOFD techniques) or phased-array UT.
- Conventional monochannel High Frequency electronics available.
- Fulfils the requirements of the most common UT inspection applications in the Nuclear and Aeronautic markets.
- Low-cost minimal configuration.
- Expansion in a modular way.
- Minimize the length of the transducers cables, digitizing the UT signal very close to the transducers. This implies lower UT signal distortion, attenuation and noise.
- Replace the analog communication lines by digital ones, immune to electromagnetic interferences (fiber optic), which means no signal distortion and/or noise in the transmitted signals and performance independent of installation layout.
- All electronic parts are sealed in non ventilated rugged enclosures.
System Architecture

SONIA shows an innovative architecture to acquire the ultrasonic signals in the proximity of the transducers and transmit them to the acquisition computer using digital communications through fiber optic.

- Distributed architecture, adaptable to big machines or compact equipments.
- Fiber optic connections.
- Plug&Play modules.
- Mixed configurations (conventional and phased-array).
- Powerful Digital Signal Processing on FW.
- Multiplexed / Parallel / Mix firing.
- Low power design, no fans.
- Layout Independent characteristics.
- Reduced sized and weight.
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MODULES

**SYSTEM CONTROL & DATA SERVER**
- High performance CompactPCI CPU
- GB Ethernet connection
- Two fiber optic ports
- 4 encoder inputs and I/O

**FPR-8 / FPR-8A** – 8 UT channels module
- P/E, TTU, TOFD applications
- 300 V square wave pulser
- 0.4 to 30 MHz bandwidth

**FPA-128M** – 32x128 phased-array module
- P/E, TTU-PA applications
- Linear / Sectorial scanning
- Up to 4096 focal laws
- 100 V square wave pulser
- 0.45 to 28 MHz bandwidth

**FMI-12** – Machine interface module
- 12 encoders inputs
- 16 digital & analog inputs
- 8 digital outputs

**FDH-4** – Expansion module
- 1 fiber optic root port
- 4 fiber optic expansion ports

**FPRHF-1** – 1 high frequency UT channel module
- UT microscopy applications
- High energy avalanche pulser
- 4 to 200 MHz bandwidth

**ACCESORIES**

**FPR-8-LNR** 1 channel preamplifier for FPR-8 module
- Through -Transmission, pulse-echo and TOFD applications.
- 37 dB gain
- 0.2 MHz – 40 MHz Bandwidth

**IPEX-HYPER** probe connector adapter for FPA-128M
- For using probes with HYPERTRONICS connector
- For probes up to 128 elements
- Low signal distortion and crosstalk.
- 4 LEMO 00 connectors for single crystal probes
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Equips

Conventional & PA Ultrasonic
SONIA COMPACT is a flexible ultrasonic equipment designed for use in hard environments, like those found in nuclear power plants and in the industry.
- Flexible in configuration: Conventional UT, Phased-array or a mix of them, with internal or external UT modules.
- Gigabit Ethernet for connection with external computers.
- External modules connected using fibre optic link.
- Four incremental encoders input for interfacing with mechanical equipments.
- All electronic parts are sealed in rugged enclosures.

Laboratory Control and Data server
SONIA RP42 is the control unit and data server for laboratory applications.
It integrates in one standard 19” rack (half width) CPU, SONIA FSC board and power supplies for configuring multi-module SONIA systems.
This equipment connects with external SONIA modules by means of 2 optical ports, and with an external computer using Gigabit Ethernet.

Industrial Control and Data server
SONIA PLATE is the control unit and data server for aeronautic and industrial applications.
It integrates on a mounting plate a CPCI chassis, power supplies and additional modules configuring multi-module SONIA systems for use with big machines like gantry systems, robotic inspection cells, immersion tanks, etc....
This equipment connects with remote SONIA modules by means of 2 optical ports, and with an external computer using Gigabit Ethernet.
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APPLICATION FIELDS

POWER GENERATION (NUCLEAR & OTHERS)
In-service inspection of components: pressure vessels, steam generators, collectors, turbines, nozzles, piping, ...

AERONAUTIC
Quality control of aeronautic component manufacturing (composites)
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INDUSTRY

Online and offline quality control of component manufacturing in heavy industry, rail industry, inspection of components in the chemical and oil industry…

OTHERS

Material testing in laboratories, material characterization…
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**INSPECTVIEW**

InspectView® is the software tool for UT acquisition with SONIA system.

It is a software suite covering the whole NDT inspection process: definition and planning, trajectory calculation, machine control, calibration, acquisition, evaluation, and report generation.

**MAIN FEATURES**

- Unified operation: All applications share information and allow for a seamless process flow
- Integrated machine control. All components of the system are managed from a single application.
- Customizable Word, PDF automatic report generation
- Automatic step-by-step execution of inspection plans with multiple phases
- Focal law calculation for array probes. Multiple geometries, probe designs and inspection techniques
- Simultaneous synchronized evaluation of several files
- Specialized evaluation tools: TOFD (Time-Of-Flight-Diffraction), FFT

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**Non-Destructive Testing Software Suite for SONIA**

- **Planning & Control**
- **Inspection Manager**
- **Trajectories**
- **Controller**
- **SONIA An Advanced Ultrasonic System**

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SONIA
Ultrasonic Modules
Detailed characteristics
FPR-8 (FPR-8A) is a conventional ultrasonic module compatible with SONIA architecture. This module has 8 UT channels with high performance in analog electronics and in digital signal processing.

**MAIN FEATURES**

- 8 UT channels, single or dual crystal probes.
- Conventional applications (pulse-echo, through-transmission and TOFD techniques).
- Linear and logarithmic amplifiers, with high dynamic range (>90 dB).
- Bandwidth from 0.4 to 30 MHz (probes from 0.5 to 20 MHz).
- Negative square wave pulser, up to -300 V.
- High digital signal processing capabilities (digital filters, gates, signal types, etc…)
- Small size that permits to minimize the length of the transducers cables, digitizing the UT signal very close to the transducers. This implies lower UT signal distortion, attenuation and noise.
- Replace the analog communication lines by digital ones, immune to electromagnetic interferences (fiber optic), which means no signal distortion and/or noise in the transmitted signals and performance independent of installation layout.
- Low power consumption. The electronic boards are sealed in non ventilated rugged enclosure.
## FPR-8 / FPR-8A Technical Specification

### Pulser (FPR-8 module)
- **Type**: Negative square wave
- **Voltage**: -100 to -300 V, 5V steps
- **Width**: 40 to 500 ns, 1.0 ns steps
- **Maximum PRF**: 20 KHz
- **Fall time**: <5 ns
- **Impedance**: <10 Ω
- **Internal damping**: 150 Ω

### Pulser (FPR-8A module)
- **Type**: Negative square wave
- **Voltage**: -20 to -300 V, 1V steps.
- **Width**: 15 to 1000 ns, 1.0 ns steps
- **Maximum PRF**: 20 KHz
- **Fall time**: <7 ns
- **Impedance**: <4 Ω
- **Internal damping**: 470 Ω

### Receiver
- **Amplifier type**: Linear & Logarithmic
- **Input range**: 2.1 Vpp
- **Bandwidth**: 0.4 to 30 MHz @-3dB
- **Gain range**: 0 to 120 dB, 0.1 dB steps (80 dB analog + 40 dB digital)
- **DAC curve**: 80 dB maximum range, 16 points, 16 ms, 32 ns resolution, 40dB/us slope.
- **Dynamic range**: 90dB (in logarithmic mode)
- **A/D sampling rate**: 125 MSPS, 14 bits
- **Sampling decimation factor**: 1 to 16
- **Gates**: 8 gates, max + 8 first echoes per gate. 1 gate for interface echo synchronization.
- **Signal modes**: RF, True Envelope, Rectified (full, +/-), Logarithmic (analog), Logarithmic (digital)
- **Frequency Filters**: Digital programmable IIR type, low-pass, high-pass, band-pass.
- **Noise reduction filters**: Averaging Anti-impulsive noise
- **Post-Rect smoothing filter**: 0 to 100% smoothing level control
- **Other digital functions**: Real time alarms associated to echoes in gates. Signal inversion. Signal compression factor up to 64.
- **UT connectors**: 16 x LEMO 00 coaxial connectors (8 T/R + 8 R connectors)
- **General I/O**: 4 digital inputs, 2 digital output (up to 24 V) optocoupled.
- **Fiber optic port**: LC-Duplex optical connector (1 Gbit full-duplex)
- **Dimensions**: 175 x 115 x 64 mm (DxWxH).
- **Power**: 24 Vdc, 0.5 A max
FPRHF-1 is a ultrasonic module compatible with SONIA architecture designed to drive high frequency probes. This module has 1 UT channel with high bandwidth, intended for applications in the field of inspection of thin components, ultrasonic microscopy, materials characterization, etc…

**MAIN FEATURES**

- 1 UT channel, single crystal probe.
- Pulse-echo technique.
- Bandwidth from 4 to 200 MHz (probes from 10 to 150 MHz).
- High speed negative spike pulser with two energy levels (low & high).
- High digital signal processing capabilities (filters, gates, signal types, etc…).
- 2 different electronic units: main unit and remote pulser-preamplifier, able to work underwater. The maximum cable length is 3 meters.
- Small size that permits to minimize the length of the transducers cables, digitizing the UT signal very close to the transducer. This implies lower UT signal distortion, attenuation and noise.
- Replace the analog communication lines by digital ones, immune to electromagnetic interferences (fiber optic), which means no signal distortion and/or noise in the transmitted signals and performance independent of installation layout.
- Low power consumption. The electronic boards are sealed in non ventilated rugged enclosure.
### FPRHF-1 TECHNICAL SPECIFICATION

#### GENERAL
- **Electronics**: Compatible with SONIA architecture
- **UT channels**: High Frequency channel, single crystal probe
- **UT techniques**: Pulse-echo (immersion)

#### PULSER
- **Type**: Negative spike
- **Voltage**: Two levels: -60V (low energy), -210 V (high energy)
- **Width**: 7 ns ±2ns (LE), 10 ns ±2ns (HE)
- **Maximum PRF**: 10 KHz
- **Fall time**: 5 ns ±2ns (LE), 4 ns ±2ns (HE)
- **Rise time**: <3 ns (LE), 6 ns ±2ns (HE)
- **Impedance**: <25 Ω

#### RECEIVER
- **Amplifier type**: Linear
- **Input range**: 240 mVpp
- **Bandwidth**: 4 to 200 MHz @-3dB
- **Gain range**: 0 to 80 dB, 0.1 dB steps

#### DIGITAL FUNCTIONS
- **A/D sampling rate**: 2 GSPS, 8 bits
  - Sampling decimation factor: 1 to 16
- **Gates**: 8 gates, max + 8 first echoes per gate.
  - 1 gate for interface echo synchronization
- **Signal modes**: RF, Rectified (full, +/-)
- **A-scan length**: 32 Ksamples
- **Noise reduction filters**: Averaging, Anti-impulsive noise
- **Post-Rect smoothing filter**: 0 to 100% smoothing level control
- **Other digital functions**: Real time alarms associated to echoes in gates. Signal inversion. Signal compression factor up to 64.

#### OTHERS
- **UT connectors**: 1 x LEMO 00 coaxial connector
- **General I/O**: 4 digital inputs, 2 digital output (up to 24 V) optocoupled.
- **Fiberoptic port**: LC-Duplex optical connector (1 Gbit full-duplex)
- **Dimensions (DxWxH)**: Remote P/R: 50 x 50 x 32 mm (weight 150g)
  - Main unit: 175 x 115 x 64 mm.mm (weight 950 g)
- **Power**: 24 Vdc, 1 A max (11W typ)
FPA-128M 32x128 channels UT phased-array module

FPA-128M is a phased-array ultrasonic module compatible with SONIA architecture. This module has 32x128 (multiplexed) UT channels with high performance in analog electronics and in digital signal processing.

MAIN FEATURES

- 32x128 UT channels, multiplexed (32 receivers, 128 pulsers).
- Separated TX/RX for pulse-echo, through-transmission and tandem applications.
- Apertures from 1 to 32 elements.
- Bandwidth from 0.45 to 28MHz (probes from 0.5 to 20MHz).
- Negative square wave pulser, up to -100 V.
- High digital signal processing capabilities (DDF, digital filters, gates, signal types, etc…).
- Small size that permits to minimize the length of the transducers cables, digitizing the UT signal very close to the transducers. This implies lower UT signal distortion, attenuation and noise.
- Replace the analog communication lines by digital ones, immune to electromagnetic interferences (fiber optic), which means no signal distortion and/or noise in the transmitted signals and performance independent of installation layout.
- Low power consumption.
- Rugged enclosure, protection degree IP54.
## FPA-128M TECHNICAL SPECIFICATION

### GENERAL
- **Electronics**: Compatible with SONIA architecture
- **UT channels**: 32x128 multiplexed channels (TX/RX separated)
- **UT techniques**: Pulse-echo, through-transmission, tandem

### PULSER
- **Type**: Negative square wave
- **Voltage**: -15 to -100 V, 1V steps.
- **Width**: 20 to 500 ns, 2.0 ns steps
- **Maximum PRF**: 20 KHz
- **Fall time**: <6 ns
- **Impedance**: <15 Ω

### RECEIVER
- **Input range**: 0.8 Vpp
- **Bandwidth**: 0.45 to 28MHz @-3dB
- **Gain range**: 0 to 80dB, 0.1 dB steps (analog gain) / 0 to 40dB, 0.1 dB steps (digital gain)
- **TGC**: 60 dB maximum range, 16 points, 16 ms extent, 32 ns resolution, 40dB/us slope.

### BEAM FORMER
- **Focal laws**: Up to 4096, 128 scans.
- **Electronic Scan types**: Linear, sectorial, complex
- **Focusing**: Dynamic Depth Focusing (DDF)

### DIGITAL FUNCTIONS
- **A/D sampling rate**: 125 MSPS, 12 bits (internal processing @18 bits) / Sampling decimation factor: 1 to 16
- **Gates**: 4 gates, max + 8 first echoes per gate. 1 gate for interface echo synchronization.
- **Signal modes**: RF, True Envelope, Rectified (full, +/-), Logarithmic (digital)
- **Frequency Filters**: Digital programmable IIR type, low-pass, high-pass, band-pass.
- **Noise reduction filters**: Averaging / Anti-impulsive noise
- **Post-Rect smoothing filter**: 0 to 100% smoothing level control
- **Other digital functions**: Real time alarms associated to echoes in gates. Signal inversion. Signal compression factor up to 64.

### OTHERS
- **UT connectors**: I-PEX Minidock
- **General I/O**: 4 digital inputs, 2 digital output (up to 24 V) optocoupled.
- **Fiberoptic port**: LC-Duplex optical connector (1 Gbit full-duplex)
- **Dimensions**: 166x111x64 mm (DxWxH)
- **Power**: 24 Vdc, 25W typ.
- **Accessories**: IPEX to Hypertronics connectors converter, IPEX splitter (2x64 channels) for dual probe applications