

Inspection System

SONOAIR® R&D

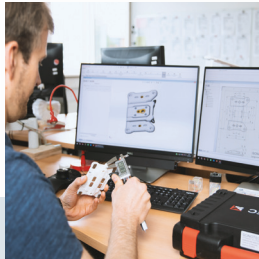
For Non-Contact
Ultrasonic Testing

MADE IN GERMANY

Nondestructive Testing

SONOAIR® Components

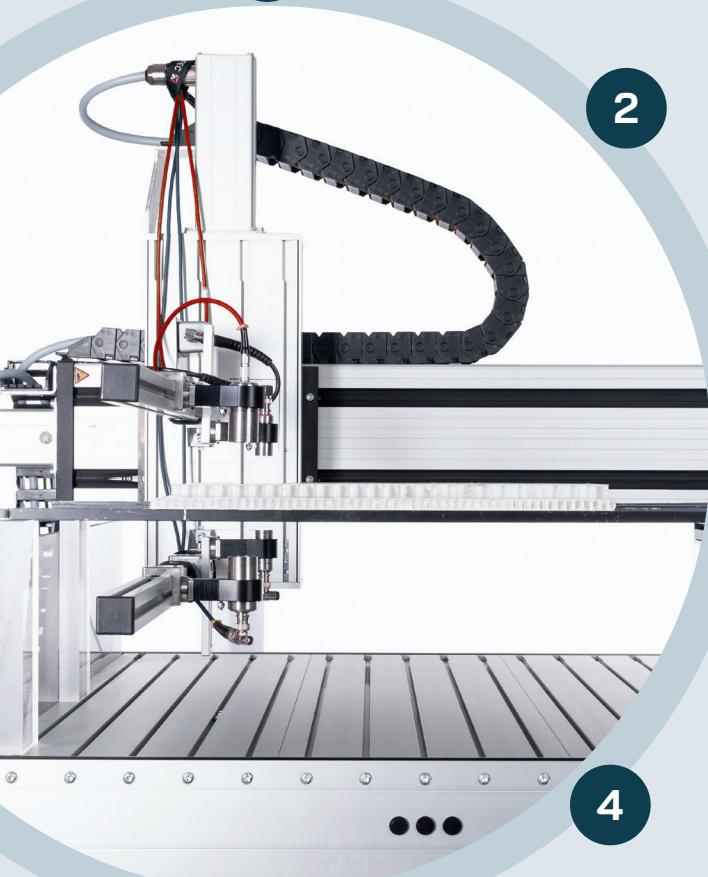
Electronics, Software, Probes & Scanner



Technology Leader

Strong partner for research, development, training and education

1



2



Air-coupled Probes

Max. resolution and highest sensitivity due to state of the art SONOTEC piezo-composite technology incl. element focusing

3



Up to 4 Channels

Up to 4 transmitter and receiver channels with freely configurable square-wave burst pulser and low-noise pre-amplifiers

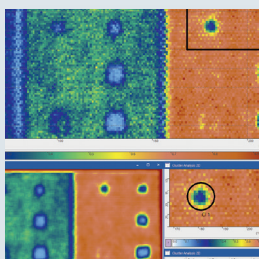
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High End Laboratory Electronics

High performance pulser-receiver system

5



SONOWARE

Laboratory friendly software for basic measurement and advanced analysis capabilities

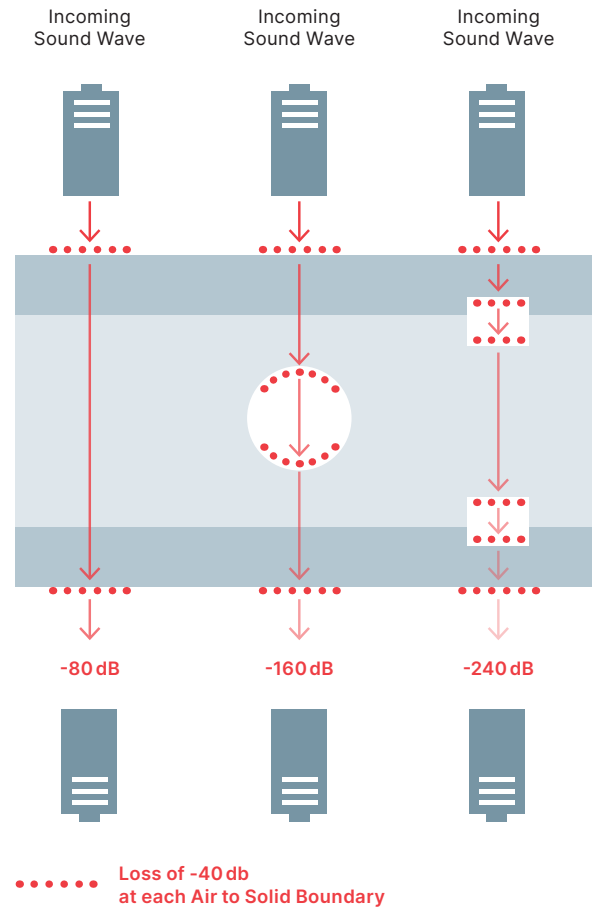
The Principle of Air-coupled Ultrasonic Testing

Considering modern developments in terms of light weight construction, climate change, renewable energies, cost efficiency and additive manufacturing non-contact air-coupled ultrasonic testing is rapidly gaining more importance again.

Due to their material or production dependent characteristics many test objects cannot be exposed to liquid couplant because they would macerate, delaminate, corrode or be destroyed in a different way. Even existing liquid coupled inspection systems (e.g. squirter or immersion) require time and cost consuming water supply, drainage or drying processes.

SONOAIR R&D features a free configuration of the sender characteristics with a pulser voltage of up to 800V. Through a combination of a pre-amplifier on the receiver (probe integrated or external) and a post-amplifier inside the electronics the system generates an ultra-low noise level of less than 1nV/√Hz.

The receiver dynamic of 120dB provides an industry leading signal to noise ratio (SNR) even with highly attenuating materials and leads to clear and reproduceable measurement results.



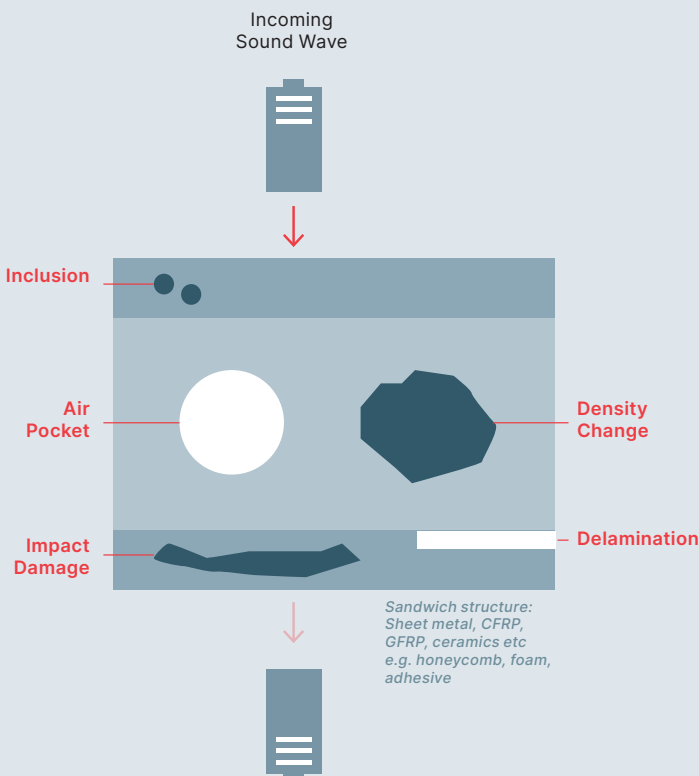
Method: Transmission

Air-coupled ultrasonic testing in through-transmission is the ideal measurement method to detect common defects in modern multilayer composite structures including delaminations, air inclusions, kissing bonds, and impact damages.

By using air as the couplant even very small defects can be located. With a wavelength in air of only 0.85 mm discontinuities from approximately 1 mm size can be detected.

In addition, the SONOAIR technology can be used to inspect highly attenuating materials which are impossible or difficult to test with liquid coupled ultrasonic inspection systems.

This applies particularly to foams, multi-layer honeycombs, plastics, ceramics, wood and concrete. Modern fibre-composite structures such as CFRP or GFRP can be inspected without any compromises with respect to minimum defect sizes compared to immersion or squirter ultrasonic testing systems.

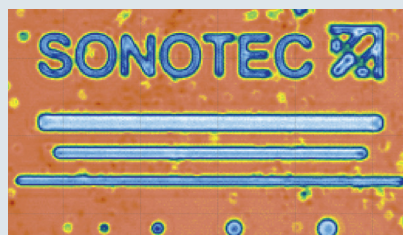
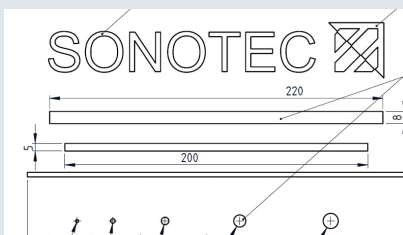


Application Samples (C-Scans)

SONOAIR R&D provides the flexibility to display measurement results via A-, C- or D-scans. In addition, the raw data is available for post-processing. The below C-scans represent a combined color-coded image consisting of the maximum amplitudes of each individual measurement point (A-scans).

The smallest detectable defect size and the level of ultrasound conductivity highly depend on the material characteristics, the expected defect type, the test frequency, the measurement resolution and the scanning speed. The sample scans have been recorded with a resolution of 1mm x 1mm and a scan speed of 100mm/s.

Bonded Plastic Plates



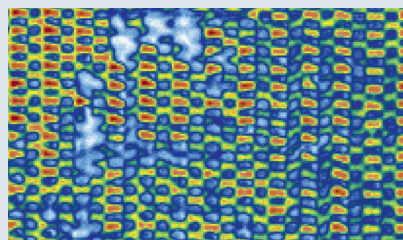
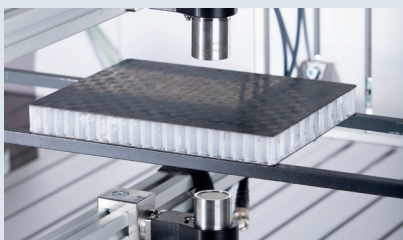
Test method: Transmission

Type of defect: air inclusions and incomplete adhesive adhesion

Probe: CF400

Defect size: min. \varnothing 2mm

Honeycomb Composite with CFRP Layers

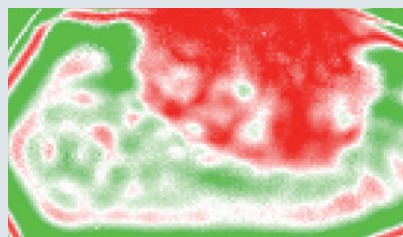
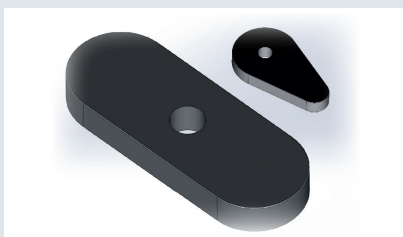


Test method: Transmission

Types of defects: impact damage and delaminated top layer

Probe: CFC230_D25_P65

Ceramics

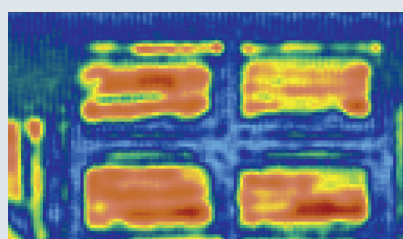
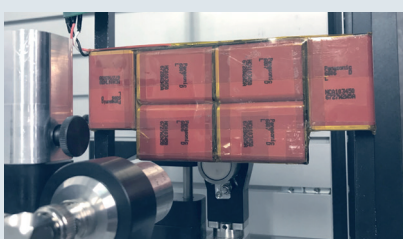


Test method: Transmission

Type of defects: delamination and density fluctuations before and after the sintering process

Probes: CF075 and CF1255

Battery



Test method: Transmission

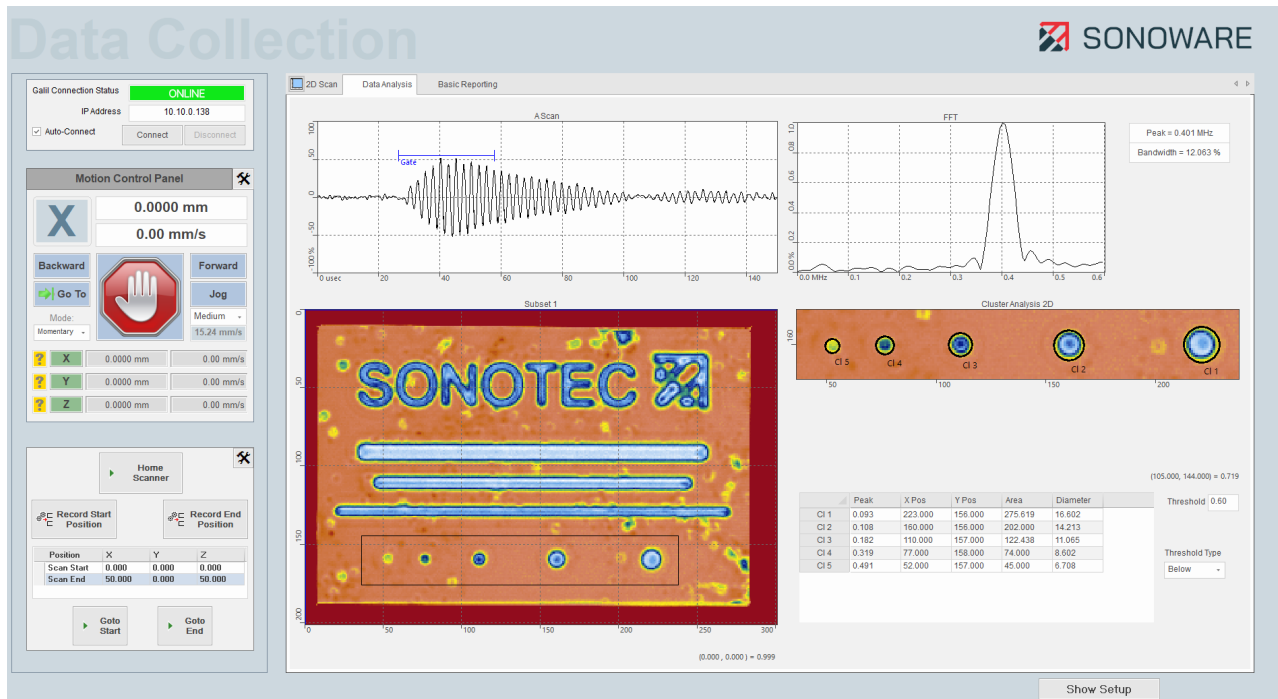
Type of defects: air pockets, electrolyte distribution

Probes: CF400

SONOWARE

Basic and Advanced Software

The SONOWARE inspection software for air-coupled ultrasonic testing was designed especially for the use in laboratories and offline production environments.



SONOWARE Basic is ideal for the fast inspection of test samples. The intuitive user interface enables the user to quickly parametrize the SONOAIR hardware, perform the measurement and evaluate the results.



SONOWARE Advanced is the perfect software to develop new test and evaluation methods. The complete raw data is available in a binary format. In addition, an extensive tool box of filters and post-processing capabilities is provided to optimize the measurement results.

CFC Ultrasonic Transducers for Non-contact UT

The ultrasonic probes SONOSCAN CFC are used for air-coupled ultrasonic testing with the SONOAIR system. The probes are produced with apertures of 12.5 mm, 19 mm and 25 mm. Transmitter and receiver are optimized for each other. The receivers are optionally available with integrated pre-amplifiers (several discrete amplification steps up to 80 dB).



Technical Data

General Data	
19" Unit consisting of	PC with Windows operating system and software; 14-bits digitizer, 100MS/s; Ultrasonic pulser unit; Ultrasonic receiver unit
Ambient Temperature	5°C ... 40°C
Network Interface	1Gbit/s LAN
Protection Class	IP20
Standards	DIN EN 61010, DIN EN 60204

Pulser	
Number of Channels	1 or 4
Pulse Height	Adjustable from 8V to 400V
Frequency Range	35kHz ... 3MHz
Maximum Power	2kW (400V), optional 4kW (800V)
Type	Square wave burst (freely configurable width for every pulse)

Receiver	
Number of Channels	1 or 4
Frequency Range	35kHz ... 750kHz
Gain	0dB ... 120dB, 0.5dB increment
Noise	1nV/√Hz

Scanner (Standard)	
Scanning Area (X × Y × Z)	500 mm × 500 mm × 160 mm (Other scanners on request)
Positioning Accuracy	20 μm
Scan Increment	0.1mm

SONOWARE Basic

- Intuitive and clear graphical user interface
- Separate windows for hardware parametrization (transmitter, receiver, scanner)
- Customizable screen layout
- Repositioning of the gates after the measurement
- Display of the measurement results as A-, B-, or D-Scan
- Storage of complete data sets

SONOWARE Advanced

- All functionalities of SONOWARE Basic included
- Storage of the complete A-scans for each measurement point
- Raw data access (e.g. for subsequent export to Matlab, LabVIEW, etc.)
- Individual signal processing algorithms, e.g. for filters
- Automatic post processing capabilities
- Multi-channel measurements
- Database support

Training

In cooperation with the ultrasonic research center „Forschungszentrum Ultraschall (FZ-U)“ we are offering training courses for air-coupled ultrasonic testing. The FZ-U is among the globally leading ultrasonic institutes and has a high expertise in the inspection of materials and structures through air-coupled UT.

The trainings consist of theoretical and practical parts including simulations and live testing demonstrations. In addition, participants can bring their own test samples to evaluate them professionally with the FZ-U experts.

Website: www.fz-u.de



Forschungszentrum
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