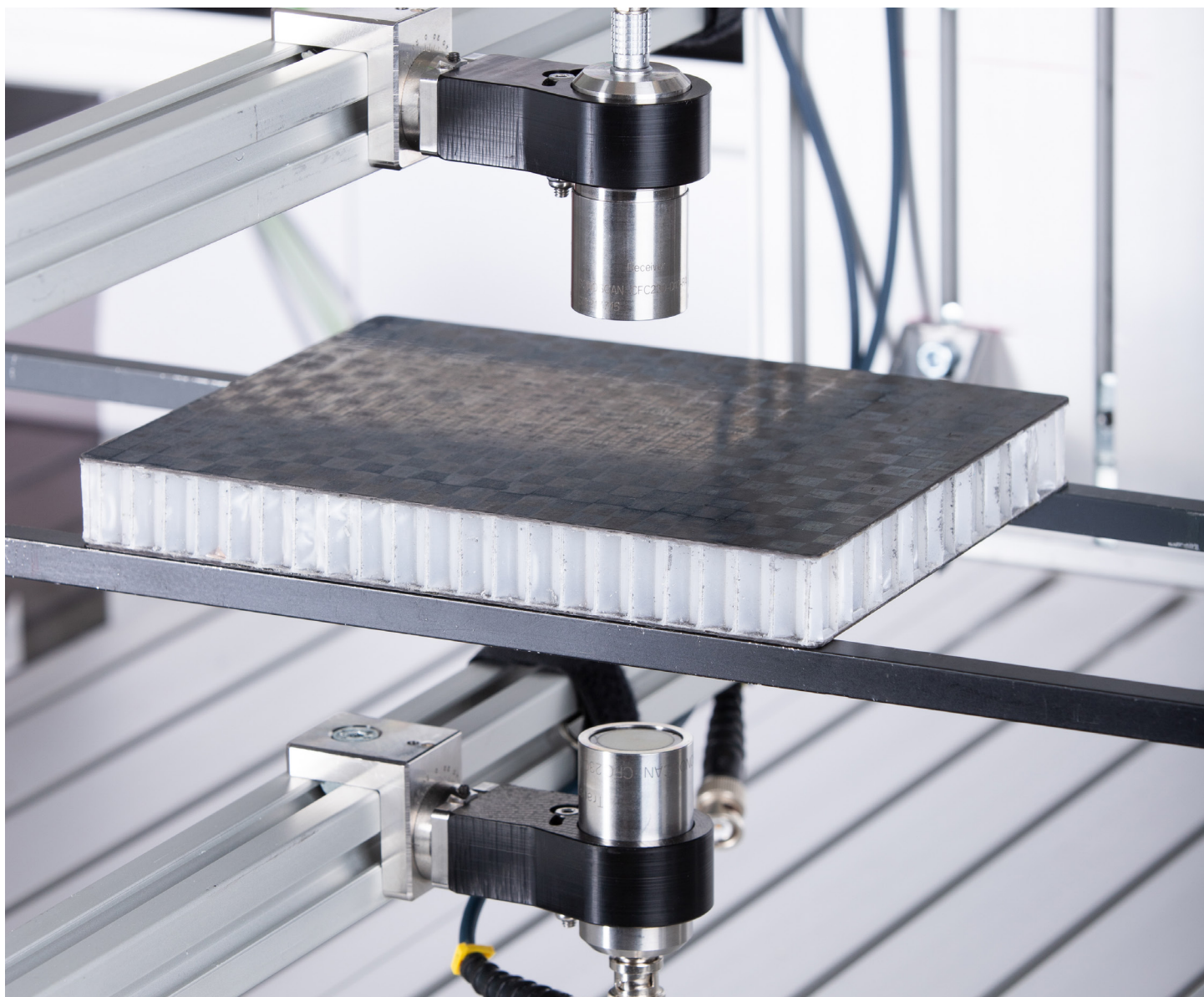


SONOAIR 



SONOAIR  **R&D**

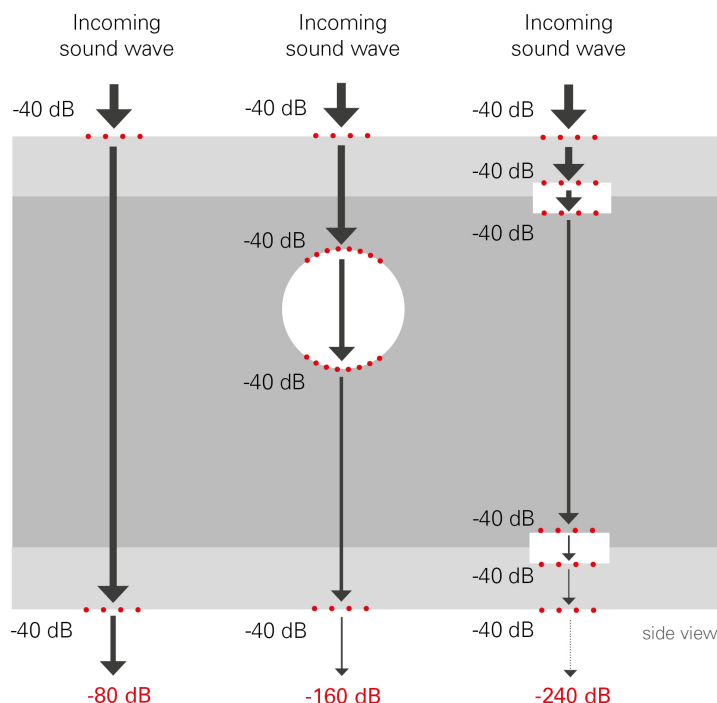
FOR NON-CONTACT ULTRASONIC TESTING

MADE IN GERMANY

SONOTEC 
ULTRASONIC SOLUTIONS

THE PRINCIPLE OF AIR-COUPLED ULTRASONIC TESTING

In contrast to conventional ultrasonic testing there is no need for liquid couplant and no direct contact with the test object. Air-coupled ultrasonic testing is not a completely new technology. Already in the 1970s, air-coupled ultrasonic testing was used primarily in the aerospace industry. The capabilities of the early systems were rather limited (defect resolution, sensitivity, software post-processing, modularity, etc.) and have never been developed further.



.....
Loss of -40 dB at each air to solid boundary

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 800 V. 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/ $\sqrt{\text{Hz}}$.

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

Fig. 1 Principle of air-coupled ultrasonic testing

MEASUREMENT 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.

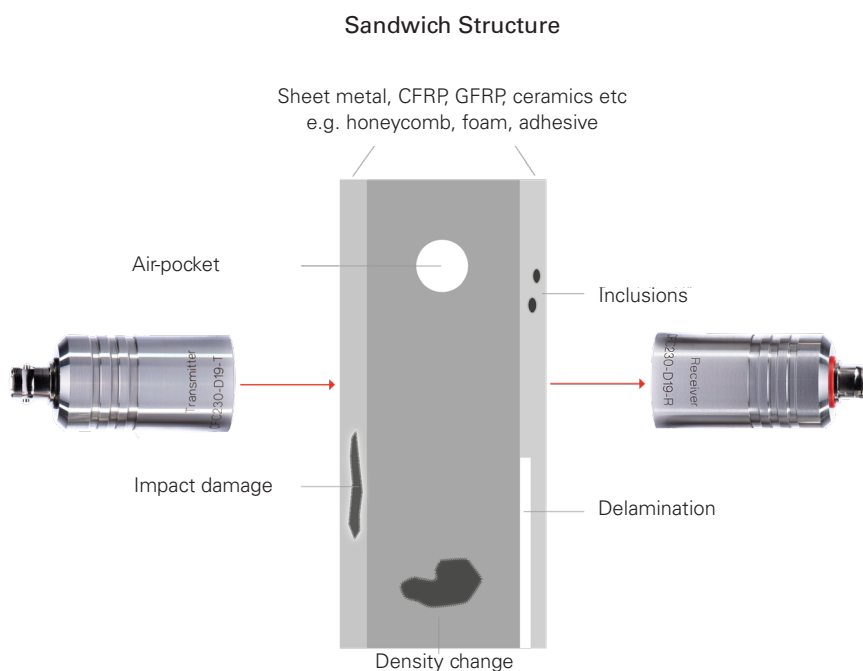
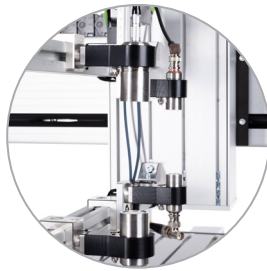


Fig. 2 Measurement setup - transmission



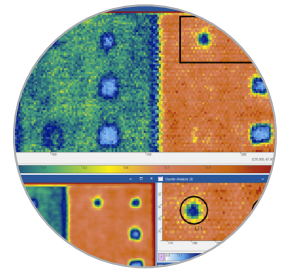
AIR-COUPLED PROBES

Maximum resolution and highest sensitivity due to state of the art SONOTEC piezo-composite technology including element focusing



MODULARITY

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



SONOWARE SOFTWARE

Laboratory friendly software for basic measurement and advanced analysis capabilities



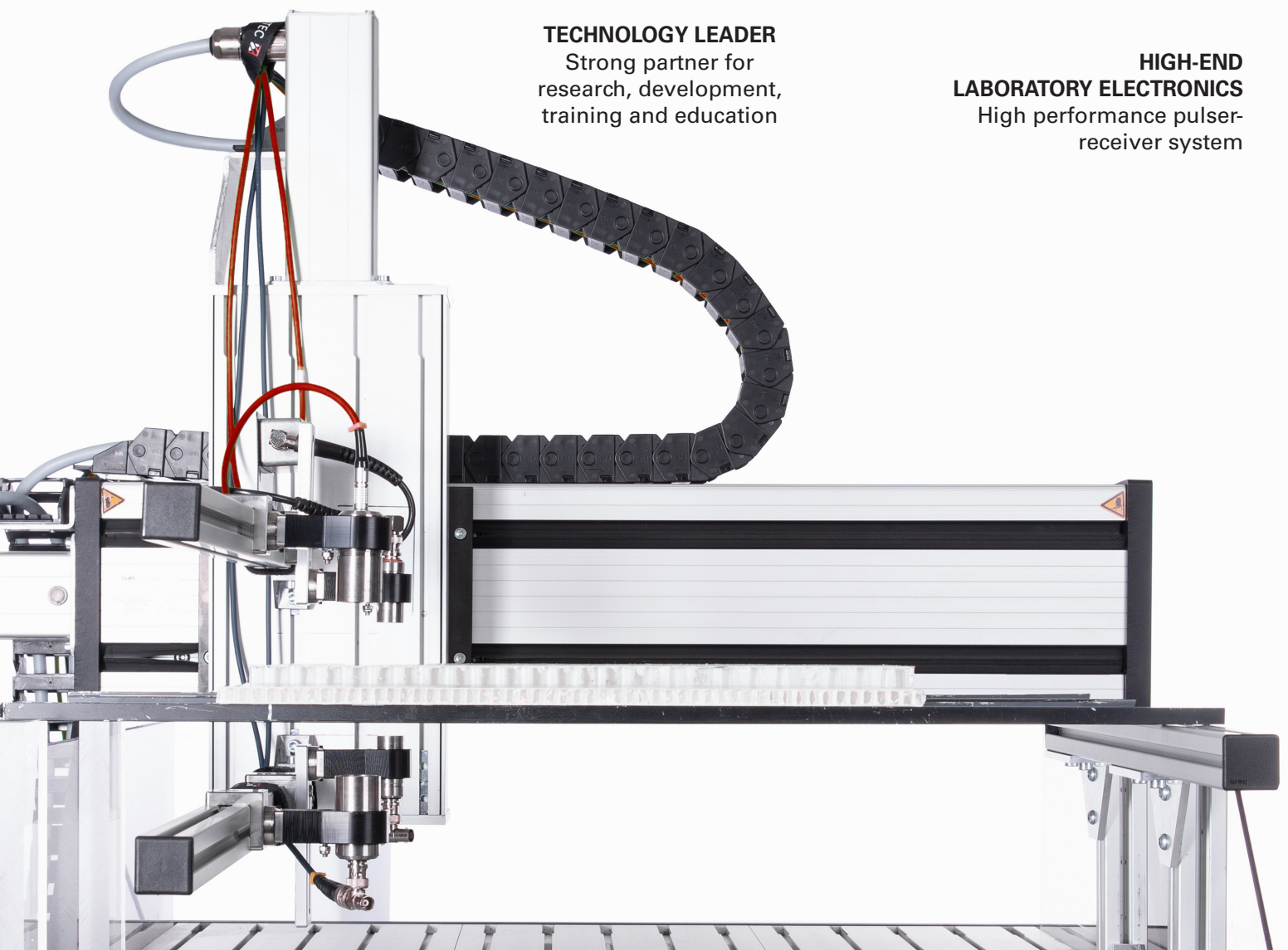
TECHNOLOGY LEADER

Strong partner for research, development, training and education



HIGH-END LABORATORY ELECTRONICS

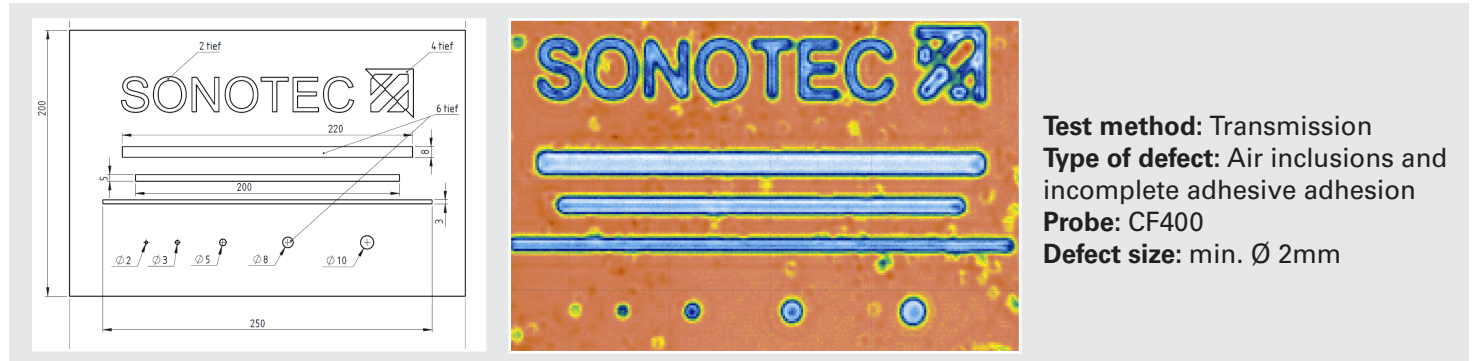
High performance pulser-receiver system



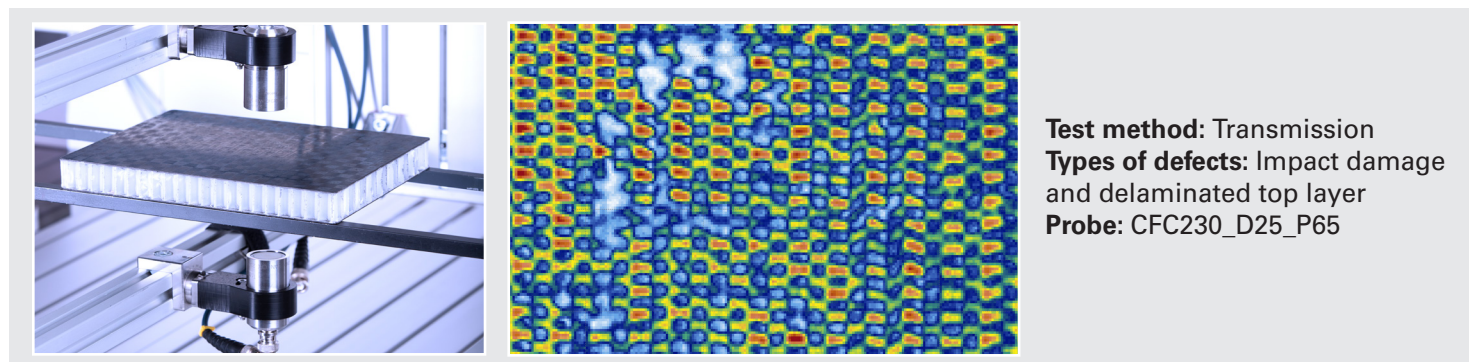
SAMPLE APPLICATIONS

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 1 x 1 mm and a scan speed of 100 mm/s.

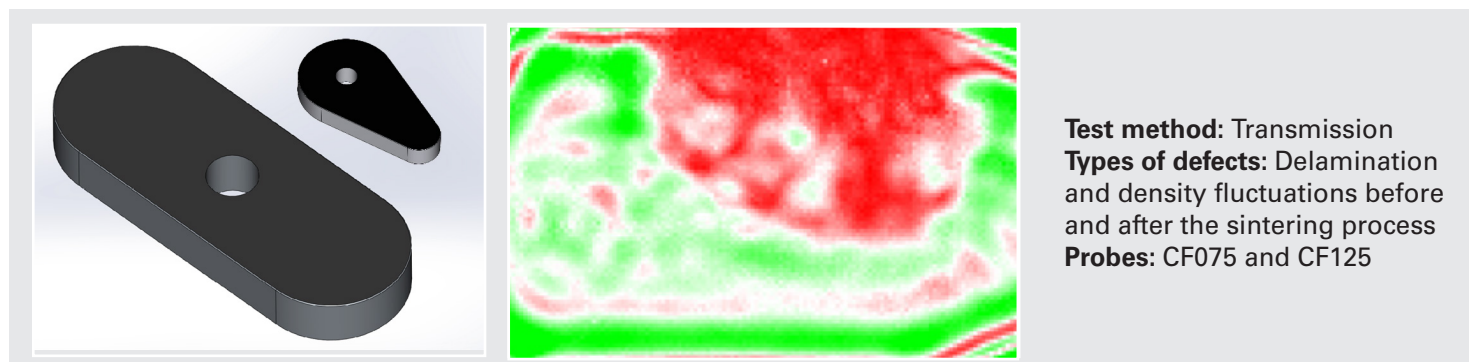
Bonded Plastic Plates



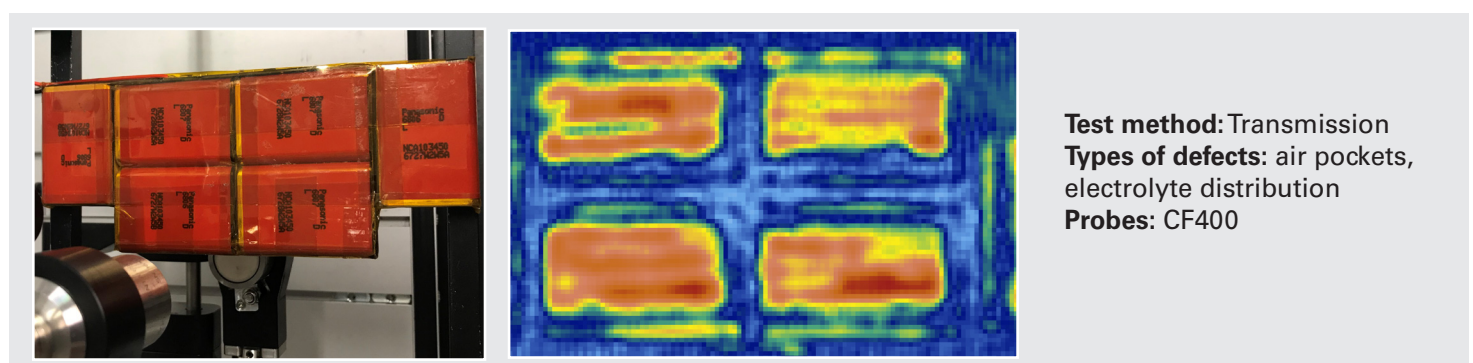
Honeycomb Composite with CFRP Layers



High Performance Ceramic



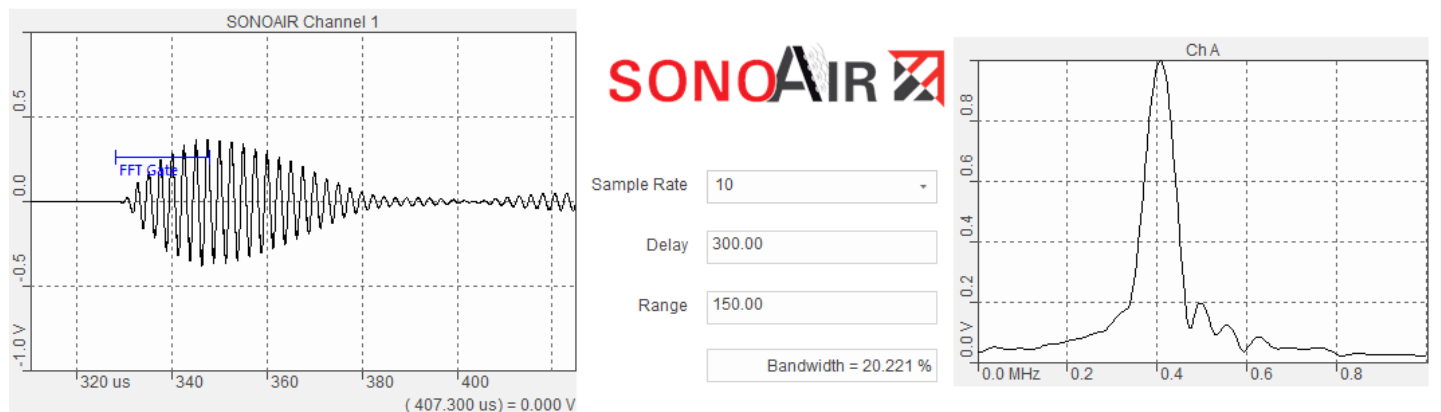
Battery



Software SONOWARE

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.

SONOAIR 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 PROBES FOR NON-CONTACT ULTRASONIC INSPECTIONS



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|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).



All SONOSCAN CFC probes are manufactured with the SONOTEC piezo-composite technology in Halle (Saale), Germany.

TECHNICAL DATA

GENERAL DATA

19" unit consisting of PC with Windows operating system and software;
14-bits digitizer, 100 MS/s;
Ultrasonic pulser unit;
Ultrasonic receiver unit

Operating temperature 5 to 40 °C

Network interface 1 GBit/s LAN

Protection class IP20

Standards DIN EN 61010, DIN EN 60204

PULSER

Number of channels 1 or 4

Pulse height Adjustable from 8 to 400 V

Frequency range 35 kHz to 3 MHz

Maximum power 2 kW (400 V), optional 4 kW (800 V)

Type Square wave burst (freely configurable width for every pulse)

RECEIVER

Number of channels 1 or 4

Frequency range 35 kHz to 750 kHz

Gain 0 to 120 dB, 0.5 dB increment

Noise 1 nV/√Hz

SCANNER (STANDARD)

Scanning area (X x Y x Z) 500 x 500 x 160 mm
(Other scanners on request)

Positioning accuracy 20 µm

Scan increment 0,1 mm

Scan orientation Typically horizontal

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 ultrasonic testing.

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.

Contact: www.fz-u.de



Forschungszentrum
Ultraschall



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SONOTEC



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