

# Flexus Concrete

## Automated Ultrasonic Imaging System for Concrete Elements

### Applications

- Automated inspection of bridges, cross beams, surface plates
- Detection of tendon ducts and other built-in parts
- Detection and location of defects
- One-sided thickness measurement

Flexus enables the visualization of the inner parts of concrete elements at one-sided access. Only the combination of optimal transducer excitation, use of a transducer array, extremely low-noise amplification, hardware bandpass filters, and the Synthetic Aperture Focusing Technique (SAFT) reconstruction algorithm provide highest resolution and best penetration. Three-dimensional images of concrete regions visible on-site enable new applications in civil engineering.

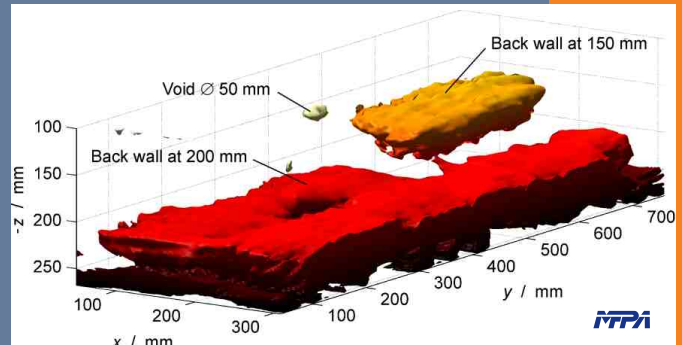
Electronic scanning using a transducer array improves the measuring time by a factor of 10 to at least 12 min/m<sup>2</sup> concrete surface. A special SAFT-algorithm calculates three dimensional images from about 2600 measurements/m<sup>2</sup>. The image is available directly after the measurement. Depending on operating conditions, objects with minimal lateral dimensions of 5 cm can be detected.

### The measurement and imaging system Flexus consists of the following components:

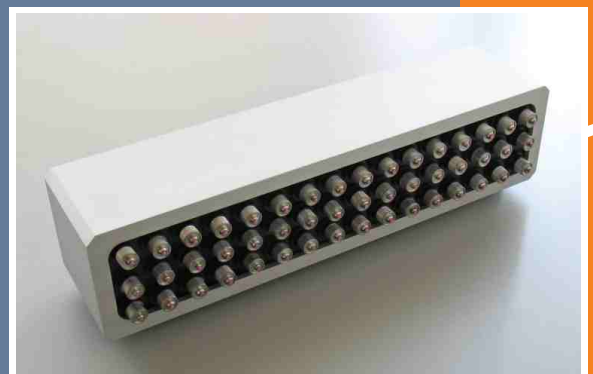
- Low frequency ultrasonic system USPC 3041
- Ultrasonic array with 48 transducers and 16 channels, electronically switched by a multiplexer
- Automated scanner with three axes and software-controlled movement of the transducer array
- SAFT imaging and image evaluation software for the calculation and presentation of two-dimensional and three-dimensional images directly on-site.

The development of Flexus was carried out in co-operation with the MFPA Weimar, Germany ([www.mfpa.de/zfp](http://www.mfpa.de/zfp)), and was supported by the German government (BMWA, PRO INNO II).

A customized adaption of the imaging system is possible.



3D- SAFT-image of the interior of a concrete specimen with a hollow sphere of 50 mm  $\varnothing$  and back wall misalignment



Transducer-array with 48 elements



Components of Flexus Concrete : ultrasonic system, transducer array, multiplexer, and scanner with controller

Images: MFPA Weimar