



## PHASED ARRAY ULTRASONIC TEST SYSTEM FOR WHEELSET SOLID SHAFT TESTING

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In order to avoid accidents and incidents in rail operation, non-destructive test methods are used for the maintenance of railway vehicles. By applying complex measurement systems, fine cracks or corrosion can be identified and evaluated.

Regarding vehicles in the rail freight transport, wheelset solid shafts are mainly used. These parts are susceptible to defects and fatigue due to their usage profile (high alternating load, operational performance, rail condition). The wheelset solid shafts are removed as part of the scheduled maintenance and tested for possible defects with ultrasonic technology. So far, the Deutsche Bahn used partly automated phased array inspection systems of the first generation.

Within the scope of an industrial project involving Fraunhofer IKTS, the system integrator arxes-tolina GmbH and the mechanics partner BIP-Industrietechnik GmbH, these inspection plants were replaced by optimized ones.

In the new plants, several ultrasonic devices type "PCUS® pro Array" are utilized together with the fully automated test software "PCUS® pro Lab". The ultrasonic devices, developed at IKTS and optimized for industrial operations, are characterized by a compact design, high channel numbers, an extraordinary signal-noise ratio as well as an outstanding data transmission rate. Their compact design allows the assembly close to the test probes. So, interferences and signal distortions, which are accompanied by long signal cables, are minimized.

The test software developed at IKTS was improved and optimized as part of a project together with arxes-tolina GmbH. It enables a fast and reliable evaluation of ultrasonic images while simultaneously operating the software intuitively and ergonomically. In the process, the software is capable of parallel actuating all ultrasonic test devices integrated in the inspection system and therefore, minimizing the predefined cycle time by simultaneously using several phased array probes.

As part of the industrial project, phased array probes were manufactured at IKTS and adjusted to the requirements provided by arxes-tolina GmbH, to be able to test varnished and coated wheelset solid shafts with high susceptibility. Hence, the previously necessary mechanical pre-treatment of the shaft surface, for example, by sandblasting is omitted. In addition, the specifically curved probes can be applied for all shaft designs.

The newly developed ultrasonic test systems are optimized with focus on high reliability, long lifetime, minimal wear and, thus, low maintenance and repair cost.

Two plants were already set up by the DB Fahrzeuginstandhaltung GmbH (heavy maintenance) and accepted after the test operation. These systems serve as reference for international industrial partners. Currently, there are ongoing negotiations about further plants.

### Services offered

- Ultrasonic systems according to customer specifications
- Development and adjustment of test software
- Development of high-performance test electronics

**1** *Optimized non-destructive testing of wheelset solid shafts used in rail freight transport.*