

Press Release

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Fraunhofer IZFP at InnoTrans 2026

New ultrasonic solutions for greater safety and efficiency in rail freight transport

At InnoTrans 2026 in Berlin, the Fraunhofer Institute for Nondestructive Testing IZFP in Saarbrücken will present two new technological solutions for the ultrasonic testing of wheelsets in rail transport: The focus is on the “UER” system for evaluating residual stresses in railway wheels and “PASAWIS,” a mobile handheld ultrasonic testing system for comprehensive wheelset inspection. Both developments enable more efficient, automated, and digitized maintenance processes in rail freight transport. Visitors can find Fraunhofer IZFP from September 22 to 25, 2026, at the Fraunhofer Gesellschaft’s joint booth in Hall 23, Booth 240.

Researchers from Fraunhofer IZFP will provide practical insights into current research results and specific use cases on all four days of the trade show. Industry professionals will have the opportunity to engage directly with our team of experts and discuss specific application possibilities for the technologies, as both systems address current challenges in safety-critical wheelset maintenance—ranging from the precise evaluation of material-related residual stress conditions to fully digital and documented ultrasonic testing of complete wheelsets.

UER – Ultrasonic Residual Stress Evaluation: compact, connected, flexible

The reliable determination of residual stress in railway wheels is a central component of safety-critical maintenance for many decades. The goal is to detect critical stress conditions at an early stage, prevent stress-induced crack propagation into the wheel rim, and thereby avoid related accidents.

With UER (Ultrasonic Residual Stress Measurement on Wheel Rims), Fraunhofer IZFP presents the fourth generation of its established ultrasonic testing system: The new version has undergone comprehensive technical modernization and has been adapted to the current requirements and challenges of industrial workshop environments. Thanks to an optimized inspection process the efficiency increased significantly; the inspection effort is reduced by about one-third, while energy consumption and computing requirements are also lowered.

A key feature of UER is the complete integration of all control, communication, and ultrasonic components into a compact embedded system. The tough design enables reliable, continuous industrial use. All control components have been modernized, ensuring long-term availability of spare parts and making the system future-proof.

Operation is fully cross platform compatible via an integrated web application, allowing any internet-connected device to serve as a user interface. This concept is complemented by Wi-Fi-based communication for flexible use in workshops and production environments.

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Since its first fully automated implementation in 1993, the technology developed by Fraunhofer IZFP has been recognized as a proven solution for non-contact ultrasonic TOF (time-of-flight) measurement to evaluate residual stress in railway wheels. With the new UER, this technology is now being systematically further developed and adapted to the modern requirements of full digital maintenance environment.

PASAWIS – Ultrasonic testing system for complete wheelset inspection: mobile, digital, interoperable

With PASAWIS (Phased Array Semi-Automated Wheelset Inspection System), Fraunhofer IZFP is introducing a mobile semi-automated testing system for the complete ultrasonic inspection of wheelsets. The system was developed specifically for small and medium-sized maintenance workshops and, for the first time, enables a fully documented mobile ultrasonic inspection of all relevant wheelset areas.

PASAWIS combines three ultrasonic sensor systems for inspecting the wheel shaft, rim, and tread. This allows the entire wheelset to be inspected using a single mobile inspection system. A key advantage is the complete digital recording of all inspection data. This data is stored locally and can be transferred via interfaces to databases, document management systems, or cloud-based solutions. Data management is performed in the standardized DICONDE format in accordance with ASTM E2633-14, ensuring high interoperability and long-term archiving.

The software automatically generates customized inspection reports containing measurement data, graphical analyses, and metadata for the respective wheelset. Additionally, the reports are digitally signed, ensuring data integrity and traceability. Assistive functions intuitively guide the operator through the entire inspection process and enable a short training period. The entire inspection process can be carried out by a single person; the inspection time is approximately 15 minutes per wheelset.

Since PASAWIS can inspect not only the wheel shaft and rim but also the wheel tread using ultrasound, additional methods such as eddy current or magnetic particle testing are no longer necessary. This significantly reduces organizational effort and simplifies qualification requirements.

With UER and PASAWIS, Fraunhofer IZFP will showcase the next step in the development of modern ultrasonic testing technology at InnoTrans 2026: This marks a shift from stand-alone testing processes toward intelligently networked, fully digitized, and practical testing systems for industrial rail transport.



Fig. 1: UER system – Ultrasonic residual stress testing on railway wheels
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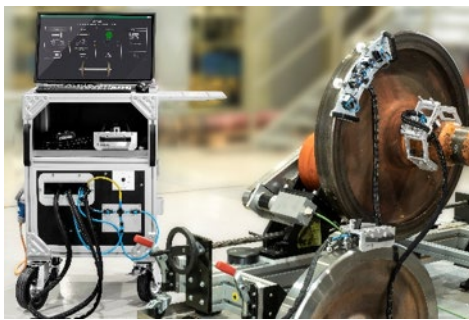


Fig. 2: PASAWIS – A wheelset inspection system that can be used mobile in production
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