



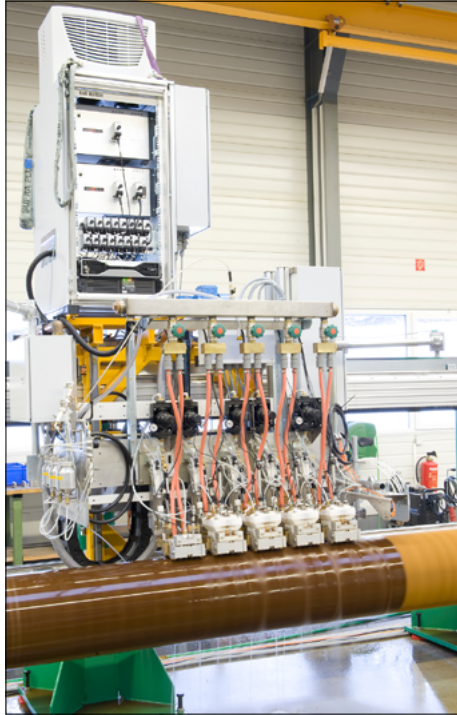
ECHOGRAPH RPTR and RPTR PAUT

Ultrasonic and PAUT Inspection of Tubes with Testing Portal

KARL DEUTSCH

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Probe holders for the detection of longitudinal defects, transverse defects and laminations. Also the wall thickness is measured. In this case, the phased array technique is employed.

Ultrasonic tube inspection with testing portal

KARL DEUTSCH has developed ultrasonic testing equipment since 1951 and has shipped the first inspection system for seamless tubes more than 50 years ago. Many improvements for the ECHOGRAPH electronics, the robust testing mechanics and the ultrasonic probes have led to our current state-of-the-art. All components (testing electronics, testing mechanics, ultrasonic probes) are developed and assembled in-house. KARL DEUTSCH maintains a strict quality management system according to DIN EN ISO 9001 which was firstly certified in 1993!

Unique about this testing system is the way to couple the ultrasound into the specimen. Water jet coupling is used, which means that the water path between probe and tube surface is in the order of several centimetres. This method of ultrasonic coupling results in little wear for the probes and the probe guiding devices. Also for a rough tube surface, stable coupling conditions are achieved because the water path can vary more than with gap coupling. The UT system ECHOGRAPH RPTR is designed for rough environmental conditions and a high through-

put. This system is especially suitable for an off-line inspection. It consists of a testing portal and several multi-probe holders. The tubes are typically loaded with a transverse conveyor. Once the tubes are placed in the testing portal, rollers put the tubes into rotation. The number of probe holders is chosen in accordance with the desired throughput and the respective testing task(s). The probe holders are linearly moved along the tube and inspect the tube in the 12 o'clock position. Rotational and translatory movements result in helical test traces.

Many testing tasks are possible. ERW-tubes (electric-resistance welded tubes with longitudinal weld seam) are tested for laminations, i.e. with straight-beam probes. Also the wall thickness can be measured with this setup. Seamless tubes are typically tested for longitudinal and transverse defects, delamination as well as wall thickness. Newer specifications additionally require detection of oblique defects. Ultrasonic incidence is produced in the clockwise and the anti-clockwise direction. Some specifications also ask for the detection of transverse defects. In that case, ultrasonic incidence is produced in both axial directions of the tube.

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Key Features

- Complete full body inspection in a single pass
- No untested zones
- Space-efficient integration into existing production lines
- Built for continuous high-speed production
- Advanced gimbal-mounted probe holders and sealed water chambers for excellent coupling conditions with minimal water consumption

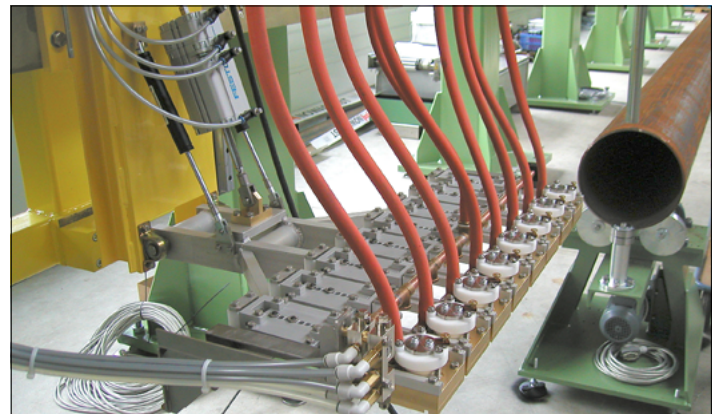
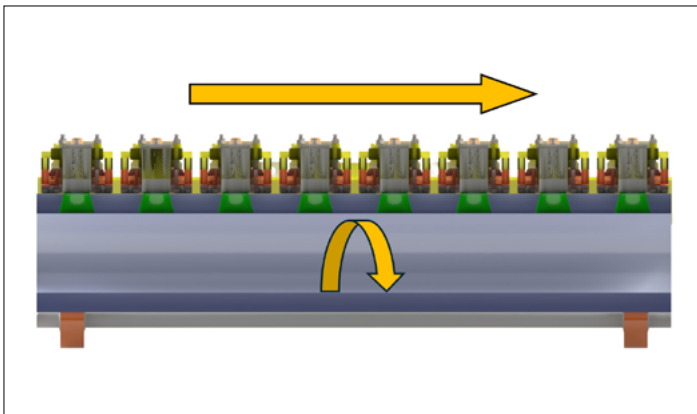


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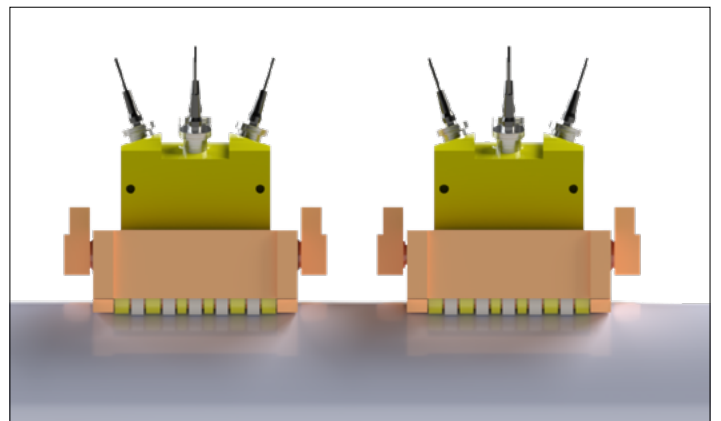
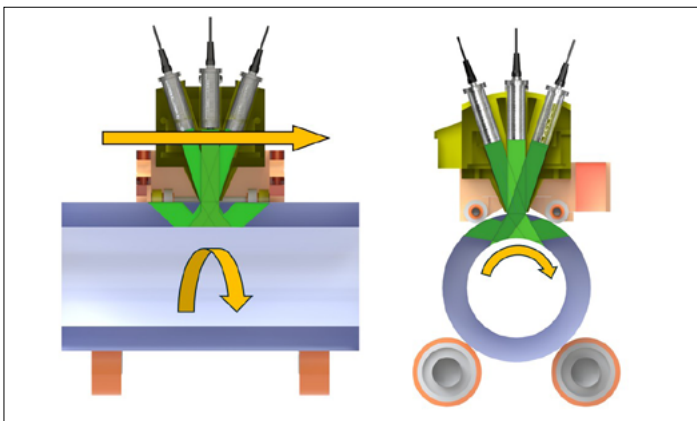
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In this application, transverse loading and discharging of the pipes is used. The entire process is fully automated.



Inspection of tubes with longitudinal weld (ERW tubes): In this example, eight ultrasonic probes are employed. Dependent on the throughput and coverage requirements, either gap coupling with broad-beam dual-element probes or squirter coupling with single-crystal probes is carried out. Each probe holder is flexibly mounted to ensure perfect guidance on the tube surface.



Inspection of tubes with 5 incidence directions: In this example, 5 ultrasonic probes are mounted into each probe holder. Each probe holder is individually lowered and lifted for short untested tube ends. Water jet coupling is employed to obtain stable coupling conditions. Longitudinal and transverse defects are detected with angular incidence. The testing angle is typically chosen to 45° within the tube material. Straight-beam testing is used to detect laminations and to measure the wall thickness.

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	ECHOGRAPH RPTR	ECHOGRAPH RPTR PAUT
Applications	ERW-welded or seamless tubes and cold drawn tubes	ERW-welded tubes and seamless tubes
Tube diameter (D)	40 – 1,000 mm	60 – 1,000 mm
Wall thickness (s)	2 – 100 mm	3 – 100 mm
s/D-Ratio	up to 0.2	up to 0.25
Tube length	4.0 – 15.3 m (scalable as required)	
Inspection capabilities	▪ Flaw inspection for longitudinal (LT), transverse (TF) and lamination (LAM) defects ▪ Wall thickness (WT) and eccentricity measurement and inspection for round bottom grooves	▪ All ECHOGRAPH RPTR capabilities ▪ Oblique flaw inspection up to $\pm 30^\circ$ ▪ Extended oblique flaw inspection up to $\pm 75^\circ$
Wall thickness measurement accuracy	dynamic ± 0.05 mm	
Inspection speed (circumferential)	up to 1,500 mm/s	up to 2,000 mm/s
Standards and compliance	API 5L, API 5CT, ISO 10893-10 (Parts 12, 14), EN 10246-6 (Parts 13, 14), GB/T 5777-2019	
System options	▪ Flaw marking device for location-true separate marking of all flaws ▪ Extended diameter or wall thickness ranges ▪ Integration into Level 2 or MES systems ▪ Automated data exchange and reporting ▪ Remote service and diagnostics ▪ Testing roller stations ▪ Calibration roller stations ▪ Stopper devices ▪ Reference pipes	▪ All ECHOGRAPH RPTR system options ▪ Alternative phased array probe configurations ▪ Gapless oblique flaw inspection

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