

ECHOGRAPH HRPR

High-Speed Ultrasonic Inspection of Tubes

KARL DEUTSCH

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View of the test table with sliding possibility and with two immersion test chambers. The shown system is designed for tube diameters up to 170 mm. Longitudinal defects are detected and the wall thickness is measured. 40 ultrasonic channels are used.

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High test speed and little mechanical wear are key features of the patented HRP-testing concept. No rotating mechanical components are used. ECHOGRAPH HRPR: Well-proven in the industry for more than 30 years !

For tube inspection with automated throughput at high testing speed, special testing chambers with exchangeable probe cassettes were designed. Non-contact ultrasonic coupling is carried out in immersion technique. The ultrasonic probes are mounted to probe cassettes. The cassettes are available in various sizes depending on the respective tube diameter. All probes are arranged around the tube axis with a fixed distance (water path) to the tube surface. The sound fields produce overlap in the circumferential and axial direction.

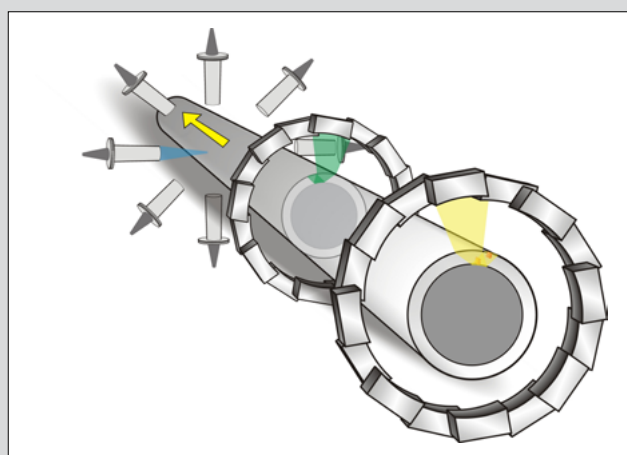
The ultrasonic probe configuration is dependent on the testing task and the respective specification:

- Longitudinal flaw detection with 16 probes transmitting ultrasound in the clockwise direction. Another 16 probes are designated for the anti-clockwise direction. Ultrasound enters the tube under a refraction angle between 30° and 70° (adjustable dependent on the ratio of wall thickness and diameter). One probe cassette carries 16 probes. Therefore, one set of two cassettes is required during the inspection. One cassette size can be used for a diameter range of approximately 20 mm. More than one set is used to cover a larger diameter range.
- Transverse flaw inspection with 8 probes orientated in feeding direction, and 8 probes orientated against the feeding direction, penetrating with 45° angle of refraction (option).
- Combined wall thickness measurement and lamination inspection with 8 probes with normal sound incidence (option).

The closing mechanisms of the testing chambers are designed for tube inspection without plugged ends. Even shorter untested tube ends can be achieved by plugging the tubes or by testing the tubes end by end.



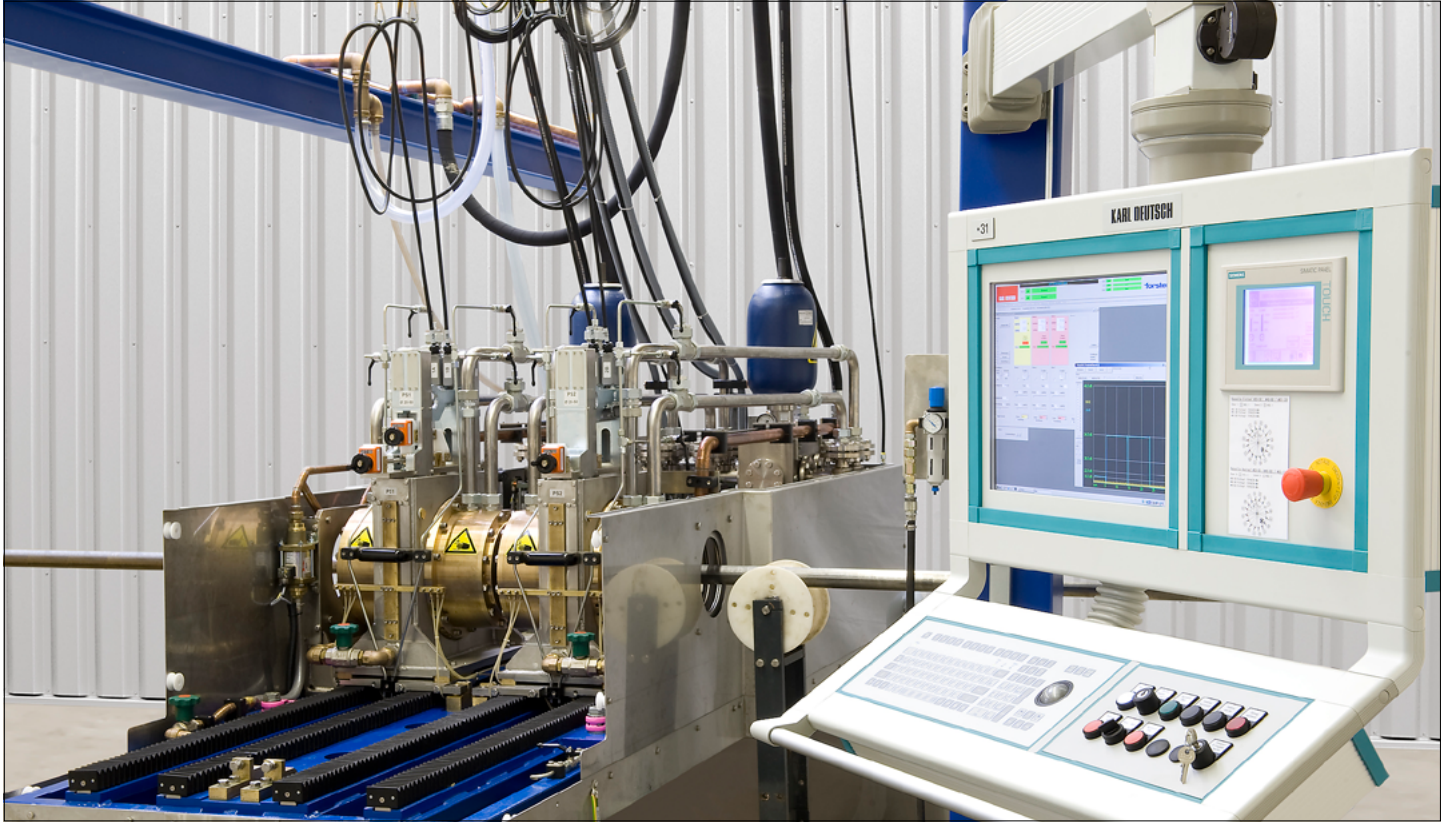
Fast system calibration using the automated sensitivity adjustment, i.e. each probe is adjusted to the same sensitivity.



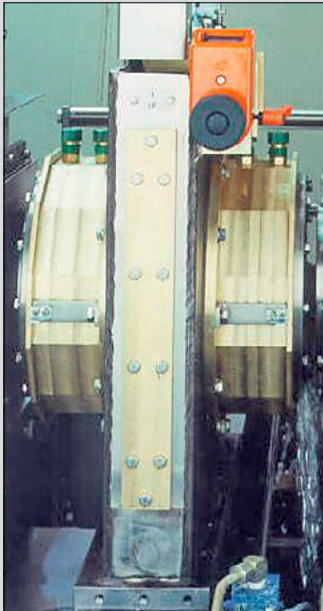
Two probe rings to detect longitudinal defects (yellow: clockwise incidence, green: counter-clockwise) and another ring to measure the wall thickness (blue).

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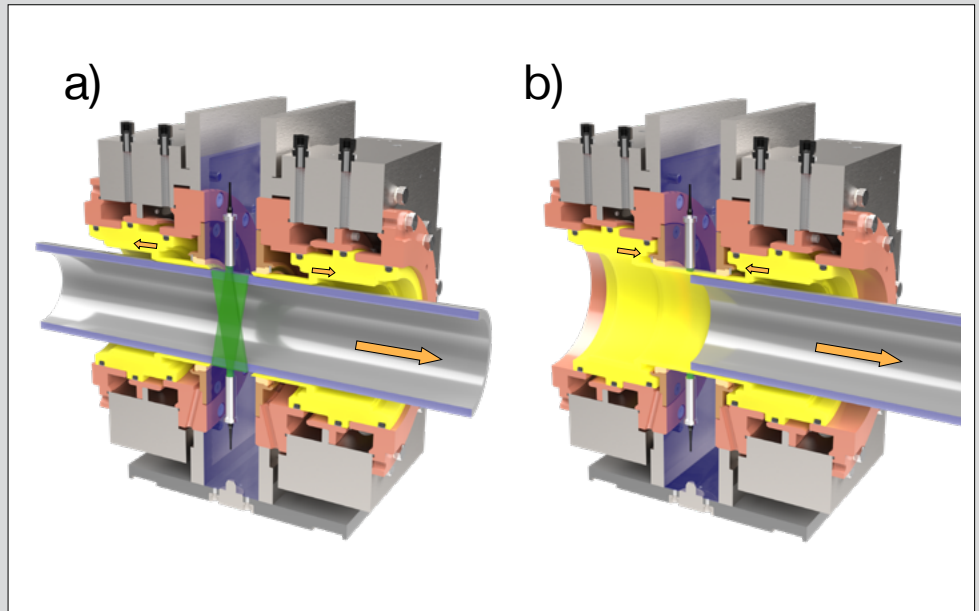
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Tube testing system and operator panel to adjust the ultrasonic test parameters and the PLC parameters (Siemens).



Immersion test chamber for high-speed tube testing



Quick-sliding sleeves open and close the immersion chamber during the inspection and provide short untested tube ends: a) Open test chamber during test, b) Closed test chamber after tube is tested.

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Applications	seamless or welded tubes (online/offline testing)
Processing stage	rolled, drawn, stretch-reduced, welded, extruded, turned, grinded
Pipe diameter range	10 – 180 mm
Wall thickness range	1.0 – 10 mm
Straightness deviation	max. 1 mm/m
s/D-Ratio	< 0.2
Surface condition	as rolled, without loose scale or better
Pipe ends	machined, no burr
Inspection capabilities	<ul style="list-style-type: none">▪ Longitudinal defect detection▪ Optional: Wall thickness measurement, transverse defect detection
Standards and compliance	API 5L

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