

ECHOGRAPH-HRP.R

High-Speed Ultrasonic Inspection of Tubes

KARL DEUTSCH

ECHOGRAPH-HRP.R

High-Speed Ultrasonic Inspection of Tubes



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.

High-Speed Ultrasonic Inspection of Tubes

High test speed and little mechanical wear are key features of the patented HRP-testing concept. No rotating mechanical components are used. HRP: Well-proven in the industry for more than 15 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 (sound 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 penetrates into the tube under a refraction angle between 30° to 70° (adjustable de-

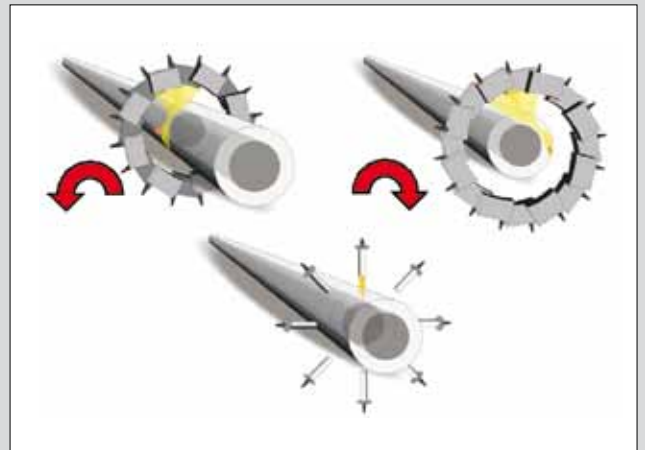
pendent on the ratio of wall thickness and diameter). One probe cassette carries 16 probes. Therefore, one set of two cassettes is required during the inspection. One cassette size can be used for a diameter range of approximately 20 mm. More than one set is used to cover a larger diameter range.

- 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.



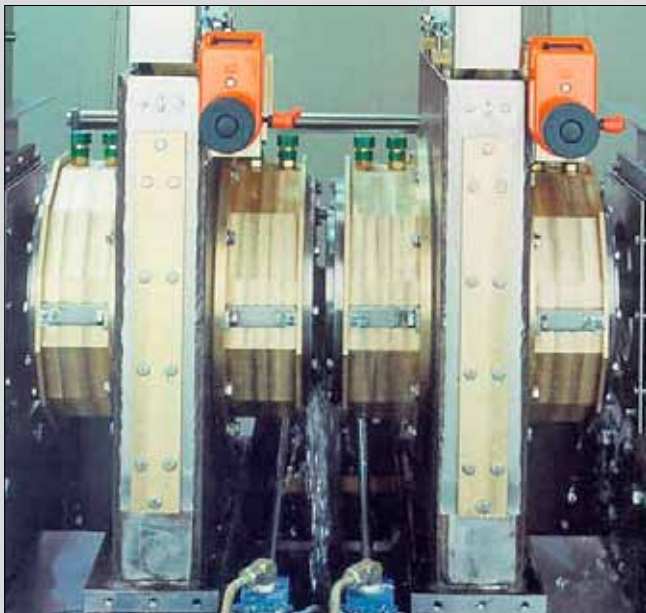
Probe configuration to detect longitudinal cracks and to measure the wall thickness.

ECHOGRAPH-HRP.R

High-Speed Ultrasonic Inspection of Tubes



Onsite view of tube testing system (output side)



Two test chambers for longitudinal defect detection. Fast closing mechanisms guarantee short untested tube ends.



Test cassette with ring of ultrasonic probes and central adjustment of the testing angle by means of the orange dial.

ECHOGRAPH-HRP.R

High-Speed Ultrasonic Inspection of Tubes



Special line-focussed probes for angular incidence in different sizes to test the respective bar diameters. Each probe covers 30 degree of the bar surface – independent of the bar diameter.

Specimens	
Pipes	
Diameter range (D)	10 - 170 mm
Specimen ends	machined, no burr
Straightness deviation	max. 1 mm/m
Surface condition	as rolled, without loose scale or better
Processing stage	rolled, drawn, stretch-reduced, welded, extruded, turned, grinded
Seamless or Welded Tubes	
Wall thickness (s)	> 0.3 mm
s/D-Ratio	< 0.2