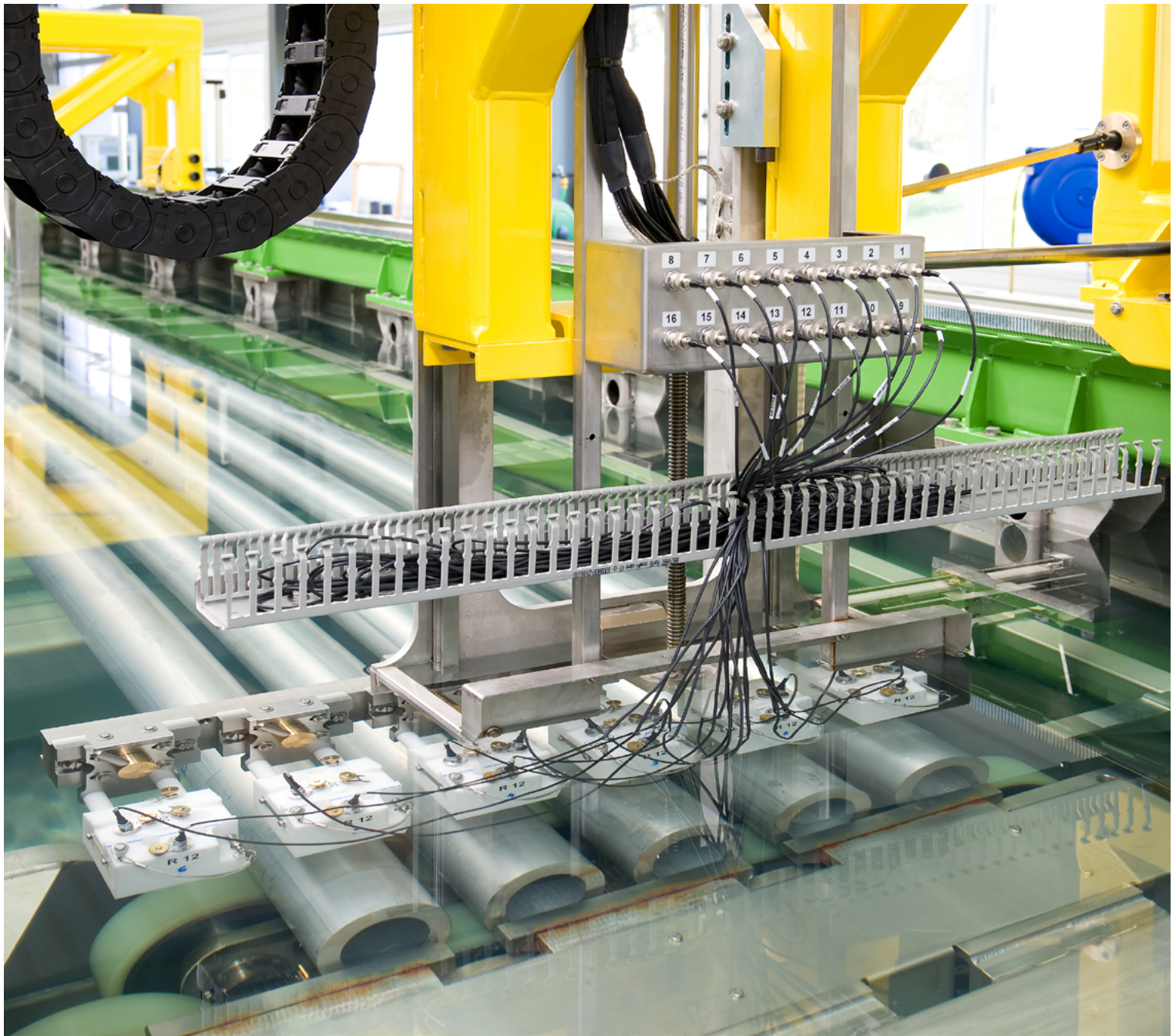




ECHOGRAPH TTPS

Ultrasonic Immersion Test Tanks

KARL DEUTSCH

ECHOGRAPH TTPS

Ultrasonic Immersion Test Tanks

The evaluation of the ultrasonic signals is carried out with a multi-channel ECHOGRAPH electronic. This ultrasonic electronic is especially designed for automated ultrasonic testing. Four flaw gates, two amplitude thresholds, a programmable TCG (time-corrected gain, sometimes also called DAC for distance amplitude correction) and many evaluation parameters are standard. A remote diagnosis and service can be provided by TCP/IP direct from KARL DEUTSCH in Germany. Data exchange with a host computer or a SQL data base is possible as an option. The main ultrasonic electronics is well protected in an air-conditioned and shielded cabinet. An operator panel with keyboard and display for convenient parameter adjustment is mounted near to the testing mechanics.

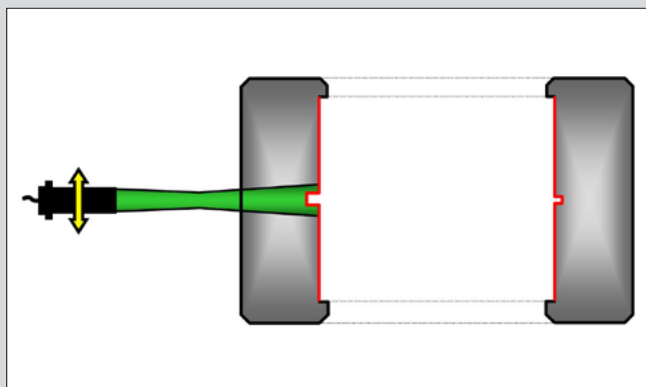
External ultrasonic pre-amplifiers and the shortest-possible cable length to the probes provide an excellent signal-to-noise-ratio even under mill conditions. As a first example an immersion test tank for bearing rings is presented. The bearings are designated for high-speed trains and therefore the testing sensitivity is in accordance with DIN EN 12080. This specification enforces a 0.5 mm flat bottom hole as calibration reflector which imposes the highest requirements on the mechanical precision. This reflector must be detected with straight beam ultrasonic incidence either by direct defect echo evaluation or by detecting a reduction of the back wall echo.



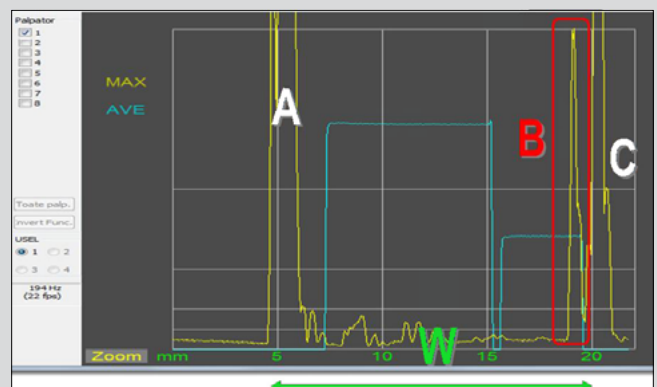
View into immersion tank with bearing ring. The probe holder is positioned outside the ring to inspect the internal ring surface. For higher throughput, four similar probes are used for the inspection. The ring is put into rotation with three rollers. A vertical probe movement results in helical test tracks.



Immersion test tank with probe manipulator, water filter circulation system and ECHOGRAPH testing electronics. The operator panel contains a touch screen for setting the PLC parameters and an industrial keyboard to set the ultrasonics.



Test principle of ring testing with flat bottom hole (FBH) as reference defect



Test result in A-scan format: A) interface echo, B) 1 mm FBH echo, C) back wall echo, W) wall thickness

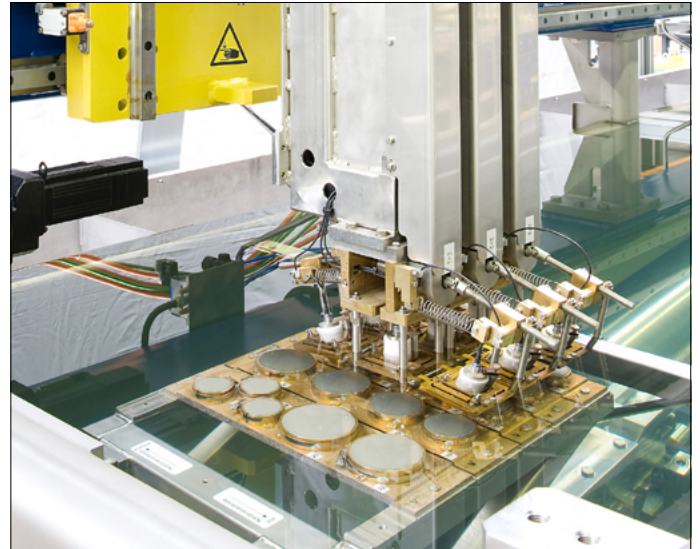
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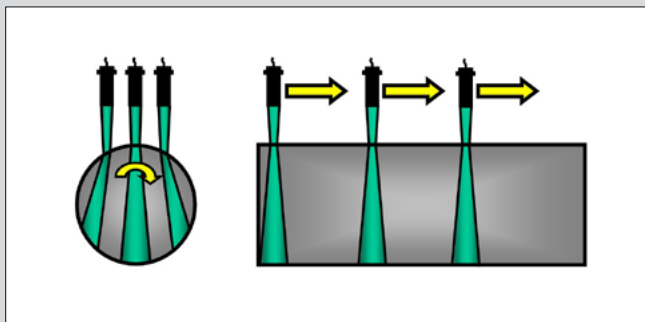
This test tank is designed for aluminium billets in the aerospace industry. The billet diameters range from 172 to 620 mm. The length is between 0.3 and 2 m. The test sensitivity is 0.8 mm FBH for the straight-beam probes. Additional angle beam probes detect surface defects. To increase the throughput, each test task is carried out with three similar probes and two independent rotating devices were provided. The sensitivity adjustment is carried in a fully-automated manner using 32 certified test blocks with FBHs in varying depths.



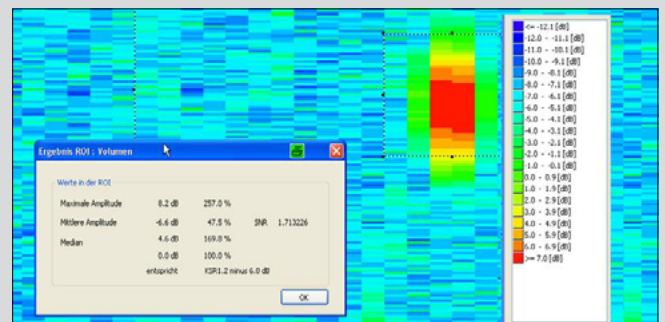
Test tank with for a rotational aluminium billet inspection



Fully-automated sensitivity adjustment



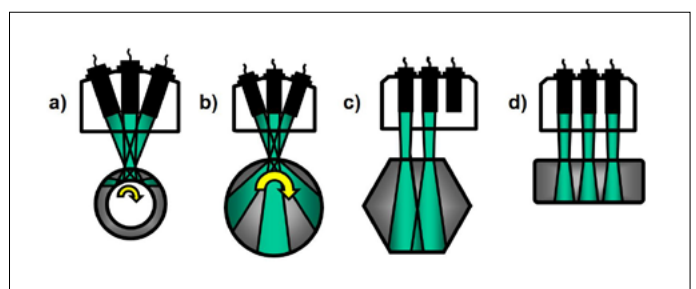
Probe configuration for aluminium billet testing:
Three straight beam probes and six angle beam probes.



Test result in C-scan format with many statistical functions: "Regions of interest" can be flexibly assigned.



Large immersion test tank for bars, profiles and tubes. Up to six samples can be tested at the same time.

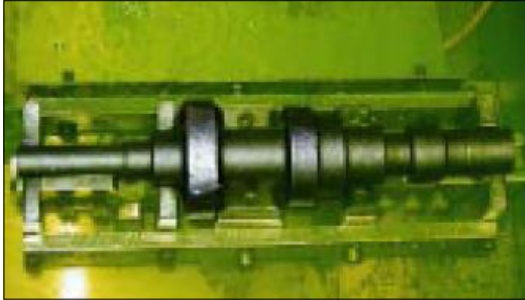


Many different probe holders can be mounted and adapted to the test tasks. Up to 16 probes can be employed. Round samples undergo a rotational test. Other profiles are inspected with a linear probe movement and overlapping coverage by using several probes.

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Ultrasonic Immersion Test Tanks

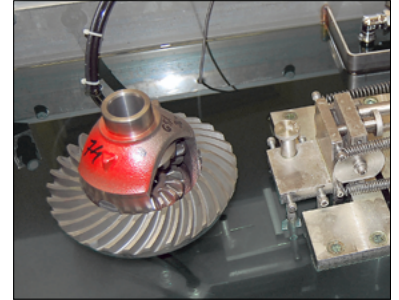
A piece-by-piece inspection is useful for many components, e.g. from the automotive industry. Forged gear shafts and laser-welded gears are typical inspection tasks. Also steel samples are commonly tested in accordance with SEP 1927 (steel cleanliness).



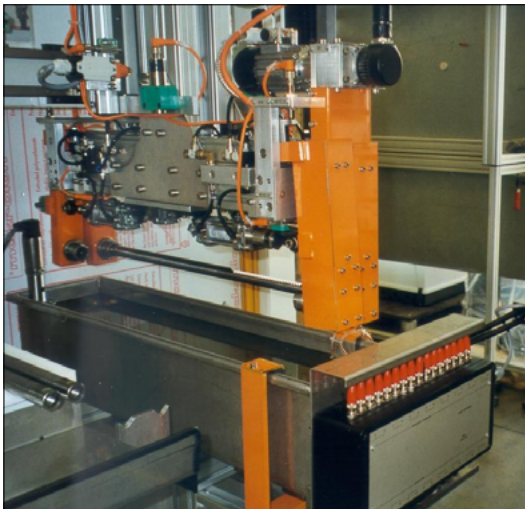
Testing of forged gear shafts (chevrons)



Steel cleanliness test (SEP 1927)



Testing of laser-welded gears



Small test tank with eight probes for steering racks



View into the systems workshop where a large immersion test tank is assembled

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Billets	aerospace billets, test sensitivity 0.8 mm FBH
Tubes	aerospace tubes, test sensitivity 5 – 10% notches
Bearing rings	bearings for high-speed trains, 0.5 mm FBH
Steel samples	ultrasonic cleanliness test (SEP 1927), 0.7 mm FBH
Welded gears	inspection of circumferential laser welds
Bars and profiles	automotive profiles, test sensitivity 0.8 – 1.2 mm FBH, depending on cross section
Automotive components	steering racks, piston pins, welded gears, forged gear shafts, valves, etc.

KARL DEUTSCH Prüf- und Messgeräatebau GmbH + Co KG
 Otto-Hausmann-Ring 101 · 42115 Wuppertal · Germany
 Phone +49 202 7192 0
 info@karldeutsch.de · www.karldeutsch.de

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