

ECHOGRAPH-TTPS
Ultrasonic Immersion Testing

KARL DEUTSCH

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The evaluation of the ultrasonic signals is carried out with the digital ECHOGRAPH 1155 system. This multichannel ultrasonic electronics is specially 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 multiple evaluation parameters are standard features. Remote diagnostics and support can be provided via TCP/IP directly by KARL DEUTSCH in Germany. Data exchange with a host computer or a SQL data base is possible as an option. The main ultrasonic test electronics is well protected in an air-conditioned and EMC shielded cabinet. An operator panel with keyboard and display for convenient parameter adjustment is mounted next to the testing mechanics. External ultrasonic preamplifiers and the shortest possible cable length to the probes provide an excellent signal-to-noise ratio even in rough steel mill environments.

KARL DEUTSCH has more than 60 years experience in developing ultrasonic testing equipment. Many improvements of the ECHOGRAPH electronics, the robust testing mechanics and the ultrasonic probes have led to our current state-of-the-art. All components are developed and assembled in-house. KARL DEUTSCH maintains a strict quality management system according to DIN EN ISO 9001.

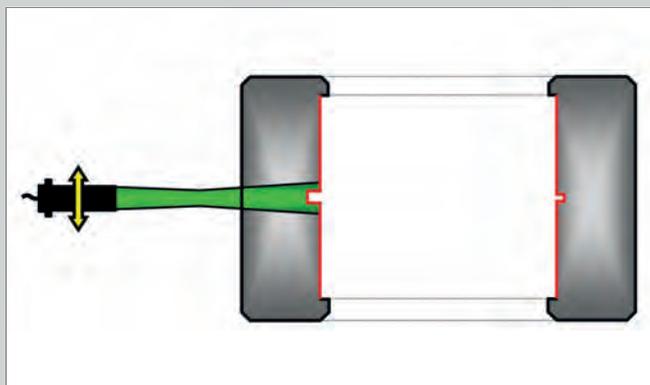
Immersion test tank for bearing rings: Bearing rings for high speed trains are tested in accordance with DIN EN 12080. This specification enforces a 0.5 mm flat bottom hole (FBH) as calibration reflector which imposes the highest requirements on the mechanical precision. The reflector needs to be detected with straight beam ultrasonic incidence either by direct defect echo evaluation or by detecting a reduction of the back wall echo.



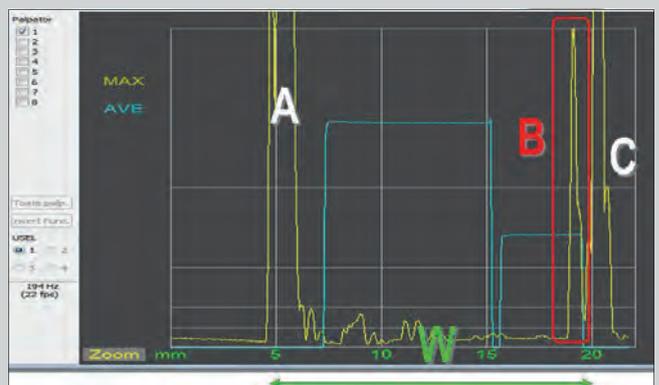
View into immersion tank with bearing ring: The probe holder (PH) is positioned outside the ring to inspect the internal ring surface. For higher throughput, four probes are used in parallel for the inspection. The ring is put into rotation with three rollers. A vertical probe movement results in helical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



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



Principle of ring testing with flat bottom hole (FBH) as reference defect.



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

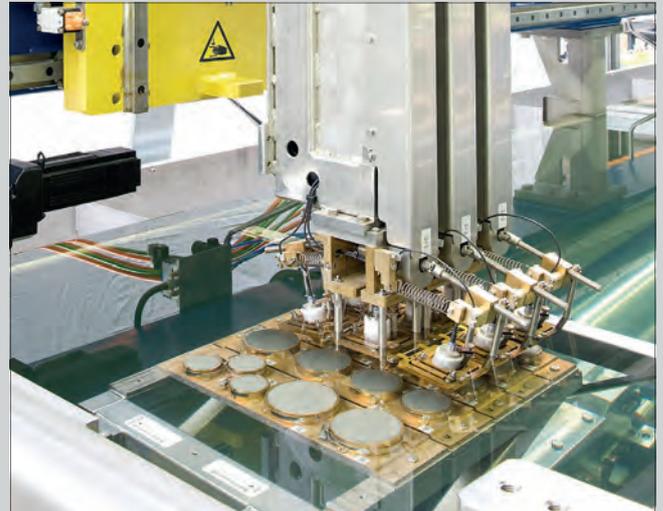
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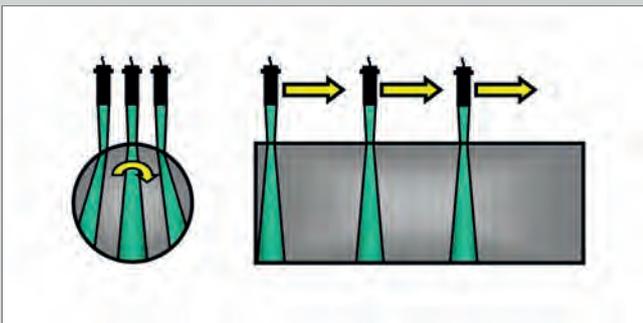
Immersion test tank for aluminum billets in the aerospace industry: The billet diameters range from 172 to 620 mm and the billet lengths lie between 0.3 and 2 m. The test sensitivity is 0.8 mm FBH for the straight beam probes. Additional angle beam probes detect surface defects. To increase the throughput, testing is carried out with 3 probe clusters in parallel. Also two parallel test positions are integrated in the same test tank. The sensitivity adjustment is done fully automatically using 32 certified test blocks with FBHs in varying depths.



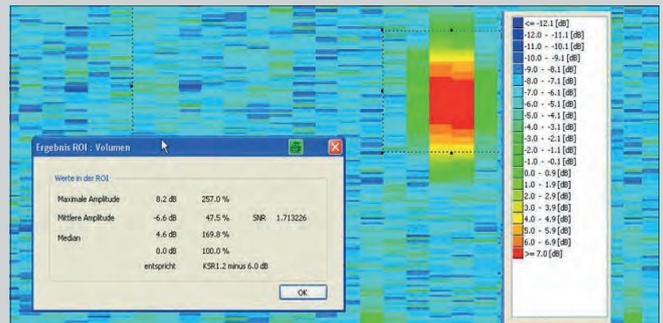
Test tank for rotational aluminium billet inspection



Fully automated sensitivity adjustment



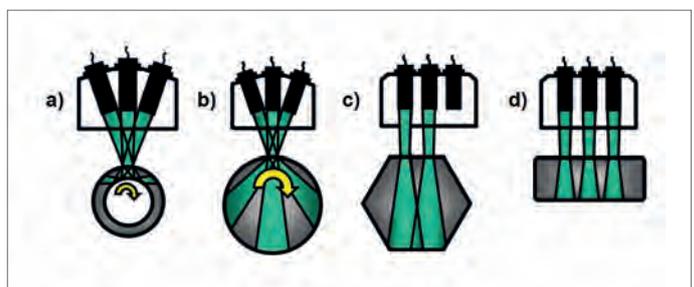
Probe configuration for aluminium billet testing with three straight beam probes and six angle beam probes.



C-scan test result with many statistical functions; "regions of interest" can be assigned flexibly.



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

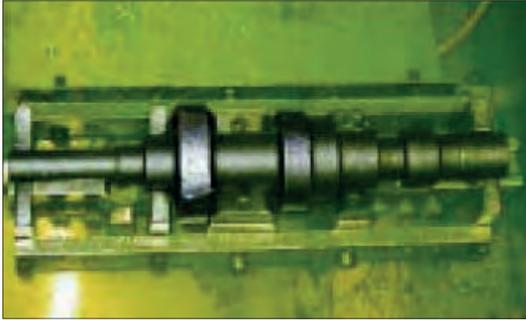


Many different probe holders can be mounted and adapted even to varying billet geometries. Up to 16 probes are employed. Round samples undergo a rotational test. Other profiles are inspected with a linear probe movement and best possible coverage by using several probes.

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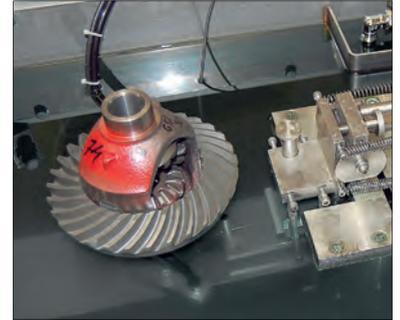
Immersion tanks for component testing, e.g. for the automotive industry: Forged gear shafts and laser-welded gears are typical test components. Also steel samples are commonly tested in accordance with SEP1927 (steel cleanliness).



Testing of forged gear shafts (chevrons)



Steel cleanliness test (SEP1927)



Testing laser-welded gears



Small test tank with eight probes for steering racks



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

Specimens and Typical Project Data

Billets	aerospace billets, test sensitivity: 0.8 mm FBH
 Tubes	aerospace tubes, test sensitivity: notch depth 5% to 10% of wall thickness
Bearing rings	bearings for high-speed trains, test sensitivity: 0.5 mm FBH
Steel samples	ultrasonic cleanliness test (SEP1927), test sensitivity: 0.7 mm FBH
Welded gears	circumferential laser welds e.g. on automotive components
Bars and profiles	automotive profiles, test sensitivity: 0.8 to 1.2 mm FBH, depending on cross section
Automotive components	steering racks, piston pins, welded gears, forged gear shafts, valves, etc.

KARL DEUTSCH Pruef- und Messgeraetebau GmbH + Co KG

Otto-Hausmann-Ring 101 · 42115 Wuppertal · Germany

Phone (+49 -202) 7192-0 · Fax (+49 -202) 7149 32

info@karldeutsch.de · www.karldeutsch.de

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9001
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