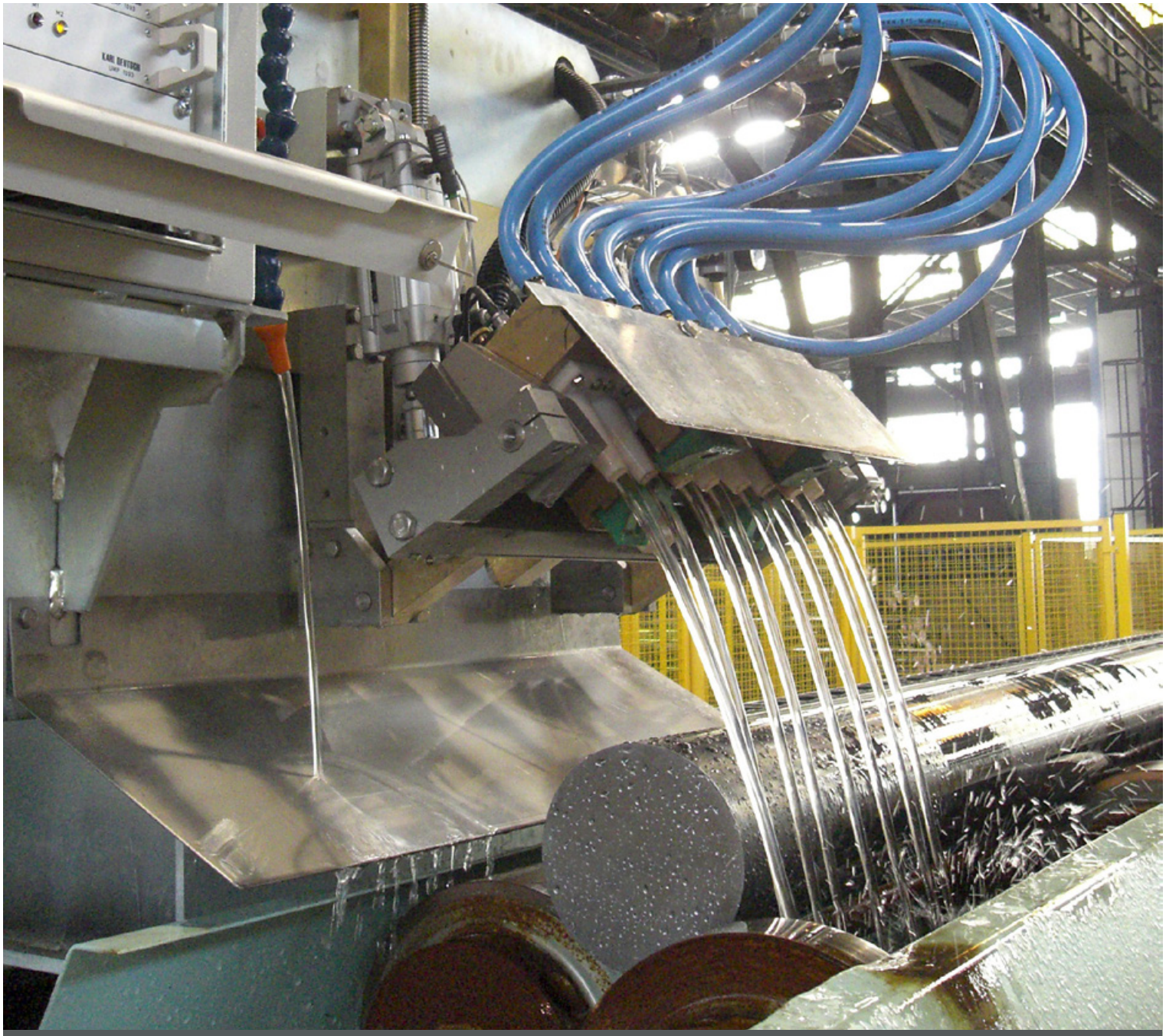


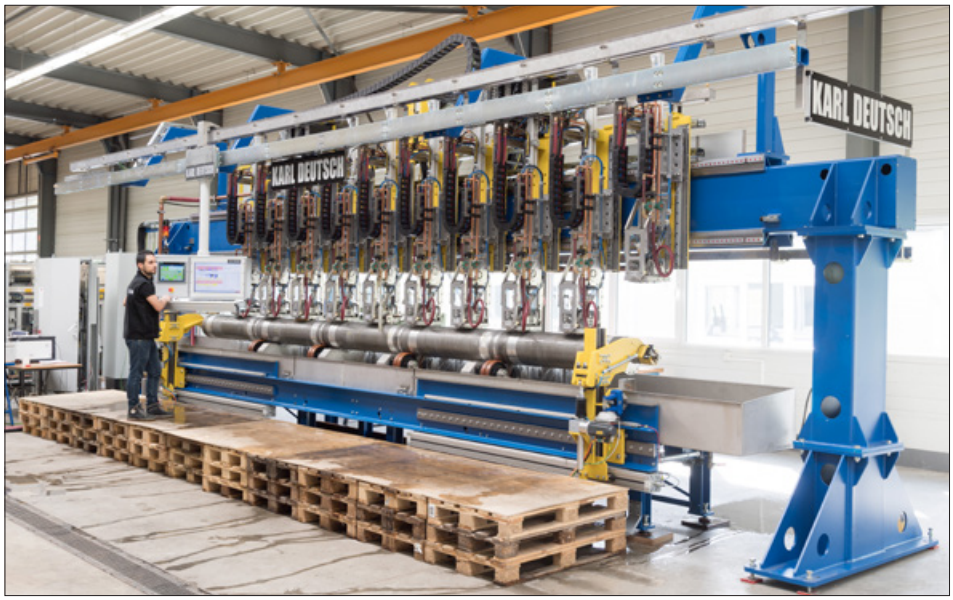
ECHOGRAPH ALPT/RPTS
Ultrasonic Inspection of Round Billets

KARL DEUTSCH

ECHOGRAPH ALPT/RPTS
Ultrasonic Inspection of Round Billets

ECHOGRAPH ultrasonic testing systems are designed for rough environmental conditions and high through put. During the inspection, the billet is scanned with helical testing traces. While the billet is rotating, the probes are linearly guided along the billet axis.

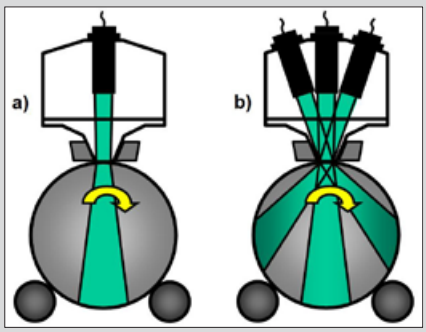
KARL DEUTSCH has more than 70 years experience in developing ultrasonic testing equipment. Many improvements for the ECHOGRAPH electronics, the robust testing mechanics and the ultrasonic probes have led to our current state-of-the-art. All components are developed and assembled in-house. KARL DEUTSCH maintains a strict quality management system according to DIN EN ISO 9001.



Testing portal for round casted aluminium billets with ten straight beam probes for core-defect detection in accordance with ASTM B 594-90. In addition, angle beam probes inspect the billets for surface defects.

A key property of the billet inspection system is the coupling technique. The ultrasonic coupling is achieved with guided water jets, which allows for almost wear-free probe holders and short change-over times for different billet diameters. This technique is also called squirter technique which describes a water column between probe and billet. The distance between probe and billet surface is in the order of several centimetres which leads to long-lasting probes. Instead of dual-element probes (formerly used for gap coupling in older testing systems), immersion type probes with large bandwidth are used. Since the wear shoes normally do not have to be changed for varying billet diameter, short change-over times can be ensured. In combination with the electronic distance amplitude correction (DAC) a constant testing sensitivity is produced for all flaw depths.

The distance between ultrasonic probe and billet is kept constant by guiding the probe holders along the billet surface by means of skids and/or rollers. The straightness deviations require a gimble joint for the probe holders to perfectly follow the billet surface.

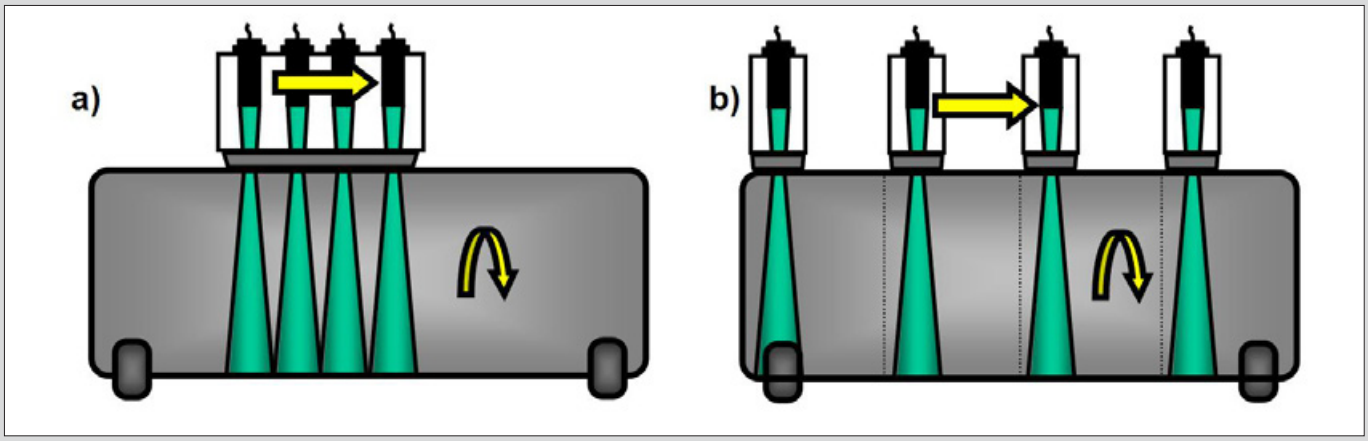


a) Often only straight-beam probes are used. Due to the rotation of the billet, good ultrasonic coverage is achieved.

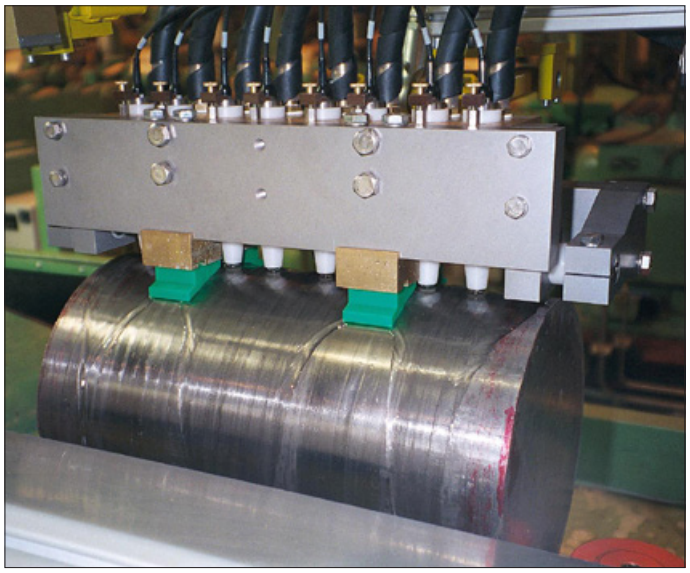
b) More sensitive for surface defects is angular ultrasonic incidence. This is achieved by tilting a straight-beam probe with respect to the billet surface. Taking the law of refraction at the billet surface into account, testing angles round 45° are typically used. Since also differently oriented defects shall be detected, both circumferential directions are provided (clockwise and counter-clockwise sound transmission).

All probes are either mounted into the same probe holder (system type ECHOGRAPH RPTS), or the probes are evenly distributed over the billet length (system type ECHOGRAPH ALPT). This depends on the billet diameter, the billet end condition and the billet straightness. Clean cut ends, rather small diameters and good straightness conditions allow the solution of one common probe holder. For large diameters the probes are mounted into separate probe holders for acoustic reasons. In that case, each probe covers a specific section of the billet.

In both cases, interleafing test traces must be provided for full ultrasonic coverage. The required throughput governs the number of probes which must be provided.



Different probe holder designs for round billet testing: a) All probes are mounted into the same probe holder with a common skid. b) The probes and probe holders are evenly distributed over the billet length. In this simple example, each probe holder covers 25 % of the billet length.



This picture shows one common probe holder with eight straight beam probes. White water nozzles guides the ultrasound for each probe. In this case, (green) plastic skids were used to protect the machined billet surface.

Here, each probe holders contains one straight-beam probe. The surface of this aluminium billet is as casted and therefore quite rough. A large metal skid protects the probe and the water nozzle from damage.

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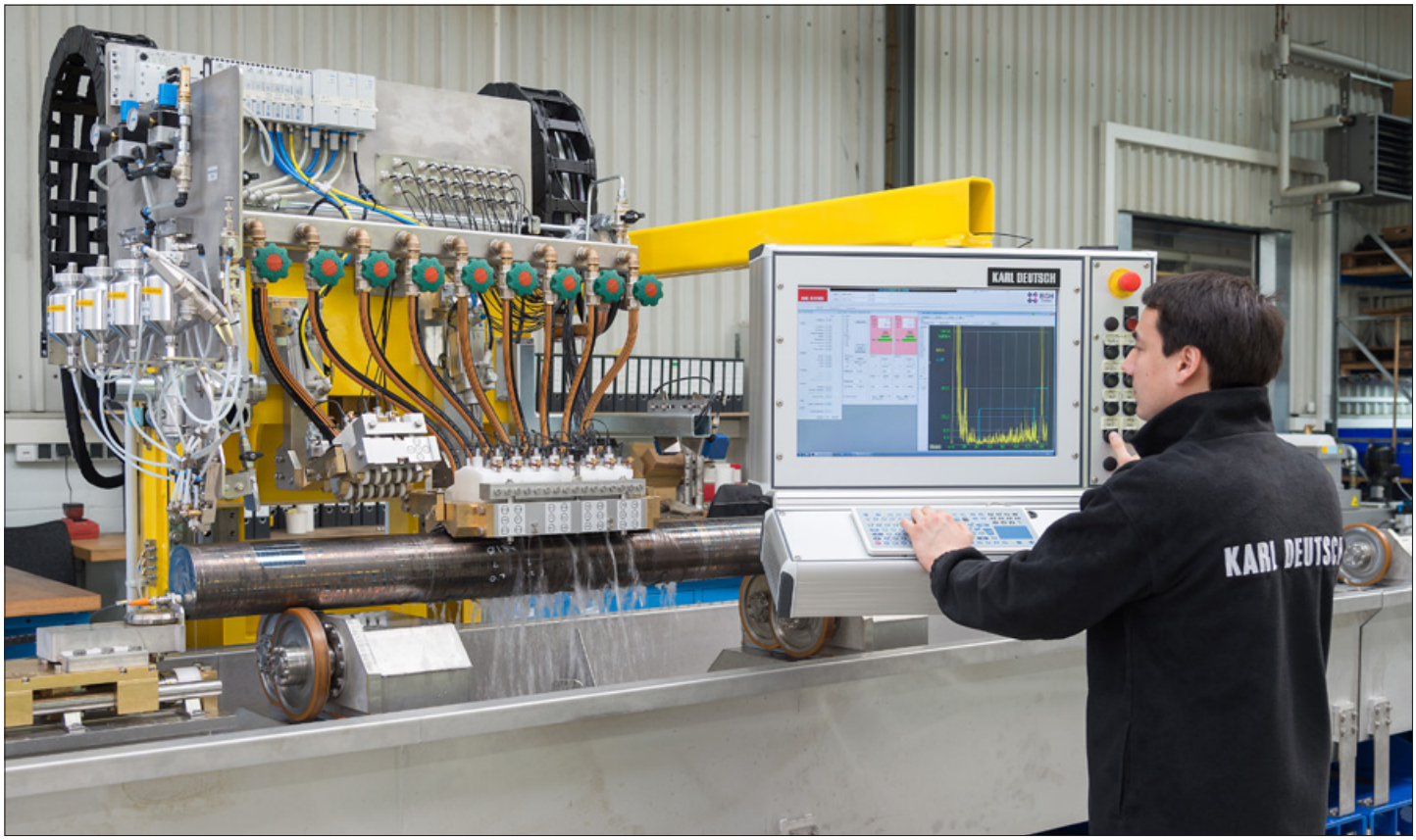

Testing portal for steel bars with one common probe holder. In this case, 8 straight-beam probes and 16 angle beam probes (8 clockwise, 8 counter-clockwise) are used. Therefore, a test trace per revolution of approx. 80 mm is achieved. A second probe holder with transverse probes is in idle mode.

Specimens and typical project data	
Round billets	
Diameter range (D)	typically 80 – 600 mm (different mechanical setups required)
Length	typically 3 – 10 m
Weight	typically 100 – 2500 kg (different mechanical setups required)
Ovality	1 % of diameter
Straightness deviation	1 mm per metre
Billet end condition	as casted or clean-cut
Test sensitivity	0.8 – 2 mm FBH, depends on material (aluminium or steel), material structure, surface condition

Leaflet P ALPT RPTS e June 2022 · Subject to change without notice

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