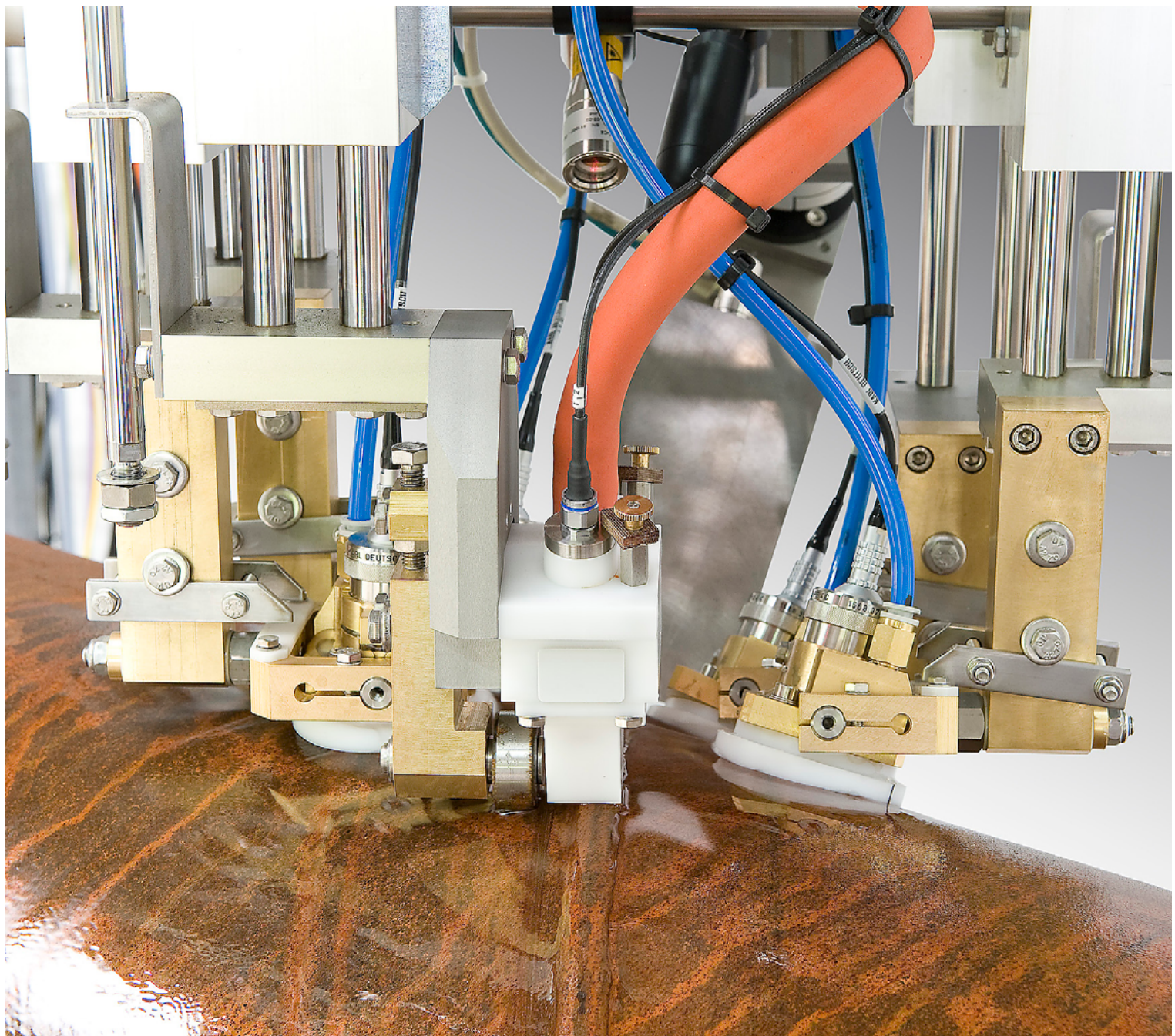




ECHOGRAPH SNUS
Ultrasonic Inspection of HSAW-Pipes

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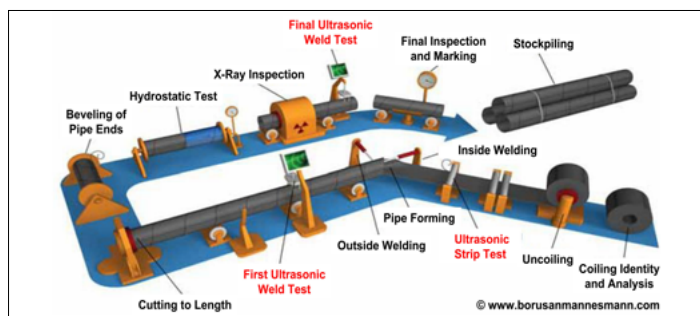
Ultrasonic Inspection of HSAW-Pipes

Three ultrasonic testing systems are typically required for the production of helically submerged-arc-welded pipes (HSAW), if they are later used for oil or gas pipelines.

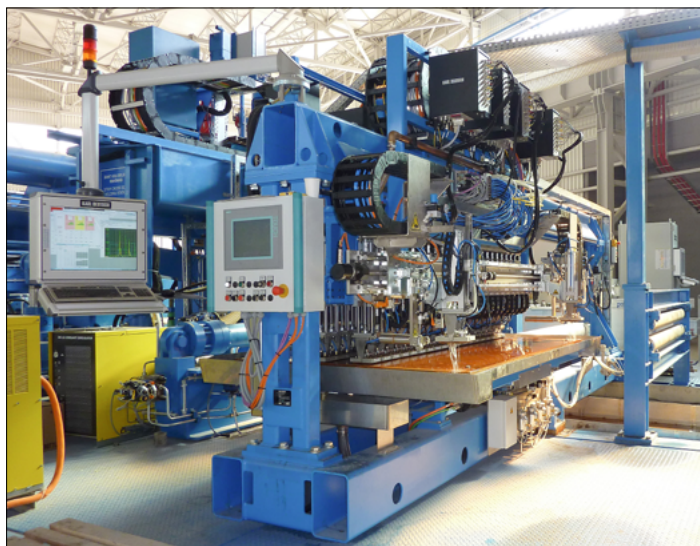
The base material, i.e. the steel coil is either tested before welding with a strip testing machine ECHOGRAPH BAPS or after welding on the finished pipe. The ultrasonic coverage for the base material depends on the number of ultrasonic probes and if an oscillating probe movement is added. In recent years, solutions with 100% coverage were presented which is typically accomplished with a strip testing system before welding.

Directly after welding, the weld is checked by a first ultrasonic testing machine (on a virtually „endless“ pipe). Therefore, the weld quality can be checked in an early stage of the production. After cutting the pipes to their specified length and after undergoing the hydrostatic test, a final ultrasonic test is performed. The detection of laminations within the pipe body, the heat-affected zones besides the weld and the pipe ends is performed with straight beam ultrasonic incidence (TR-probes). Angle beam incidence detects longitudinal and transverse defects in the helical weld. A special feature is the on-bead probe pair for transverse defect detection using the squirter coupling technique. The K- or X-setup can therefore be avoided.

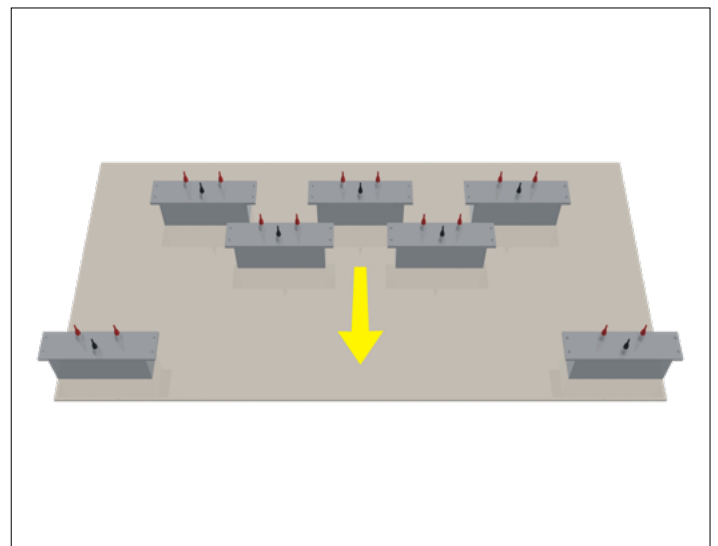
KARL DEUTSCH has more than 70 years experience in developing ultrasonic testing equipment. Many improvements for the ECHOGRAPH electronics, the robust testing mechanics and the ultrasonic probes have led to our current state-of-the-art. All components are developed and assembled in-house. KARL DEUTSCH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



Production chart for helically (spirally) welded SAW-pipes (with courtesy of Borusan Mannesmann Turkey): After uncoiling of the steel strip, an ultrasonic strip test is performed. After pipe forming and welding, a first weld test is carried out. The pipes are cut to their final length, undergo the hydrostatic test and the final ultrasonic test.



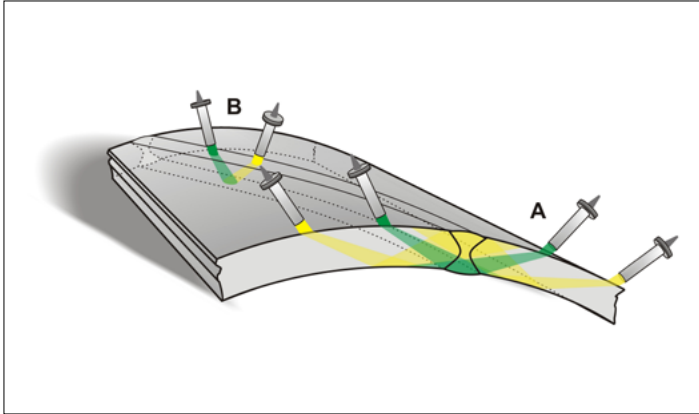
A strip testing machine consists of a testing bridge which is twice as wide as the coil width. The probe holders can be moved between the test position (online) and the calibration position (offline, see picture). For further details see our brochure ECHOGRAPH BAPS.



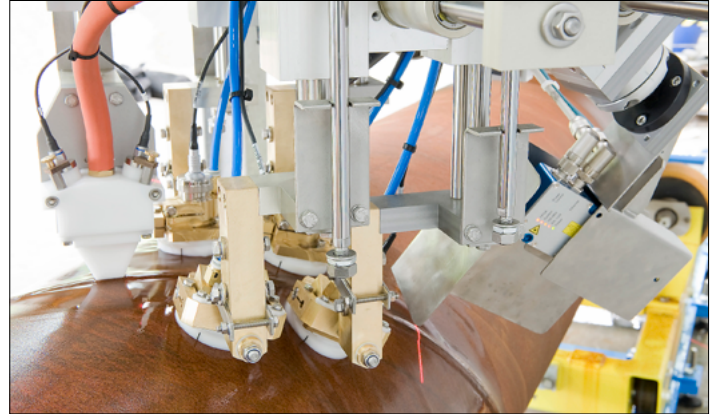
Testing of the pipe body before welding with 100% coverage. Separate probe holders are used for the strip edges. They are guided along the edges by steel rollers. The strip middle is covered by overlapping probes in two rows (100% coverage).

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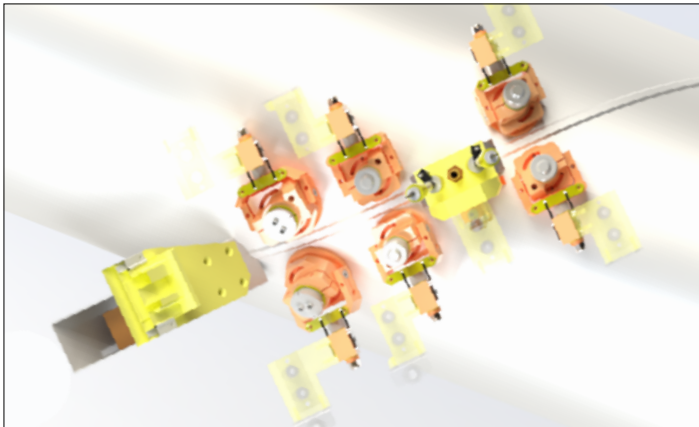
Ultrasonic Inspection of HSAW-Pipes



First ultrasonic weld test with six probes: Two probes for external longitudinal defects, two probes for internal longitudinal defects and two on-bead probes for transverse defects.



Six ultrasonic probes follow the weld crown which is monitored by a laser-optical seam tracker. The distance of the longitudinal probes with respect to the weld (skip distance) can be comfortably adjusted. The on-bead transverse probes are mounted into one common probe holder (left in picture).



Final ultrasonic test with 11 probes: Two probes for external longitudinal defects, two probes for internal longitudinal defects and two on-bead probes for transverse defects, four probes for laminations (HAZ) and one probe for the pipe end.



Due to the compact design of the probe holders, all required probes could be mounted into one test frame (right in picture). The separate pipe end probe holder is seen on the left.



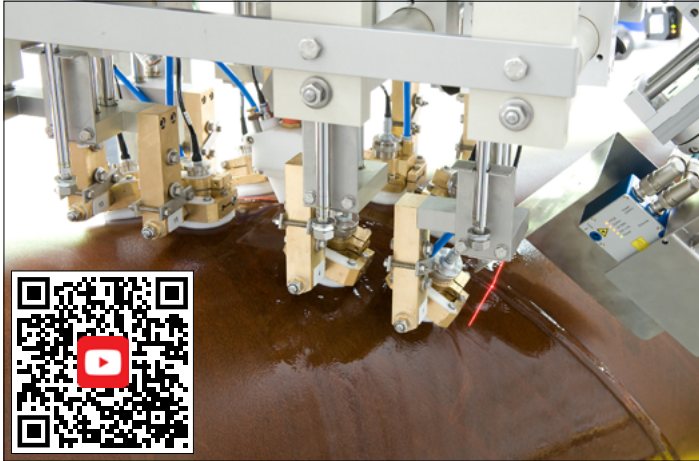
Pipe end testing is carried out using a paintbrush probe with a 50 mm test track. Perfect guidance along the pipe end is achieved by two sets of steel rollers. The same probe holder is used for both pipe ends (second set of steel rollers is lifted).



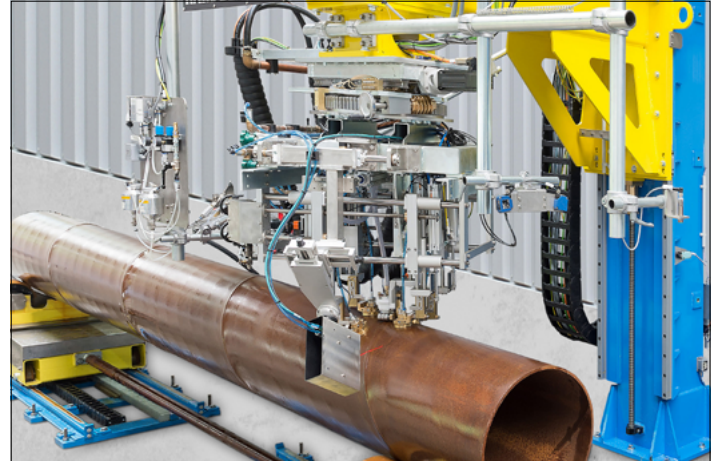
The pipe body can also be tested after welding (instead of testing the strip). Dependent on the required coverage and the welding speed the number of probes can be accordingly chosen. The coverage can be further increased with an oscillating probe movement.

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The weld seam is continuously monitored by a laser-optical tracking system.



The weld testing mechanics is mounted to a height-adjustable boom. Due to the large pipe diameter range, an operator platform is often required.

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Applications	helical SAW-tubes
Material	hot-rolled coils in the production line before (Pre-UT) and after (Final-UT) Hydrotest
Pipe diameter range	300 – 3,048 mm
Wall thickness range	3 – 32 mm
Pipe length	up to 24,000 mm, scalable as required by the customer or for continuous feed
Ovality	± 2% of diameter
Straightness deviation	max. 3 mm/m
Width of weld seam	8 – 30 mm
Inspection capabilities	▪ Flaw inspection for longitudinal (L) defects. Optional: Tandem technique (LT) for heavy wall thicknesses ▪ Flaw inspection for transverse defects on-bead T, transverse and oblique off-bead defects with X-configuration ▪ Flaw inspection for lamination (LAM) defects in the heat-affected zone besides the weld ▪ Pipe end testing PE in a separate testing system
Inspection speed	up to 20 m/min
Standards and compliance	ISO 10893 (Parts 8, 10, 11), API 5L, ISO 3183, DNV-OS-F101, DEP 31.40.20.37 (Shell), IOGP S-616, Chevron, Saudi Aramco
System options	▪ Flaw marking device for location-true separate marking of all flaws ▪ Extended diameter or wall thickness ranges ▪ Integration into Level 2 or MES systems ▪ Automated data exchange and reporting ▪ Remote service and diagnostics

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