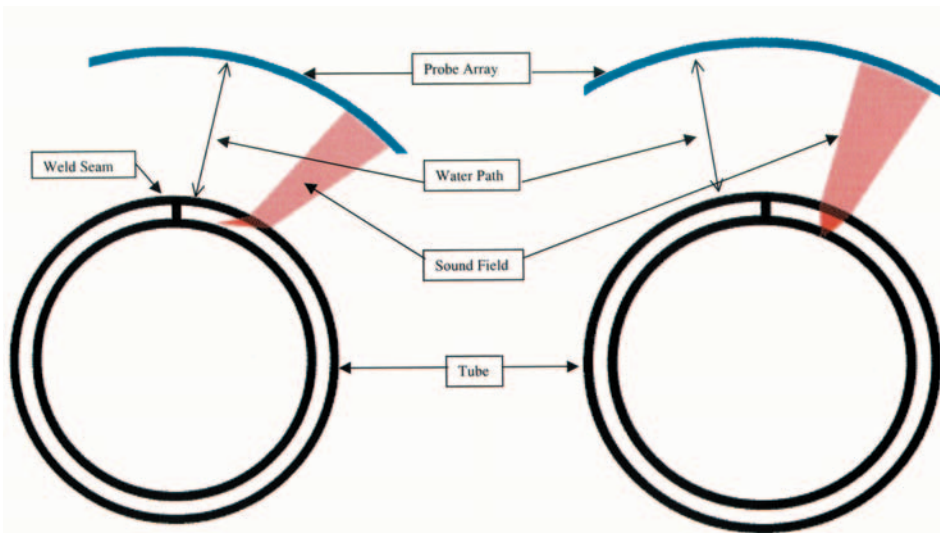


Krautkramer Testing Machines

Phased Arrays



Examples for angular beaming (left) and straight beaming (right)

left: for weld seam testing

right: for wall thickness measuring

Phased Arrays bring a new dimension to weld or tube testing. With arrays and time-delay electronics an ultrasonic beam can be focused and steered exactly to the requirements, i.e. the sound beam will be slued.

Furthermore, having determined the optimum setting, arrays allow for virtual scanning of the weld area to give an optimum test despite weld wander and to give a thickness profile of the weld area, all without any mechanical probe movement.

Because the system uses a water delay line between the probe and the tube, this means that one array can accommodate a range of tube sizes with no mechanical adjustments being necessary.

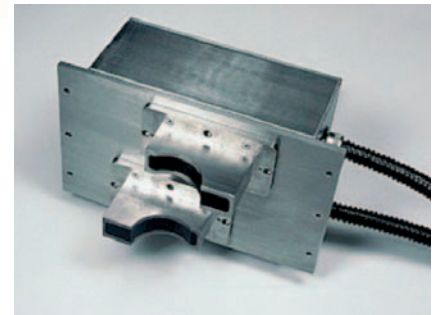
In this case the phased array is used for ERW tubes. The following applications are possible, so that weld defects and defects in the adjacent parent material of the Heat Affected Zone (HAZ) can be detected.

In addition to that, wall thickness measurement and out of this a flash trimming monitoring as well as a determination of the tube saw-off length are possible.

A Phased Array system consists of the following primary components:

- Transducers in Phased Array assembly
- Array control electronics linked to the pulser receiver channels
- Array-timing control for phasing
- Ultrasonic evaluation electronics
- Mechanic system to position array probes


Arrays are constructed in industrial housings and with up to 128 elements. They can plug directly into the Array Module.



Array probes with Array control electronics

Alternatively, the array transducers can also be operated in some distance from the Array Electronic Module (with cables of max. 2 m length).

The Array Head Module includes 128 pulsers and preamplifiers for each Array which can be switched into groups of 16 selected Array Elements from the Array itself.

GE imagination at work 

From the 128 elements 16 adjacent elements as a group can be activated simultaneously. These 16 elements create the virtual scanning transducer during a clock cycle. Through the selection of 16 out of 128 elements the sound field can be scanned. For example during the first clock cycle, elements number 1 through 16 are active, and during the second clock cycle, elements 2 through 17 are active, in the third clock cycle elements 3 through 18 are active etc. until clock cycle 113 activates elements 113 through 128. In this way it is possible to move the sound field by several centimeters without any mechanical displacement of the probe.

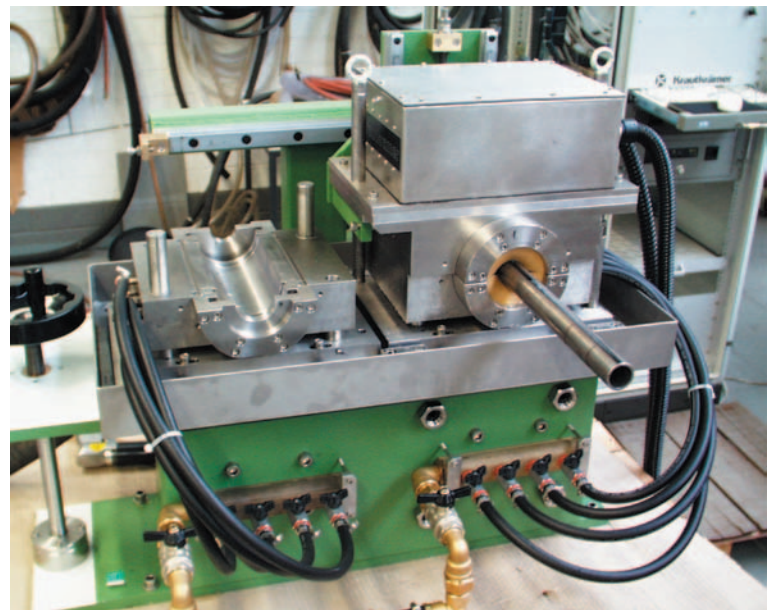
The main electronics for the system is contained in an industrial cabinet suitable for harsh environments.

The test mechanism mainly consists of the following units:

- Elevation table with manual adjustment (Adaptation to the tube diameter to be tested) or a portal with lifting and lowering device
- A test with water jet probes or a dividable water chamber for mounting the array probes incl.on-site electronics
- Second water chamber (only lower part incl. water connections) for the service and setting positions
- Divided guiding bushes and rubber sealings
- Water connections and corresponding water distributors
- Water collecting trough with hose connection for water return
- Water circulation system (optional)



Test principles



Closed Water Chamber



Open Water Chamber

Phased Array Mechanism