

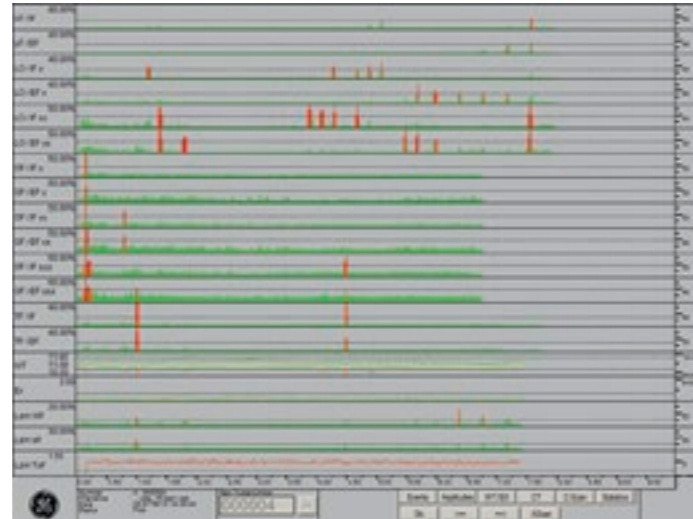
Technical Specifications

Typical Data of Test Objects	
Tube Diameter*	60 - 500 mm
Wall Thickness	3 - 50 mm
Tube Length	6 - 15 m
Rational Speed	max. 300 rpm
Circumferential Speed	up to 2.2 m/s
Pitch	max. 120 mm / revolution

* other dimensions on request

Test Specifications	
DIN EN 10246 -6, -7, -14	
EN ISO 10893 - 8, -10, -12	
API -5 CT, 5 L, 5 D	
Other Specifications on Request	

System Performance	
Longitudinal and transverse flow test	
Oblique flaw test (11°, 22°, 33°, 45°, 67°) Optional: Oblique test ±45° gapless	
Lamination test	
Wall thickness and eccentricity measurements	
Signal to noise ratio (SNR) > 18dB typical	
Steering and paintbrush in 1 cycle	
Example tube cycle time: 40-90 sec. (valid for tube OD 114-406mm, length 14 m, 2 carriage layout)	



Online evaluation graphics

Scan the QR code with your smartphone or go to <https://www.youtube.com/watch?v=DCbsasWZkFw> to see a video and learn more



GE
Oil & Gas

Krautkramer Testing Machines

Full Body Ultrasonic Inspection of Tubes with Scanning Probe System

GE Krautkramer GRP-USIP|xx Portal Portal system for stationary rotated tubes

The latest development from GE is a turnkey solution for full body inspection of tubes using Phased Array Technology on a long portal.

The scanning system detects longitudinal, transverse and oblique ($\pm 45^\circ$) flaws on the internal and external surfaces of seamless tubes, measures the wall thickness and eccentricity and checks for lamination defects. The use of the Phased Array technique allows a flexible design of the scanning system. The size of the virtual probes, the track pitch on the surface, the overlap of the sound fields as well as the beam angle for the transversal flaw detection can simply be optimized by adjusting the electronic settings.



Double carriage overview



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GEIT-60016EN (03/16)



GE imagination at work

Paint-Brush

The key procedure to detect longitudinal and oblique defects with high throughput is the Paint Brush method, which allows the detection of oblique flaws of -45° to $+45^\circ$ without gap. With this method, all elements of a phased array probe are fired simultaneously.

The received individual signals are stored and then evaluated in a special pattern (Sub-Cycles) related to the different sound transmission angles (time delayed receiving of sound energy). High speed signal processing techniques combined with the ability to transmit and receive the entire angle scan pattern in a single evaluation cycle provides an inspection for longitudinal as well as oblique defects at high pulse repetition frequencies while using the same array probe. Optional the test for other defined oblique flaw angles (Phased Array Steering Technique) is possible.



Scanning Techniques

The tubes are inspected with a scanning system, which is mounted on a carriage above the tube. During scan, the carriage moves along the tube axis, while the tube is rotated on a spin roller block station. The carriage is equipped with gimbal-mounted probe holders, each with one Phased Array probe.

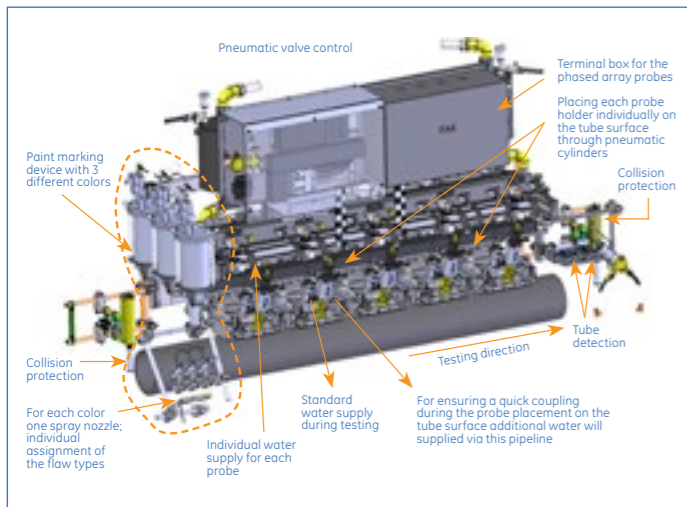
At the beginning of the test procedure, the complete probe holder mechanics will be lowered into the test position. Each probe is individually positioned onto the surface and, for more than one revolution, remains in the same position. This procedure ensures a stable coupling condition and minimizes the extent of untested tube ends. Coupling of the probe is carried out via a water delay path and is monitored during the whole inspection.

The fast and safe coupling for the total rotational speed range of the tubes is achieved by the design of the probe holders and wear shoes. After all probes are placed on the tube, the carriage will be accelerated to its test speed. On reaching the tube end, the carriage will slow down and finally stop. Before the probes are lifted off in sequence, each probe remains in the end position for 1-2 revolutions, to ensure an untested end as short as possible. As soon as all probes are lifted, the test carriage moves directly back to the start position.

When a defect has been detected, it is possible to reverse the test carriage to repeat the test of the relevant area.

For high throughput requirements, the portal can be equipped with two carriages. In this case the test start position and the paths of both test carriages are pre-programmed. The inspection is carried out with an overlap in the middle section of the tube and the inspection lines are precisely inter-locked. This ensures a complete scanning of the tube by the two test carriages.

After completing the inspection, the tube is removed from the spin roller blocks and sentenced, according to the test classification. The equipment performs data processing and evaluation of the measurements and transfer of the data to a line PC, where it can be correlated with a customer's production control system.



Test mechanic with five probe holders (indicative)



USIP|xx front end electronics



Back end electronics with realtime event LED panel

Test Electronics

Front-End electronics, type USIP|xx:

Each Front-End Electronic houses several Phased-Array electronic racks which can hold up to 12 Phase Modules each and will be mounted on the carriage. The Phased Array probes of each carriage are directly connected to the Front-End electronics for superior signal quality.

Back-End and evaluation electronic:

The complete operation takes place in the Back-End electronics. The cabinets of the Back-End electronics are placed in the operator cabin.

PLC system:

Consisting of a cabinet with integrated Operator Panel for the carriages and the spin roller block station.

