



GE Inspection Technologies



Krautkramer SNUP Systems

Ultrasonic Inspection of Submerged Arc Welded (SAW) Pipes

SAW pipes are the primary component in on and offshore oil and gas transmission pipelines. Structural integrity is paramount in these constructions and industry standards require inspection of the weld seam quality within the pipe manufacturing process. These inspection standards are well established for carbon steel pipe and are developing rapidly for constructions with corrosion resistant cladding on the internal surface of the pipe. GE has a long history of innovation providing SNUP Systems for inspection of these safety critical assets.

Krautkramer SNUP Systems

The Krautkramer SNUP Ultrasonic Testing Machine platform is available in a number of configurations to test both longitudinally or helically submerged arc welded pipe. These systems are constructed with GE's industry leading Phased Array technology or optionally with conventional ultrasonic methods to detect flaw types that can occur during the welding process: longitudinal defects along the weld axis, transverse defects perpendicular to the weld axis, and laminations in the heat affected zone on either side of the weld line.

Krautkramer SNUP Systems are designed and built by a talented team with a long history of experience in automated testing machines in Cologne, Germany, where the machines are still built today. The machines combine the experience & quality of the Krautkramer culture with the technology and global reach of GE, now a digital industrial company.

Platform Features

- **Phased Array** or conventional ultrasound capable (same UT Instrument compatible with both)
- **3D Visualization** of inspection data
- **Real-time strip chart visualisation** and recording of test data for each inspection channel
- **Real-time Phased Array sector scan tool** for quick and easy setup and optimization of the ultrasonic sound path
- **Motorized probe adjustment** for automated setup of each ultrasonic probe position for pre-defined pipe geometries greatly minimizing setup times for changeovers especially when combined with GE's Phased Array ultrasonic method
- **Multi A-scan** to view several channels at once for easy calibration
- **Automated laser guided weld seam tracking** following both weld cap edges for improved inspection control
- **Stable ultrasonic coupling** using controlled water gap and hardened wear shoes that ride on the actual pipe surface



“SNUP-LO” for inspection of Longitudinally Welded (LSAW) pipe

The SNUP-LO can be used prior to pipe expansion to generate quality data of the manufacturing process as well as after hydrostatic testing as a final quality inspection point.

Depending on a customer's factory layout, SNUP-LO systems can be constructed in a lifting frame configuration where the pipe is moved axially under the inspection heads or as a portal configuration where the pipe is held stationary and the inspection heads are moved axially along the pipe.

Both machine constructions are available with optional features to facilitate weld following on smaller diameter pipes where weld wander can be significant.



Lifting frame



Portal



“SNUP-SP” for inspection of Helically Welded (HSAW) pipe

The SNUP-SP is also available in two configurations providing ultrasonic inspection of HSAW pipes either immediately following the welder to acquire in-process quality data or after hydrostatic testing as a final quality inspection point.

Both configurations are built as lifting frame solutions where the pipe is moved both axially and rotationally below the inspection heads with positional correlation maintained by SNUP-SP control system.



HSAW inspection

SNUP-SP can be outfitted with optional pipe end testing capability and base material inspection of the base material steel strip.

Ultrasonic Methods

In excess of 80 Krautkramer SNUP series testing machines have been installed globally to inspect safety critical SAW pipe since the year 2000. Since 2015 our customer needs have driven that phased array ultrasound has become the new standard. Whatever the technical requirements of our customers, sustainable solutions for individual customer application needs and pipe constructions can be obtained with this reliable and innovative equipment. While the general ultrasonic properties are common to both Phased Array and conventional ultrasound, Phased Array provides several advantages:

- **Improved productivity** for pipe change-overs due to implementation of the sectorial scan function with far less manual intervention required during calibration cycles
- **Significantly less changeover times:** Phased Array probes are not physically swapped in and out for different pipe geometries
- **Higher repeatability and test quality** due to electronic optimization of the sound beam for given indications and further test automation using software features and motorized probe adjustment
- **Lower false call rates** due to higher signal to noise ratio (SNR) of the inspection
- **Future proof** electronic beam angle steering to be tailored to specific testing requirements without mechanical changes
- **Smaller footprint** of the overall testing machine
- **Beam optimization** by electronically changing apertures and natural focus of phased array probes
- **Matrix Array upgradeable** for electronic 2D steering and optimization of the ultrasonic sound beam
- **RotoArray option** for on-bead transverse flaw detection



Phased Array On-bead Wheel Probe



Technical Data

Typical specimen dimensions		
	SNUP-LO	SNUP-SP
Pipe diameter	> 355 mm (> 152 mm on request)	> 355 mm
Wall thickness	≤ 80 mm	≤ 25.4 mm
Pipe length	min. 5 m (typically 12 - 18 m)	min. 5 m (typically to 24 m or continuous feed)
Weld seam width	≤ 150 mm	≤ 35 mm

other values available upon request

Types of Defects

- Longitudinal and transversal flaws in the weld seam (optional oblique flaws if required)
- Laminations in the heat affected zone (HAZ)
- Optional pipe end testing for laminations and longitudinal cracks

Typical Specifications

- API 5L/ISO 3183
- DNV-OS-F101
- Shell DEP-31.40.20.37-Gen.
- Chevron, Aramco

Krautkramer USIP|xx Ultrasonic Instrument

The USIP|xx ultrasonic instrument platform is the fastest, most capable, systems level instrument available in today's market enabling the industry leading performance of the Krautkramer SNUP Systems.

- One instrument for either linear Phased Array, matrix array, or conventional ultrasonic probe configurations
- Modularity based on a 64 parallel channel ultrasonic card with up to 12 cards per ATCA chassis scalable up to 6144 total channels with Phased Array apertures up to 256 channels
- 8 parallel data evaluations per channel card per ultrasonic shot cycle
- 80 Mbyte/sec transfer rate of an A-scan with 4096 points at 5 khz and 16-bit resolution — the necessary data at the necessary speed to support real-time process control
- Configurable up to 24-bit dynamic range
- 5 gates per evaluation channel
- Local gain feature with individual gain setting per gate
- Easy to operate Microsoft Windows™ GUI
- Dual threshold evaluation possible (warning/alarm)
- Extensive monitoring functions, self-test and diagnostic support

Imagination at work

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