Sharck™

ECA Probes for Carbon Steel Weld Crack Detection and Depth Sizing

A Giant Leap in Ferromagnetic Electromagnetic Testing

Ferrous materials have always been a challenge for eddy current. *Until now*.

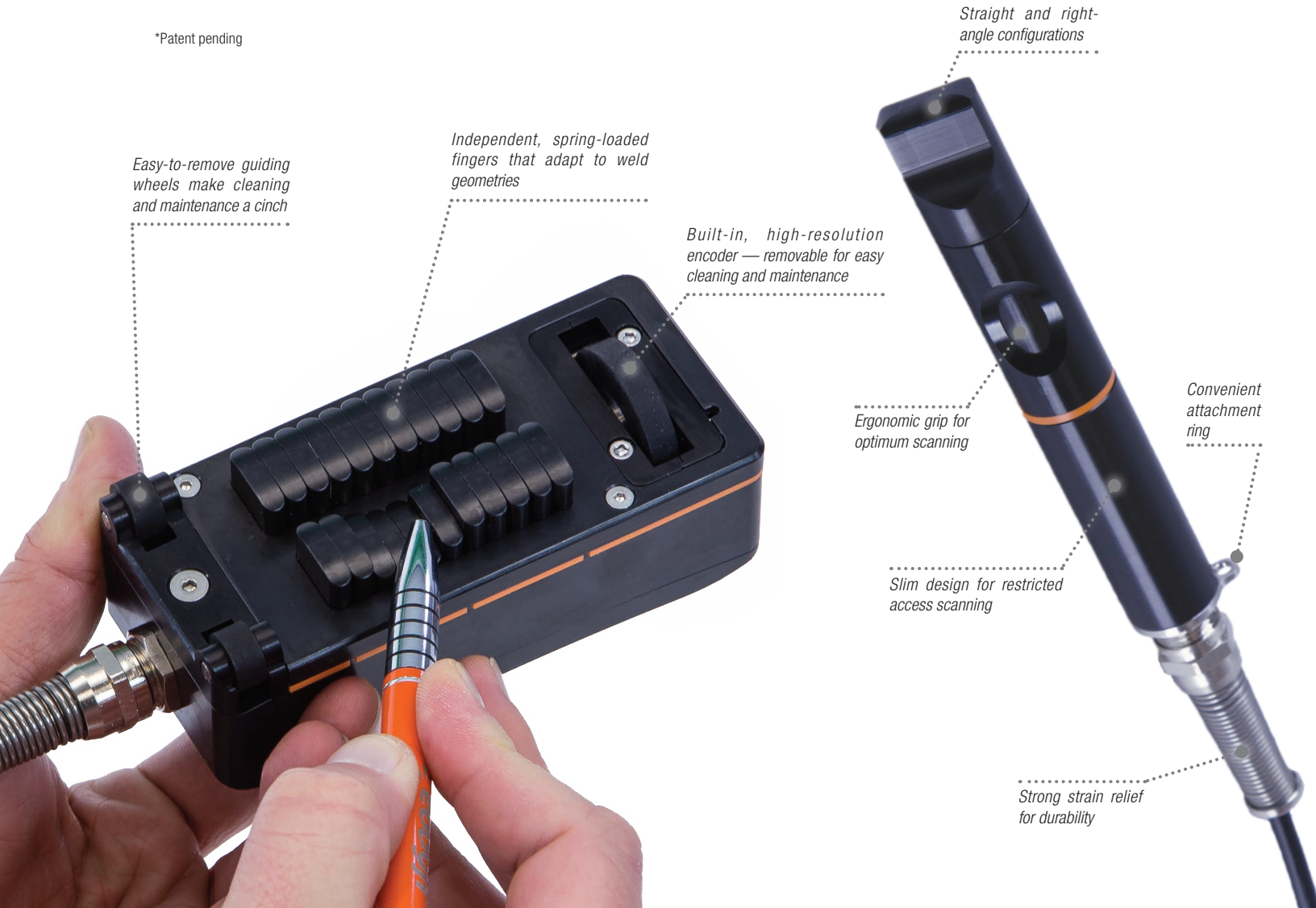
The innovative design of ***Sharck***™ probes* is capable of addressing the inspection needs of several industries that rely heavily on carbon steel welds, such as the oil and gas (onshore and offshore), wind power, and structural industries.

To inspect for cracks in carbon steel welds with penetrant testing (PT) and magnetic particle testing (MT), coatings must normally be removed, surfaces must be cleaned, which is all very time consuming. Other techniques such as ECT pencil probes are highly operator dependant, most of the time offering limited record-keeping capabilities and no depth sizing. Similarly, existing advanced electromagnetic methods are slow, require multiple scans, offer limited data, and rely on algorithms and calculations to measure crack depth.

The ***Sharck*** is a new type of eddy current array (ECA) probe based on tangential ECA (TECA™) technology and specifically developed for cracking in carbon steel. This new probe is not only capable of measuring crack position and length, but also of sizing cracks up to 7 mm (0.28 in) deep. All this without removing paint or protective coatings.

The spring-loaded fingers of the ***Sharck*** probe adapt to the geometry of the weld crown. This enables scanning the weld cap, the toe area, and the heat affected zone in a single pass — at up to 200 mm/s (8 in/s) with full data recording. And, the advanced 2D and 3D C-scan imaging generated from the ***Sharck*** probe data offers the most intuitive inspection results.

*Patent pending

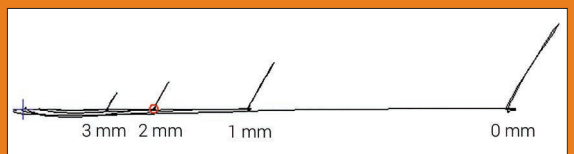


Tangential Eddy Current Array (TECA™)

Traditional pancake coil axes are *perpendicular* to the surface under test. The patent-pending ***Sharck***™ probe, on the other hand, incorporates the new TECA technology where *tangential* coils are positioned on their sides, with their central axes parallel to the surface. *Tangential* also means that eddy currents flow parallel to the surface and are capable of "diving" under cracks to measure their depth.

Each finger in ***Sharck*** probes contains three coils. Two are tangential, working in a transmit-receive mode. Using several small coil arrangements yields great resolution, while multiplexing channels over many fingers provides a large, uniform eddy current distribution for optimal sensitivity. The third coil is a pancake coil used to monitor crack position and detect transverse cracks.

While tangential eddy current is not an entirely new concept, it has never before been used in an array technique with high-performance multiplexing. One key advantage of TECA is that it offers signals similar to traditional ECT pencil probe signals, making TECA easy to learn, minimizing the ramp-up time, while being a more information-rich technique.



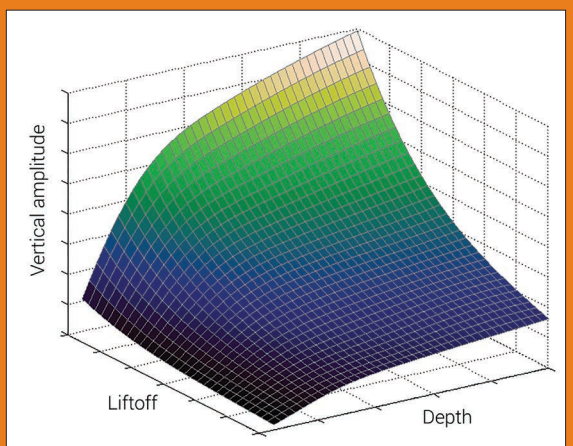
Same crack with different liftoff values

TECA offers extremely valuable information:

- An almost flat liftoff signal
- Crack-like indications approximately 90° relative to the liftoff signal
- All crack-like indications feature the same phase shift

This has several major benefits, one being the capability of monitoring liftoff — unlike orthogonal coils that simply cancel the liftoff signal.

Obviously, the vertical amplitude of a given indication is impacted by liftoff. But thanks to a coil design capable of monitoring liftoff, the ***Sharck*** probe can compensate, offering accurate depth measurements.



A 3D depth plane is integrated into the software to correlate crack depth, vertical amplitude and liftoff

An Advanced Array Technology Leveraging Advanced Software

- Based on tangential eddy current array
- Fast — Maximum scan speed of 200 mm/s
- Single-pass detection of longitudinal and transverse cracks
- Wide coverage — Simultaneously scan weld cap, toe area, and heat-affected zone
- High-performance multiplexing for optimal sensitivity
- Reliable, less operator dependent compared to alternatives
- Easy interpretation with intuitive encoded 2D/3D C-scans
- Actual crack depth measurements — Not based on theoretical modelling
- Automatic readings — Crack length and depth, liftoff
- Auto-compensation — Live monitoring of liftoff and permeability variations
- Full data recording and archiving capabilities

Weld Probe Specifications

	SHARCK-W028-E-H05S	SHARCK-W053-E-H05S	SHARCK-W103-E-H05S
Casing	Small	Medium	Large
Coverage	28 mm (1.1 in)	53 mm (2.1 in)	103 mm (4.1 in)
Fingers	12 (6 × 2 rows)	22 (11 × 2 rows)	42 (21 × 2 rows)
Minimum number of required channels	32	64	128
Frequency	Tuned, fixed at 20 kHz and 80 kHz		
Encoder	Built-in, IP68 rated, 20.53 counts/mm		
Standard cable*	5 m (16.4 ft)		
Maximum surface temperature	100 °C (212 °F)		
Minimum pipe diameter for circumferential weld scan	25.4 cm (10 in)		
Minimum pipe diameter for axial weld scan	30.5 cm (12 in)	40.6 cm (16 in)	58.4 cm (23 in)

* Other available cable lengths: 15 m (49.2 ft) and 25 m (82.0 ft)

Pencil Probe Specifications

	SHARCK-PEN-ST-N05TE	SHARCK-PEN-RA-N05TE
Casing	Straight	Right angle
Coverage	Approximately 7 mm (0.3 in) at –6 dB	
Finger	1	
Minimum number of required channels	32	
Frequency	Tuned, fixed at 20 kHz and 80 kHz	
Standard cable*	Standard, strong strain relief, 5 m (16.4 ft)	
Maximum surface temperature	100 °C (212 °F)	

* Other available cable lengths include: 15 m (49.2 ft) and 25 m (82.0 ft)

Performances

Item	Value	Note
Minimum detectable longitudinal crack length	2 mm (0.08 in)	Results may vary according to crack location, liftoff, etc.
Minimum detectable longitudinal crack depth	0.5 mm (0.02 in)	Results may vary according to crack location, liftoff, etc.
Maximum measurable crack depth	7 mm (0.28 in)	Typical, with good accuracy, but can detect deeper cracks
Length sizing accuracy	±2 mm (0.08 in)	Typical when using 0.5 mm (0.02 in) scan resolution
Depth sizing accuracy	20 % to 40 %	Typical for a wide range of crack length-to-depth ratios and alloys
Scan speed	Up to 200 mm/s (7.9 in/s)	With full data recording
Liftoff tolerance	Up to 3 mm (0.12 in)	Non-conductive coatings and paints, with monitoring and auto-correction
Materials	Wide variety of carbon steels	Tested on: • AISI 1018, 1020, 1045, 1117, 4140 • SA516, 537, 387 • API 2W60 • ABS A131 • Others

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