

PROTON

# Phased Array Ultrasonic Service



## Providing Clarity to your Pipeline Asset

PROTON™ is a highly configurable phased array inspection platform allowing a combination of multiple angles and crack techniques (pulse-echo, pitch and catch) for crack detection and sizing in addition to high-resolution metal loss measurement.

Multi angle sampling allows the best depth tool tolerance available in the market by means of these multiple indirect crack measurement techniques and direct crack tip measurement for critical features. The multiple angles cover a wide range of crack features such as hook cracks, lack of fusion, lack of penetration, weld anomalies, SCC, amongst other linear indications.

The high-resolution metal loss measurement enables local wall thickness measurements and weld attributes such as width, peaking, and weld misalignment.

Data acquisition for different mediums, weld types and sound velocities can be optimized via firmware without the need for mechanical modification of the tool. The flexibility of optimizing the configuration for specific environments, ensures the best data possible for the individual application in a single inspection.



Axial Cracks



Circumferential Cracks



Metal Loss



Geometry Ovalities



Mapping

## Enhanced Precision through Feature Context

PROTON depth tool tolerance is at a feature level as it considers the context and surrounding of the crack. This is possible because of the multiple attributes that are recorded and considered for the depth calculation such as weld type, relative position, weld geometry, etc.

The information PROTON provides allows the understanding of the truest condition of the pipeline asset.

## Benefits

- Improved decision making, repair planning and cost reduction through a combination of the best tool tolerance and local wall thickness measurements.
- Increased operational efficiency to quickly adapt to changing operational conditions at short notice in advance of the inspection via quick firmware changes.
- Enable efficient remediation planning resulting from detection capabilities for critical interacting threats and combined features such as cracks in dents.

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## Specifications

### Key Performance Specifications (referring to API 1163)

POD for axial cracks, crack-like anomalies and linear indications  $\geq 90\%$

Min. depth of crack with  $L \geq 20$  mm (0.79 in)

• Base material & at weld	1 mm	0.04 in
• In weld	2 mm	0.08 in

Depth sizing accuracy at 80% certainty in ERW, base material and at DSAW

• 1 ... < 4 mm (0.04 ... < 0.16 in)	$\pm 0.7$ mm	$\pm 0.028$ in
• $\geq 4$ mm (0.16 in)	$\pm 0.7$ mm	$\pm 0.028$ in

Depth sizing accuracy at 80% certainty in DSAW<sup>1</sup>

• 1 ... < 4 mm (0.04 ... < 0.16 in)	$\pm 1.0$ mm	$\pm 0.039$ in
• $\geq 4$ mm (0.16 in)	unspecified	unspecified

Local wall thickness measurement capabilities in base material, ERW and DSAW at 90% certainty

Local wall thickness	$\pm 0.4$ mm	$\pm 0.016$ in
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Length sizing accuracy at 90% certainty	$\pm 10$ mm	$\pm 0.39$ in
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Location in pipe wall

• Internal/external	Yes	Yes
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Flaw orientation for sizing

• Maximum skew angle	10°	10°
• Maximum tilt angle	45°	45°

POD for axial cracks, crack-like anomalies and linear indications interacting with geometric anomalies  $\geq 85\%$ <sup>2,3</sup>

Min. depth of crack with  $L \geq 30$  mm (0.79 in)

• Base material & at weld	1 mm	0.04 in
• In weld	2 mm	0.08 in

<sup>1</sup> DSAW weld width between 17.1 mm to 24.1 mm and weld height between 2.1 mm to 4.1 mm

<sup>2</sup> Minimum requirement of two pulse echo angles

<sup>3</sup> POI and depth accuracy is not applicable

### Defect Location Accuracy

Axial from nearest girth weld	$\pm 0.1$ m	$\pm 3.94$ in
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• Circumferential for $\varnothing < 20$ "	$\pm 10^\circ$	$\pm 10^\circ$
• Circumferential for $\varnothing \geq 20$ "	$\pm 5^\circ$	$\pm 5^\circ$



PROTON - Phased Array Inline Inspection Tool

### Key Tool Specifications: PROTON

Tool sizes	24" and 26"	24" and 26"
Pipeline medium	Liquid	Liquid
Max. operation speed	1.4 m/s	3.13 mph
Temperature range	-10 to +50 °C	14 to 122 °F
Max. pressure	120 bar	1740 psi
Min. bend radius	3 D 90°	3 D 90°
Min. axial sampling distance	4.5 mm	0.177 in
Circumferential sensor spacing	5 mm	0.20 in

Max. operating speed and min. axial sampling distance depend on specific ILI tool set-up. Special configurations for high-temperature, high-pressure, multi-diameter and bi-directional inspections available upon request.



Cross section of an internal hook crack in an ERW long seam after a freeze break.

Please note: Tool and performance specifications depend on inspection and pipeline conditions. Please contact your local NDT Global representative for further information. NDT Global reserves the right to introduce modifications and changes without prior notice.