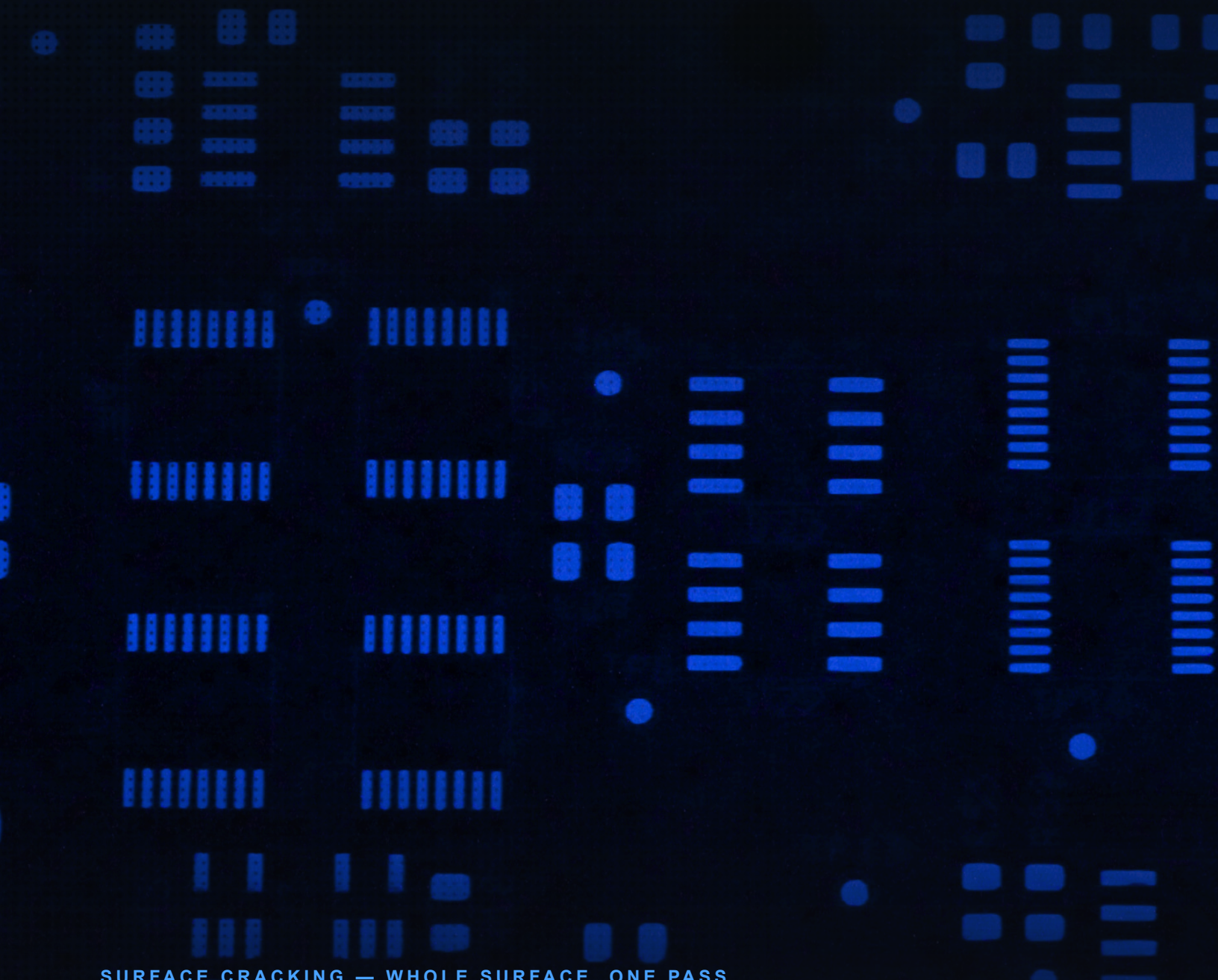
HELIX

PRODUCT DATA SHEET

HLX-PDS-2026-007 Rev C

August 2026



SURFACE CRACKING — WHOLE SURFACE, ONE PASS

HELIX ECA

Eddy current array scanner

SHOWN: HELIX ECA REV 3 SENSOR ARRAY BOARD

The HELIX screening system

HELIX ECA is one layer of a screening system that ends in a model of the asset, not a folder of scan files. The array produces the measurement; the encoder ties every sample to a position; HELIX Horizon ties the scan line to a physical location on a LiDAR + photogrammetry 3D model of the real component.

1 ARRAY
32 coils are multiplexed and fired in sequence; cracks and near-surface flaws disturb the local electromagnetic response beneath each coil. One pass covers the full array width — the coil layout fixes coverage, not operator technique.

→

2 C-SCAN
Responses assemble into a live C-scan on the connected device, with position from an optical encoder running on the surface. Indications are flagged on the spot, before leaving the asset.

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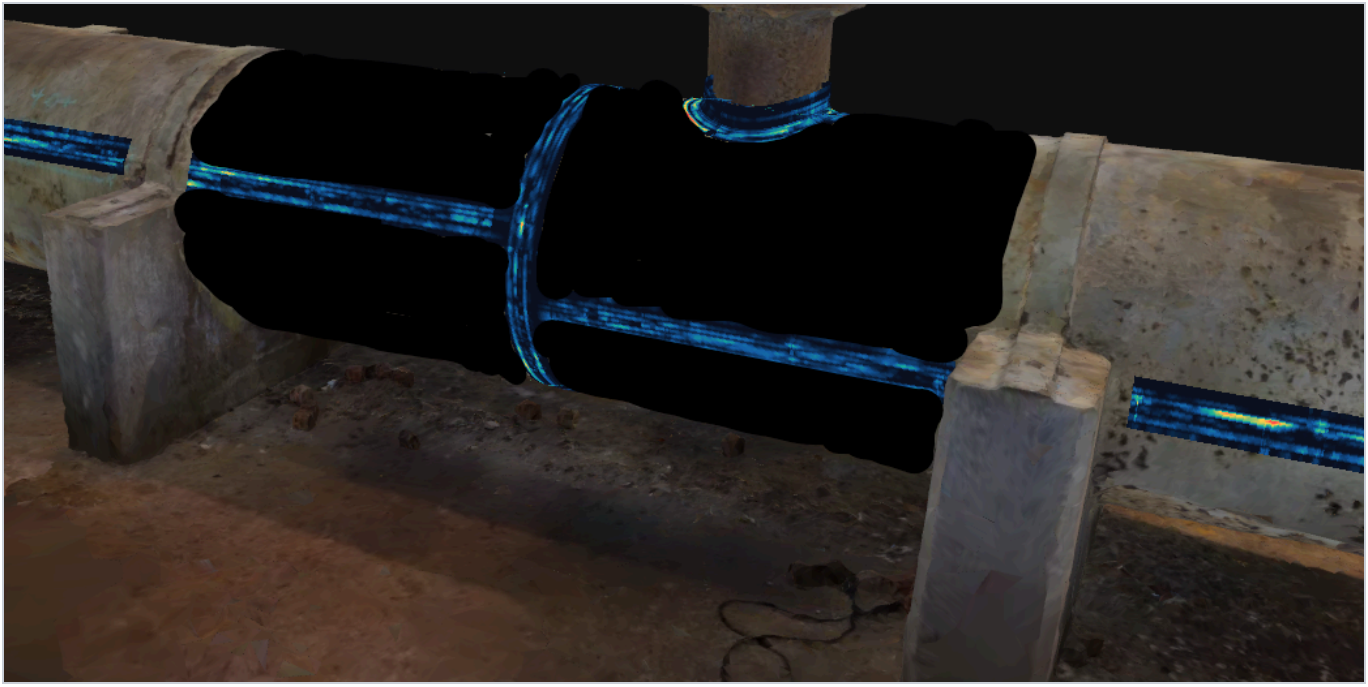
3 HORIZON REGISTRATION
Scans upload to HELIX Horizon and register to the component's 3D model, so growth is assessed against the previous scan rather than against memory.



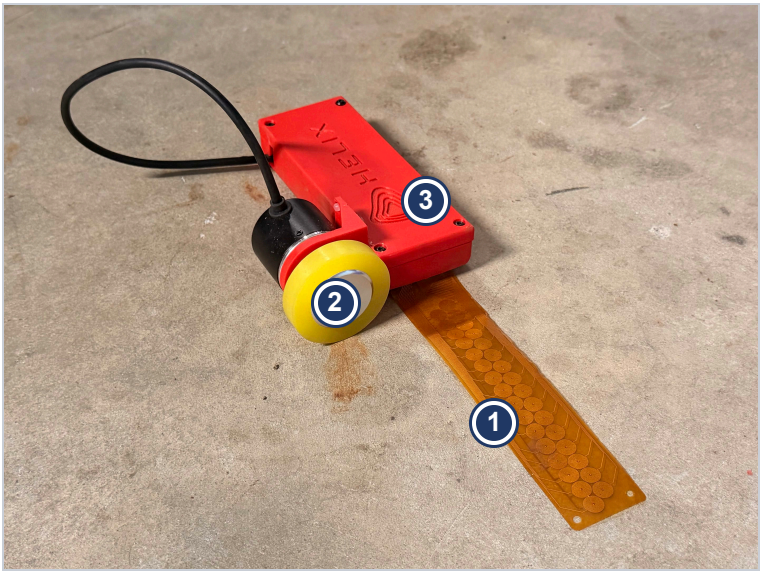
ECA scan bands registered to a photogrammetry model of an in-service pipeline tee in HELIX Horizon, Eddy Current Array layer active. Colours are relative to this scan — they mark the lowest and highest readings shown, not safe/unsafe limits.

The probe is built on the same flexible printed circuit technology as the permanently installed HELIX Sensor Wrap (patent-pending), and the same Horizon platform carries both: handheld screening results and continuous monitoring data sit on one model of one asset.

Product overview

Eddy current array screening for surface and near-surface cracking on conductive metals. A flexible 32-element probe conforms to the component, reads through paint and primer, and produces an encoder-registered C-scan — no couplant, no coating removal.

32	150 kHz	~120 mm	3.75 mm	0.5×0.1 mm
ARRAY ELEMENTS — 16 TX / 16 RX	OPERATING POINT (50–500 KHZ RANGE)	COVERED PER PASS	CROSS-TRACK SAMPLING	CRACK DETECTION, LENGTH × DEPTH

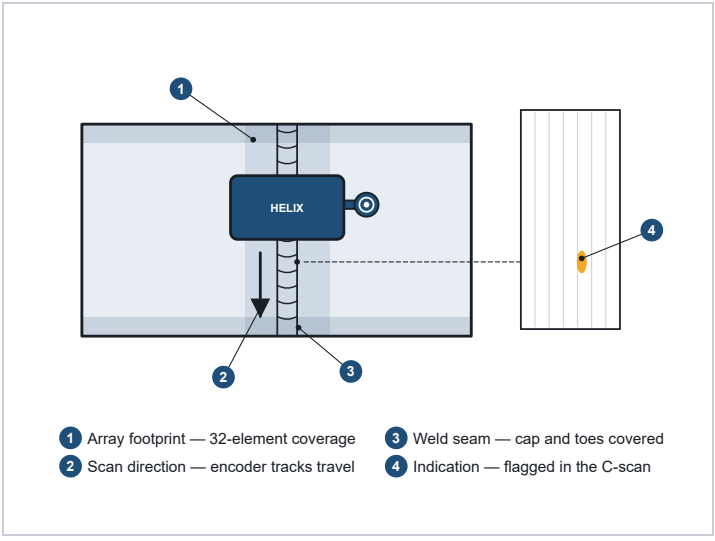


HELIX ECA-Rev3 system, deployed unit ECA-1a.

1. **Flexible eddy current array.** 32 coils of 7.5 mm diameter on 7.5 mm centres in two staggered rows on a polyimide substrate — a coil centre every 3.75 mm across the swath. The probe conforms to the component across curvature.
2. **Encoder wheel.** An optical rotary encoder tracks position along the surface, so the C-scan is registered to the component and repeatable scan to scan.
3. **Interface enclosure.** Excitation, interleaved multiplexing and acquisition for all 32 channels — 16 transmit / 16 receive, operated at 150 kHz within a 50–500 kHz range.

Host connection (not shown). A single USB-C cable to a laptop or tablet carries data and power — no separate instrument display, no mains supply, no battery.

How a scan runs



Top view: the array footprint (1) straddles the weld seam (3) — cap and both toes — and sweeps in the scan direction (2); indications appear in the live C-scan (4). Schematic illustration — not to scale.

Coverage

Coverage fixed by layout, not technique

A single pass covers the full ~120 mm array width — a weld cap and both toes in one sweep. The staggered coil geometry sets the coverage pattern, so two operators scanning the same component produce the same swath.

Coatings stay on

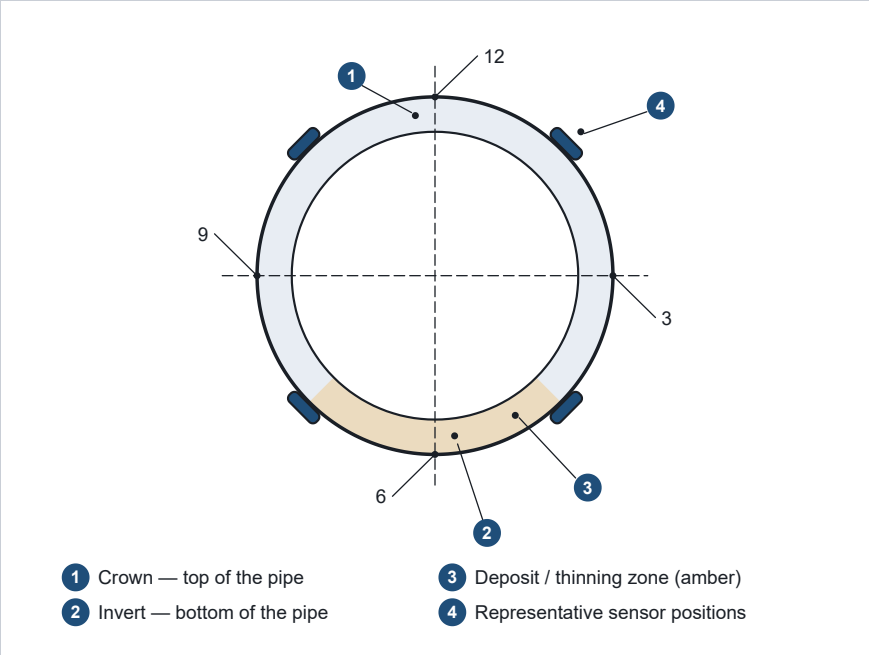
Non-conductive coatings such as paint and primer are read through to approximately 2 mm — no stripping, no couplant, no recoating after inspection. Often the largest single saving against dye penetrant or magnetic particle programmes.

Screening that accumulates

Every scan is encoder-registered and located on the asset model, so a repeat inspection is a comparison, not a re-interpretation. Indications are tracked for change between visits.

Locating scan lines on the component

On piping, scan lines and readings are located by the standard clock convention around the circumference — crown at 12 o'clock, invert at 6 — so a repeat scan re-occupies the same line. The cross-section below shows the convention.

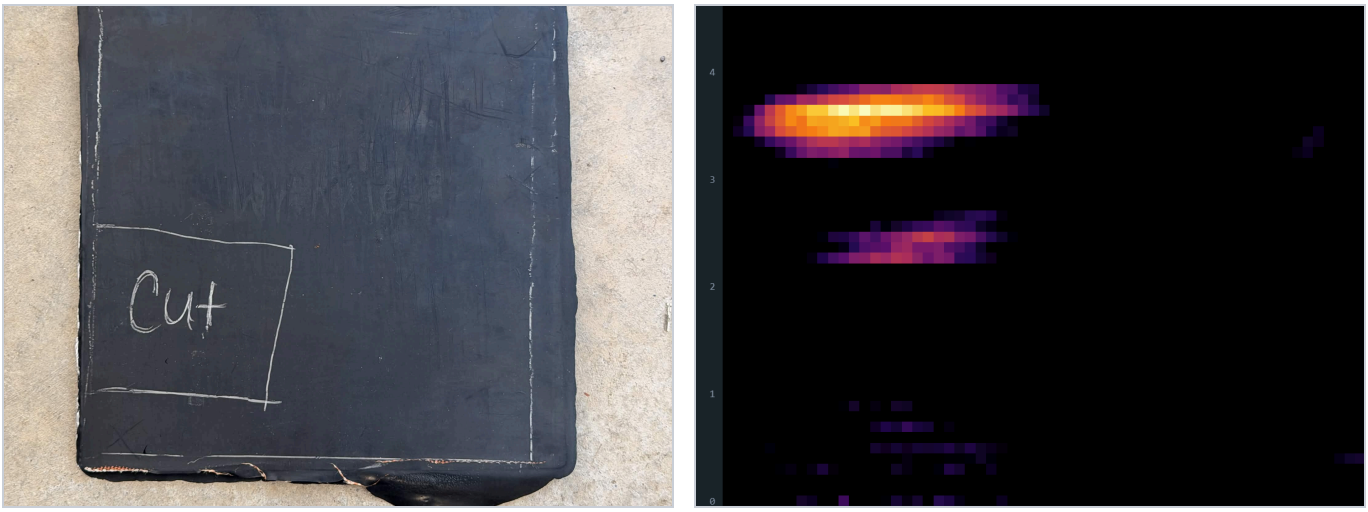


*Clock-position convention on a horizontal pipe: crown (12 o'clock), invert (6 o'clock). The shaded invert segment marks where deposits and thinning commonly concentrate; sensor pads are shown at **representative monitoring positions**, not a prescribed layout — agreed per engagement. Schematic, not to scale.*

Detection validation

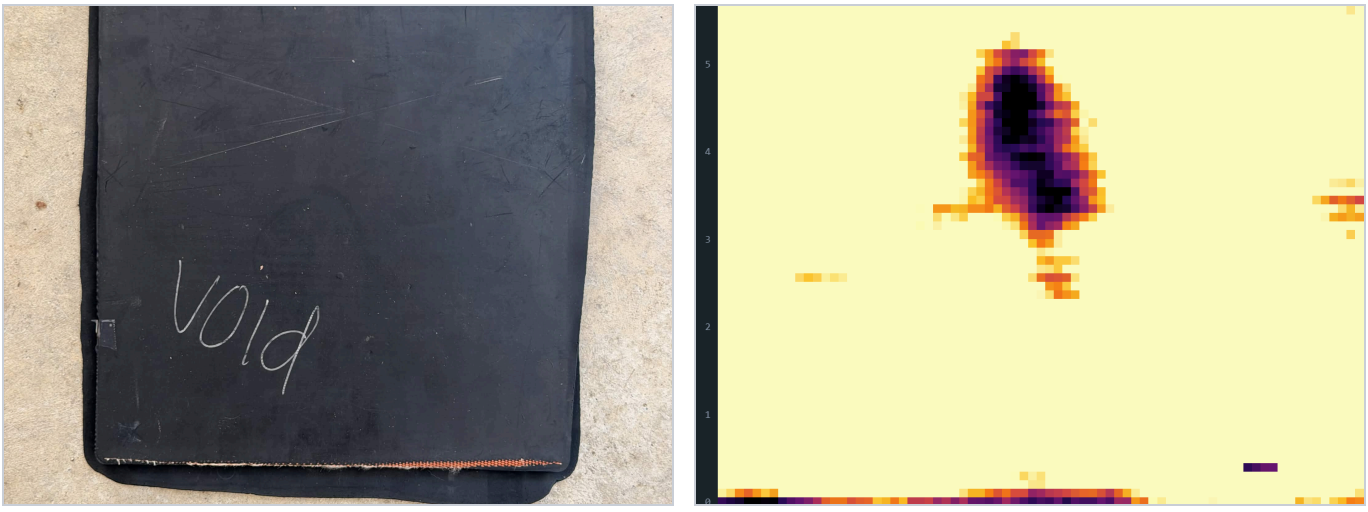
Detection sensitivity is set from the HELIX ECA crack calibration sheet and checked against engineered defect panels — test pieces carrying a known cut, void or wrinkle at a known location. Each figure below pairs the physical panel with its scan response from the standard 32-element array.

Engineered cut panel



Left: engineered defect panel, cut region marked in chalk. Right: ECA scan response — the cut appears as a continuous high-amplitude indication at the marked location; the fainter trace below is the partial-depth extension of the same feature.

Engineered void panel



Left: engineered defect panel, void marked in chalk. Right: ECA scan response — the void reads as a localised low-response region against a uniform background; edge effects at the panel boundary are visible along the lower frame edge.

Reading these figures. Scan colours are relative to each scan — they mark the lowest and highest responses shown, not safe/unsafe limits. Response amplitude depends on defect geometry, material and coil standoff, so sizing estimates are always referenced to a calibration standard matching the material, geometry and coating of the component under test. Where no suitable standard exists, one is prepared as part of the engagement.

Specifications

Probe	
Probe technology	Flexible printed circuit coil array, conformal
Elements per array	32 — 16 transmit / 16 receive
Coil diameter	7.5 mm
Coil pitch	7.5 mm centre to centre, two staggered rows with a trace lane between them
Cross-track sampling	Coil centre every 3.75 mm across the array width
Single-pass coverage	Approximately 120 mm for the standard array
Higher-resolution builds	Denser coil packing available for more resolution per unit area
Detection sensitivity	Surface cracks from approximately 0.5 mm length × 0.1 mm depth
Conformability	Minimum bend radius per probe type *
Probe options	Surface array, weld scanner, tight-radius, bolt-hole, tube-internal, custom

Material & coating	
Compatible materials	Carbon steel, stainless, aluminium, titanium, copper, brass, nickel alloys
Through-coating	Non-conductive coatings to approximately 2 mm
Standoff tolerance	Sub-millimetre for best accuracy; compensation in development
Surface condition	Reasonably clean and uniform profile; assessed at scoping

Electronics	
Array channels	32
Excitation frequency	50 kHz – 500 kHz; standard operating point 150 kHz
Excitation modes	Bridge, reflection, and hybrid driver / pickup
Multiplexing	Interleaved coil firing for cross-talk suppression
Filtering	Configurable high-pass, low-pass and band-pass per channel

Acquisition	
Display modes	Impedance plane, C-scan, strip chart, time base
Position tracking	Optical rotary encoder
Live visualisation	Real-time C-scan on the connected device
Calibration	Single point on a representative reference standard

Instrument	
Form factor	USB-C interface unit, no separate instrument display
Host connection	Single USB-C cable to a laptop, tablet or other host device
Power	Bus-powered from the host; no mains supply or battery required
Display	The display of the connected device
Data handling	Scans written to the host; upload to HELIX Horizon optional

Environment	
Operating temperature	0 – 50 °C *
Operating humidity	Non-condensing *
Ingress protection	IP65 target *
Certifications	Contact HELIX

Delivery	
Engagement	Site inspection scoped per component set, or supply of probes and interface unit
On-site output	Live C-scan, annotated captures, flagged regions of interest
Report	Indications with location, calibration-referenced sizing estimate and recommended action
Software	Upload to HELIX Horizon for analysis, registration to 3D geometry and comparison across repeat scans

* Design target, typical industry range, or pending the production calibration sheet. Unmarked values reflect the current build. Probe selection, defect criteria and reference standards are agreed per engagement. Specifications are subject to change without notice.

Limitations

The points below set out where ECA applies and what to establish before a scope is agreed.

- **Conductive materials only.** The method works by electromagnetic induction, so it applies to metals and conductive alloys — composites, ceramics and plastics are outside its scope.
- **Surface and near-surface only.** Depth of penetration is set by excitation frequency and the material. Deep subsurface flaws and remaining wall thickness are not measured; where both failure modes matter, ECA is paired with a volumetric method such as HELIX PEC.
- **Standoff affects accuracy.** Paint and primer are read through, but heavy scale or a highly irregular profile degrades the signal — surface condition is assessed at scoping.
- **Calibration is material-specific.** Sizing estimates are referenced to a standard matching the material, geometry and coating.
- **Position comes from encoder travel.** The probe needs a path it can be moved along in a controlled line; tight or obstructed access limits what one registered scan captures.

Screening, not sizing. HELIX ECA reports indications — where they are, their extent along the scan, and how they change between registered scans. Length and depth values are calibration-referenced estimates, not certified defect sizes. Screening results do not certify the asset to any code scheme; fitness-for-service is a regulated engineering assessment that remains with the client's engineers. HELIX personnel are not certified under ISO 9712 / CAN/CGSB-48.9712, and no deliverable implies such certification.

Reference frameworks

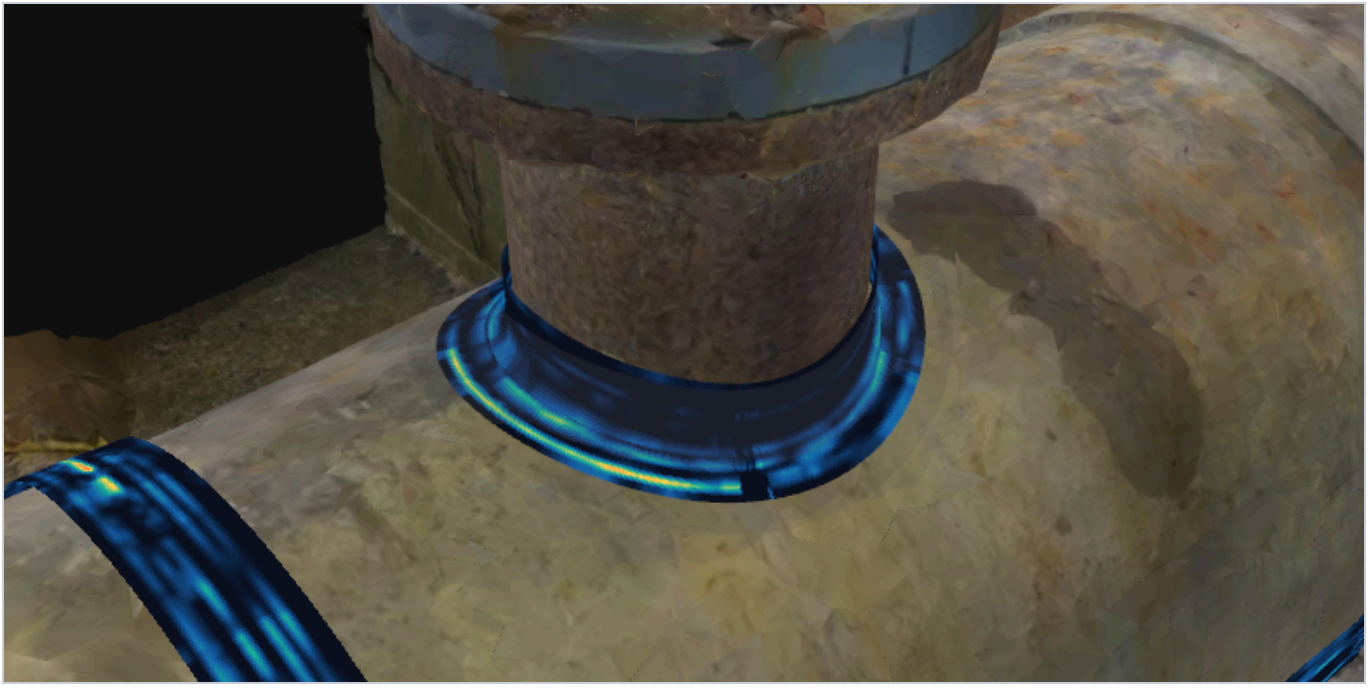
Document	Scope	Status
ISO 15548-1 / -2 / -3	Equipment for eddy current examination — instrument, probe and system characteristics and verification	Reference framework
ISO 20339:2017	Equipment for eddy current examination — array probe characteristics and verification	Reference framework
ASTM E3052-21	Examination of carbon steel welds using eddy current array	Reference framework
ISO 17643:2015	Eddy current testing of welds by complex-plane analysis	Reference framework

Standards are cited as reference frameworks that inform HELIX method and equipment practice. HELIX does not claim certification or compliance to these documents.

Engagement and ordering

Option	What is supplied
ECA site inspection	HELIX screens the agreed component set on site. Deliverables: live C-scan with flagged regions of interest, annotated captures, follow-up report, retained raw data.
Combined screening visit	Four methods in one mobilisation: PEC wall-response screening, ECA surface-discontinuity screening, LiDAR + photogrammetry 3D capture, and registration of all results to the model in HELIX Horizon.
Probe and interface supply	32-element probes and USB-C interface unit supplied to operators running their own inspection programme; probe selection agreed per engagement.
Reference standards	Calibration standard matching material, geometry and coating; prepared where no suitable standard exists.
HELIX Horizon	Upload, registration to the asset's 3D model, point-of-interest register, and comparison across repeat scans. Optional with every engagement.

To scope an engagement or request a quotation, contact **info@helixsensors.com** or book a meeting at **helixsensors.com**. Probe configuration, defect criteria and site logistics are agreed per engagement.



What an engagement returns: ECA scan data registered on the 3D model of the surveyed component in HELIX Horizon — here a close-up of collar scans on an in-service riser. Colours are relative to this scan — they mark the lowest and highest readings shown, not safe/unsafe limits.

HELIX

Continuous health monitoring of critical assets

About HELIX Sensors

HELIX Sensors Inc. is a British Columbia company building non-intrusive screening and continuous monitoring for critical industrial assets: pulsed eddy current and eddy current array screening, the patent-pending HELIX Sensor Wrap for permanently installed monitoring, and the HELIX Horizon platform that registers every result to a 3D model of the real asset. Periodic inspection is a snapshot; HELIX is built to replace snapshots with continuous visibility.

Related documents

Document	Reference
ECA technical specification	HLX-SPC-2026-003 Rev A — available on request
NDT screening & 3D condition mapping case study (Capilano River Hatchery, DFO)	Inspection reference HLX-2026-001 — available on request

Document control

Document number	HLX-PDS-2026-007
Revision	Rev C — standardised cover and figure system; Rev B technical illustrations added (weld-scan schematic, clock-position convention); Rev A initial issue
Issued	August 2026
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