HELIX

PRODUCT DATA SHEET

HLX-PDS-2026-008 Rev D

August 2026

READS THROUGH COATINGS · NO RETURN VISITS

HELIX Sensor Wrap

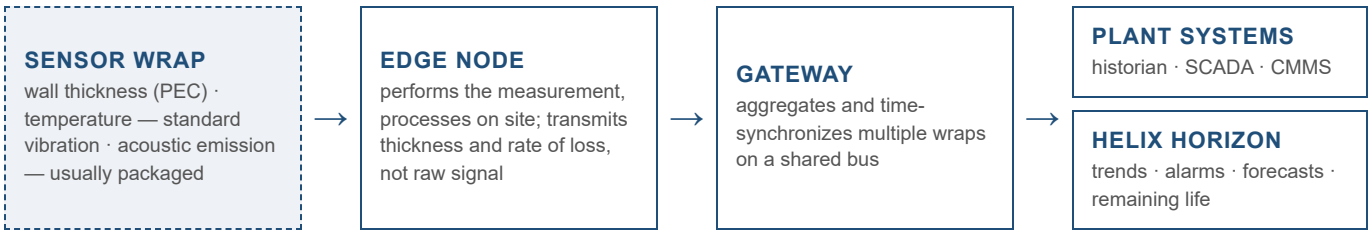
Permanently installed continuous wall-loss monitoring

SHOWN: SPIRAL-COIL SENSING ELEMENTS ON THE FLEXIBLE SUBSTRATE

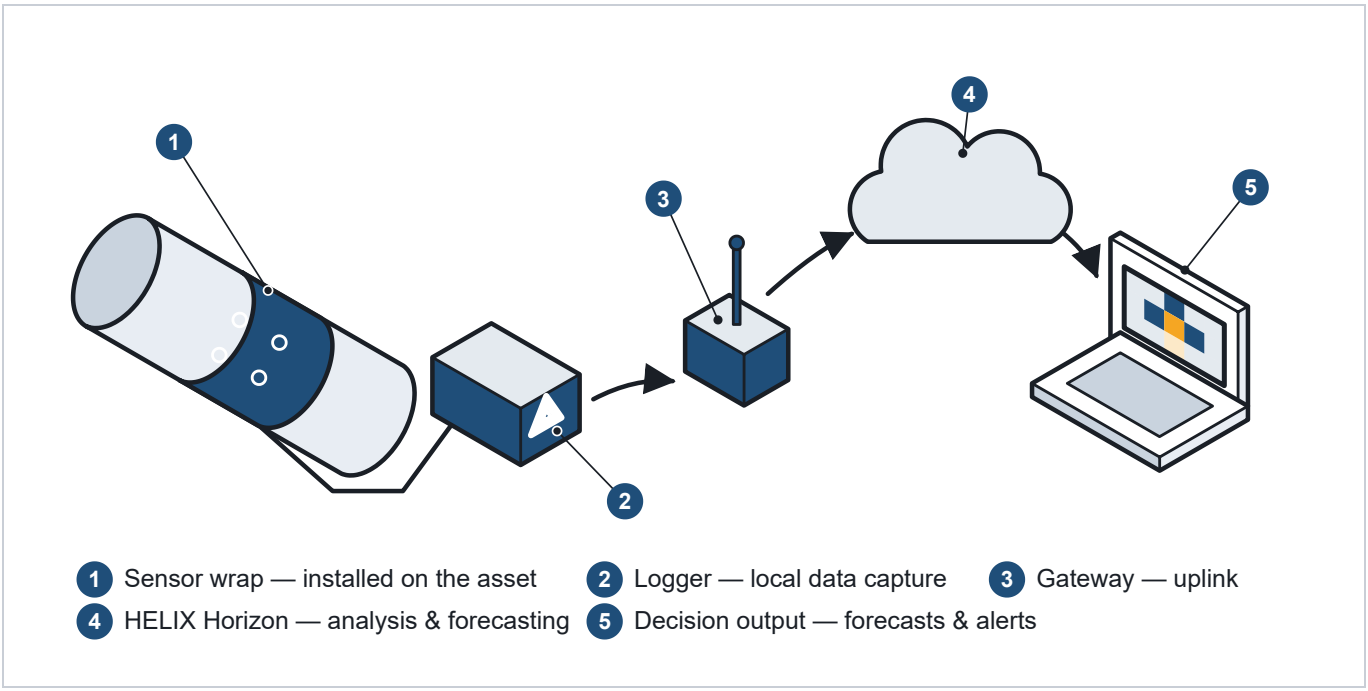
From periodic snapshots to continuous visibility

Periodic inspection samples an asset's condition months or years apart; between visits, wear rate is an assumption. The HELIX Sensor Wrap replaces that assumption with a measurement: the same nodes read the same locations on every scan, so each position accumulates a thickness history. The rate of wall loss derived from that history supports remaining-life estimation and replacement timed to condition, not to the calendar.

System architecture



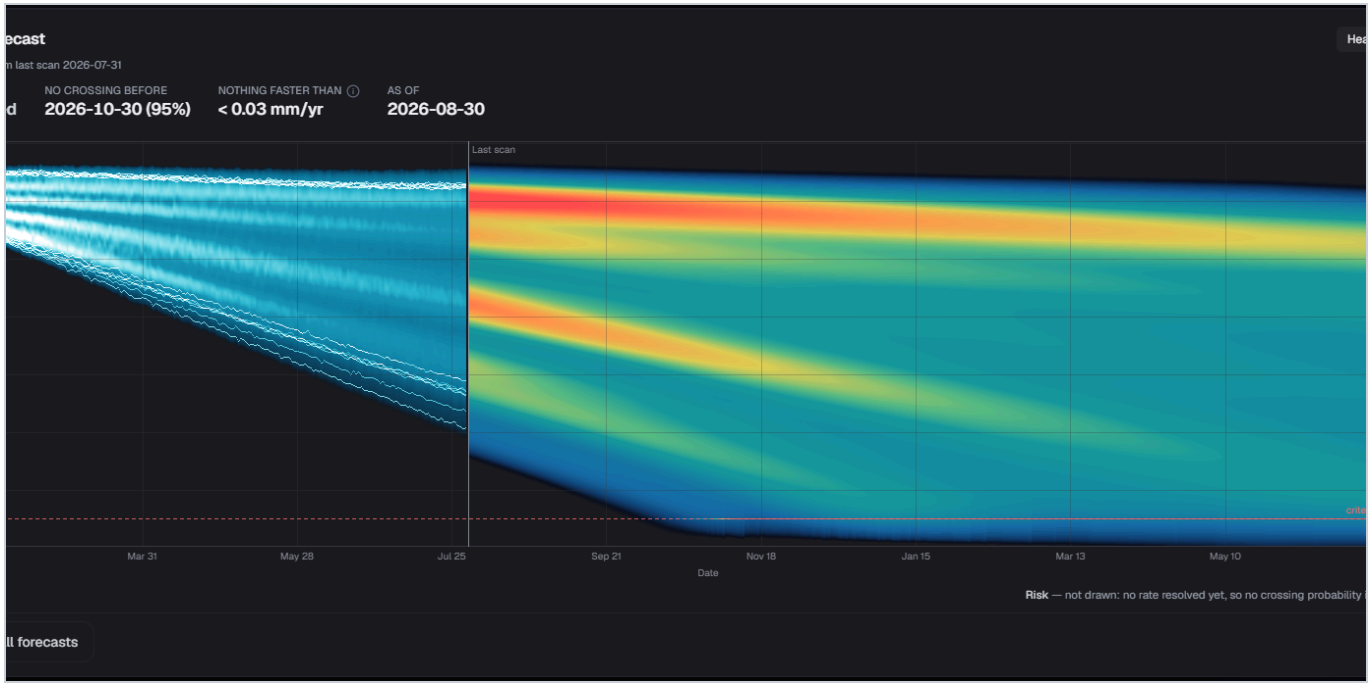
Only processed results leave the asset. Transport is matched to the site — wired or wireless — and where no site power is available, a solar node with battery backup supplies the electronics.



The same chain on the asset — (1) sensor wrap, (2) logger (edge node) capturing data locally, (3) gateway uplink, (4) HELIX Horizon analysis, (5) decision output. Schematic; not to scale.

Threshold and rate-of-change alarms are configured per channel and per zone. Integration to the plant historian or to HELIX Horizon runs over standard interfaces (see Specifications, page 7).

Forecast output in HELIX Horizon



HELIX Horizon "Latest forecast": measured thickness history, the forecast fan against the criterion line, and plain-language findings — e.g. "No crossing before 2026-10-30 (95%)". Demonstration asset shown.

LIVE WRAP PILOT — PUBLISHED FIELD RECORD *(HELIX "Array Live", helixsensors.com)*

12	3.000 mm	4,800	<1%	±25 µm
MEASUREMENT POINTS	NOMINAL WALL MONITORED	READINGS OVER 8 HOURS	WALL-LOSS DETECTION THRESHOLD	TEMPERATURE-COMPENSATED

Product overview

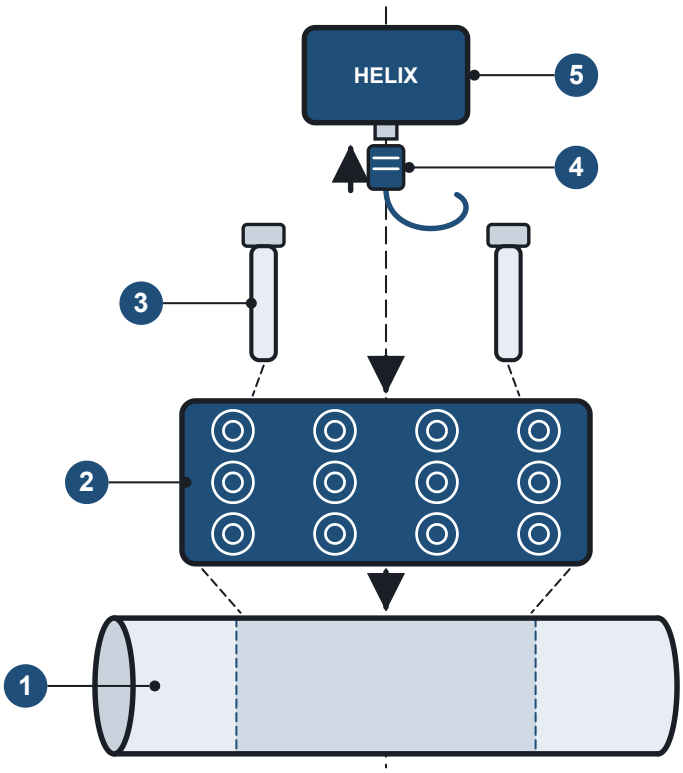
The HELIX Sensor Wrap is a flexible sensor strip that bonds permanently to a pipe, vessel or fitting and measures remaining wall thickness from the outside. Copper coils etched on a polyimide flexible circuit are potted in an elastomer and over-wrapped for service on the operating plant. The roll-to-roll construction is what makes the wrap tileable: one design scales across diameters and asset types.

Each wrap is built for a specific asset: the sensor payload and coil layout are set during scoping, based on the failure mode of concern, and fixed before fabrication. Once installed, the wrap remains in place beneath the cladding for the life of the installation.

Reads through coatings. The wrap installs over the asset's existing coating with the plant in service — no shutdown, no containment break, no surface preparation or coating removal.

How it goes together

The figure below shows a completed installation as an exploded stack, in the order the parts go onto the asset. Part names follow the wrap installation guide (HLX-ENG-2026-002 Rev A).



1. Pipe — coating left as found
2. Sensor array — bonded to the pipe
3. Banding — holds the wrap tight
4. Harness — into the bulkhead connector
5. Enclosure — banded clear of the array

The install stack, exploded on its assembly axis, parts numbered in fitting order.

What it measures

Every wrap measures wall thickness and temperature at each sensing node; vibration and acoustic emission are usually packaged alongside:

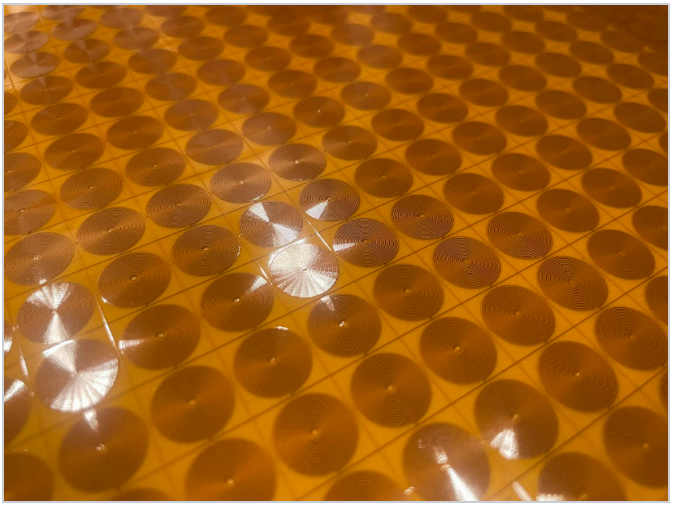
- **Wall thickness (pulsed eddy current).** Average remaining wall under each node, trended over time. Carbon, mild, ferritic, duplex and austenitic steels, 2–30 mm.
- **Temperature.** Per node, fitted as standard — compensates the thickness measurement for temperature change and gives process context.
- **Vibration.** Machinery, flow-induced and structural vibration, including cumulative load events.
- **Acoustic emission.** Detects active defect activity, including crack growth, leakage and other transient release events.

Two build formats

Coil layout follows the expected damage mechanism and the resolution required. Identifying where damage is expected to concentrate is part of scoping.

Format	Layout	Intended use
Line	Single row of 40 mm coils at 60 mm pitch, in a continuous strip ≤ 50 mm wide; run axially, circumferentially or helically	Higher resolution across a localized band — erosion at a bend, flow-accelerated corrosion, corrosion at a support contact
Area	Two-coil-wide rows of 120 mm coils packed adjacent, with a 30 mm bus lane; wound around the asset for near-continuous coverage	General wall loss over a large surface — pipe runs, vessel shells, tank walls

The wrap conforms to small-radius bends, diameter transitions, weld caps, elbows and valve bodies that rigid sensors cannot follow. Run length is cut to the asset: on an eroded bend, the affected band typically runs from part-way into the bend through the downstream tangent, so a line-format strip is cut to cross both welds rather than sit on the fitting alone. Multiple wraps are chained on a shared multi-drop bus and addressed in turn by the gateway.



Sensing elements: planar spiral coils etched in copper on polyimide flex, fabricated as a continuous sheet.

Fabricated wrap panels before elastomer potting and overwrap; the bus lane carries power and signal to every coil.

Where it applies

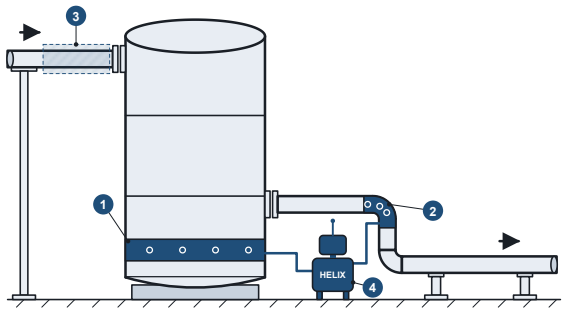
The wrap is most cost-effective where access accounts for the majority of inspection cost, or where degradation progresses faster than the inspection interval can track it. It is intended to replace repeat inspections rather than initial surveys.

Best return

- Known, localized damage mechanisms where the likely location can be identified in advance
- Components replaced on a fixed schedule or approaching a retirement limit, where measured wear rates let replacement be timed to condition
- Operations where process conditions drive wear rate, so the measured response to a change in duty supports operating decisions
- Assets where each inspection requires scaffolding, insulation removal, permits or a shutdown — including risers, jackets, elevated pipework and offshore installations
- Assets requiring a continuous, auditable integrity record for regulators or insurers

Less suited

- Random pitting or isolated cracking, which a fixed grid of averaged readings will not resolve
- Assets where the damage location cannot be predicted, so coverage cannot be scoped effectively
- One-off surveys and screening work, where handheld inspection is more economical



1. HELIX Sensor Wrap — continuous wall-loss monitoring, lower shell course
2. HELIX Sensor Wrap — outlet nozzle and elbow
3. PEC screening band — wall-response survey of the straight run
4. Logger + gateway — sends wrap data to HELIX Horizon

Representative monitoring positions on a storage-tank system; actual coverage is set at scoping.

Honest scoping matters.
Each reading is an average of the wall beneath one coil. General wall loss is resolved well — current deployments are tracking thickness changes of around 0.5%. Pitting and tight cracking are resolved only where they are large enough relative to the coil footprint to move the average. Where these are the primary concern, the geometry is worked through at scoping.

Specifications

PLATFORM	
Construction	Polyimide flex with etched copper coils, elastomer potted, protective overwrap
Thickness	Set by potting and overwrap; sensing stack ≈ 3.5 mm *
Form factor	Permanent installation beneath cladding or insulation
Compatible assets	Pipes, pressure vessels, tank shells, bends, complex joints
Build formats	Line — single row of 40 mm coils; Area — two-coil-wide rows of 120 mm coils
Run length / coverage	Cut to the asset at scoping; multiple wraps chained on one bus
Installation method	Adhesive bonded, strapped, or banded; technician installed

SENSING GEOMETRY	
Line format	40 mm coils, single row at 60 mm pitch; axial, circumferential or helical
Line format strip	Continuous strip, ≤ 50 mm wide
Area format	120 mm coils, two-coil-wide rows packed adjacent; 30 mm bus lane
Wall thickness range	2 – 30 mm *
Materials	Carbon, mild, ferritic, duplex and austenitic steels *
Measurement mode	Set per node from material class and wall at commissioning *

ENVIRONMENT	
Operating temperature	−40 to 300 °C *
Ingress protection	Designed to IP68 *
Designed service life	10+ years, modality dependent *

POWER	
Site power	12 – 24 VDC, or 110 – 240 VAC
Autonomous	Solar harvesting node with battery backup *

SENSOR PAYLOAD	
Pulsed eddy current	Always fitted — average wall thickness, trended per node
Temperature	Always fitted — required for PEC compensation
Vibration	MEMS accelerometers; usually packaged
Acoustic emission	Active defect activity; usually packaged *
Payload selection	Scoped per deployment; fixed at fabrication

DATA ACQUISITION	
Sampling	Per modality; continuous through scheduled bursts
Scan time	≈ 2 s to ≈ 21 s for a 16-node array, set by material and wall *
Onboard processing	Edge filtering, feature extraction, local aggregation
Multi-wrap	Wraps chained on a multi-drop bus; gateway addresses each in turn

TRANSMISSION	
Wired	RTU / TCP, Ethernet/IP
Wireless	Cellular LTE-M / NB-IoT, Wi-Fi, BLE
Integration	REST API, MQTT, OPC UA to plant historian or HELIX Horizon
Alarms	Threshold and rate-of-change, per modality and per zone

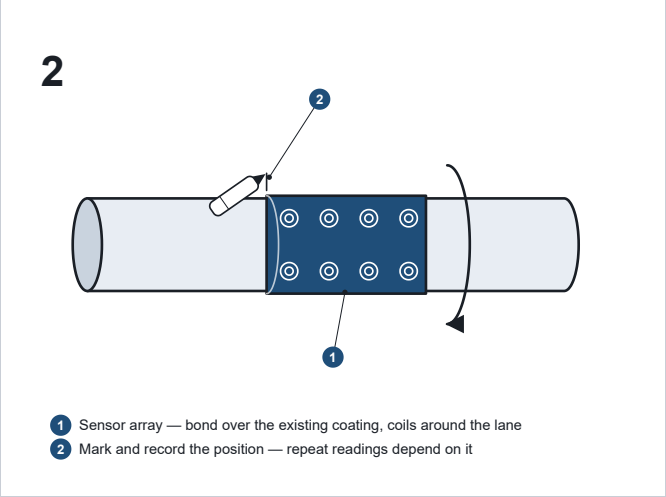
DEPLOYMENT	
Installation	HELIX technician led, documented per asset
Lead time	Per deployment, from scoping — TBD
Commissioning	Factory calibration plus on-site verification against reference
Support	Remote monitoring and analytics support included

MEASUREMENT PERFORMANCE — PUBLISHED LIVE-PILOT RECORD	
Detection threshold	<1% of nominal wall
Reading stability	±25 µm, temperature-compensated
Field record	4,800 readings over 8 h across 12 points on a 3.000 mm nominal wall

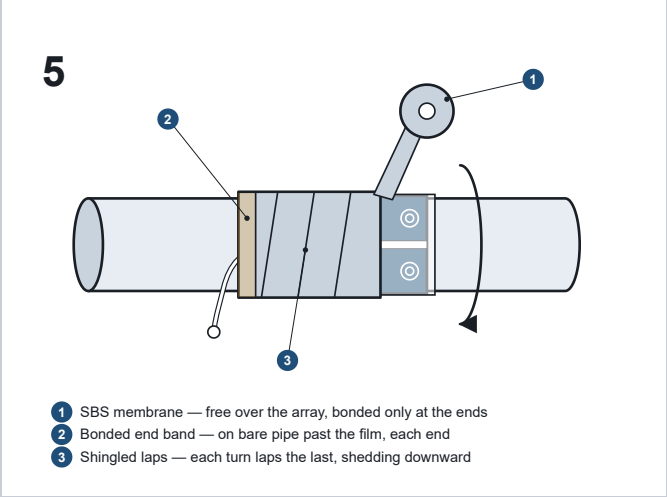
* Design values from the Wrap Technical Specification (HLX-SPC-2026-002 Rev B), confirmed per deployment. Sensor payload, site infrastructure and certification scope are agreed per deployment; hazardous-area certifications: contact HELIX. Specifications may change without notice.

Installation summary

Installation does not require a shutdown: the wrap is applied with the asset in service, over the pipe's existing coating — no containment break, no surface preparation or coating removal, and nothing coated on site. The sequence below summarizes the HELIX installation guide (HLX-ENG-2026-002 Rev A, available on request) for a straight run of ambient-temperature pipe; the full guide governs.



Step 2 — bond the array, mark its position



Step 5 — membrane over the film, bonded at the ends

Two frames from the install sequence. All eight steps are drawn frame by frame in the illustrated installation guide, HLX-QSG-2026-016.

What the installer brings

- Sensor array and harness
- LLDPE stretch film
- Knifeless tape
- SBS membrane roll
- PVC jacket roll and lap tape
- Knife, marker, degreaser, rags
- Enclosure and banding

FIT THE WRAP

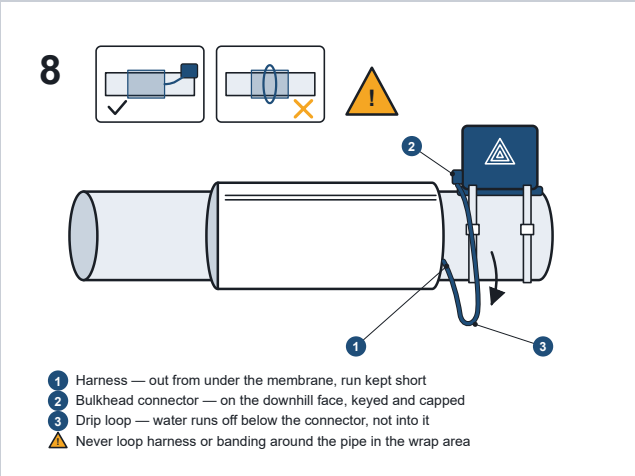
1. Clean and dry the wrap area, and a hand's width past each end. Leave the pipe's existing coating as it is.
2. Bond the sensor array. Mark and record its position — repeat readings depend on it.
3. Lay knifeless tape straight down the clear lane between the coils, never over a coil. Bring the tail out past the end and leave the pull tab accessible.
4. Stretch-film over the array and the tape, with firm, even tension, working end to end.
5. Wrap the SBS membrane. Bond it to the pipe only in the band at each end, and shingle the laps so they shed downward.
6. Cut the jacket to circumference plus a lap, wrap it, and bond the lap closed. Leave the ends open.

Installation summary — continued

CONNECT IT UP

7. Band the enclosure to bare pipe, downstream of the wrap and clear of the array. Keep the same clear distance on every install so readings stay comparable.

8. Bring the harness out from under the membrane and into the bulkhead connector. Keep the run short, with just enough slack for a drip loop below the connector.



Keep metal clear of the array.
The harness and the banding are the only metal left near the array, and both are kept clear of it deliberately. Never route either one circumferentially around the pipe within the wrap area — a conductive loop there behaves like a shorted turn, and its drift is hard to tell from wall loss.

Step 8 — harness into the connector, drip loop below

Getting back in

Release the jacket lap, lift the jacket clear, and pull the tape tail: the membrane and film split along the line and come away together. The array and its bonds are not disturbed, so readings still line up with the baseline; the enclosure stays banded, powered and wired to the gateway throughout. Refit with fresh tape, film and membrane. Weather jacket, fireproofing or insulation is reinstated over any completed install.

Starting with a pilot

HELIX's standard entry point is a structured 90-day pilot at three monitored positions, selected jointly. The pilot is designed to be falsifiable: every success criterion is scored against evidence the customer holds or can independently verify — HELIX is measured against the site's own inspection data, not against its own reporting. Pass thresholds are set jointly before commissioning and fixed in writing.

The premise. HELIX does not reduce erosion — wall loss proceeds exactly as it would without the wrap installed. What changes is what the operator knows about it, and therefore how much conservatism has to be carried in inspection frequency and replacement scheduling.

Pilot structure

Element	Detail
Monitored positions	Three, selected jointly — at least one fast-wearing position so wear-rate accuracy can be demonstrated within the term; the rest chosen for consequence and access cost
Hardware	One sensor wrap and edge node per position. Pilot hardware is mechanically retained (removable, non-bonded) and owned by the customer on delivery
Installation	Site millwrights under HELIX supervision; no surface preparation, adhesive bonding or hot work; estimated 60–90 minutes per position
Software	HELIX Horizon access for the term — continuous trending, wear-rate calculation, remaining-life estimation, threshold alerting
Term	90 days from commissioning of the final position, with a no-cost extension to 180 days if measured wall loss is insufficient to reach a verdict
Reporting	Automated continuous data, plus written HELIX reviews at day 30, day 60 and day 90

What a pilot delivers

Timing	Deliverable	Contents
Day 0	**Baseline report**	Full-circumference wall-thickness map at each position, peak-loss location identified, installation record
Day 30	**Sealed forecast**	Predicted wall thickness at each position for day 90, with stated confidence bounds — issued and not revised thereafter
Day 30 / 60	**Interim reviews**	Measured wear rate to date, comparison against site inspection data, any detected change in rate and its probable cause
Day 90	**Pilot close report**	Scoring against every criterion using site-held evidence, including criteria not met
Day 90	**180-day projection**	Forward remaining-life projection for each position, forming the basis of any later inspection-interval decision

Success criteria cover measurement agreement against the site's own manual UT, blind forward prediction against the sealed forecast, wear-rate quantification with documented methodology, rate-change detection when process conditions change, and localisation of peak wear verified on any spool pulled. If the pilot does not meet its agreed pass threshold, the software subscription fee is refunded; hardware and all data collected remain with the customer.

Stated plainly: a pilot does not detect impact damage, gasket or flange failure, weld defects or third-party damage; HELIX will not claim to have prevented a specific failure, because no such claim is verifiable; and 90 days is not sufficient to validate a replacement-interval extension — that requires at least one full observed replacement cycle, in a subsequent phase.

At close, monitored positions convert to a standard Horizon subscription with no reinstallation — the wrap transfers to the replacement spool at changeout. Pilot scope and commercial terms: contact HELIX.

Reference frameworks

HELIX pulsed eddy current measurement is developed with reference to ISO 20669:2017 (Non-destructive testing — Pulsed eddy current testing of ferromagnetic metallic components). Standards are cited as reference frameworks for method and terminology; HELIX does not claim certification or compliance to them.

Read this before relying on the data

- Continuous monitoring informs inspection and replacement planning. It is not a fitness-for-service assessment — that is a regulated engineering activity that remains with the operator's engineers.
- Each reading is an average of the wall beneath one coil. Isolated pitting and tight cracking are resolved only where they are large enough relative to the coil footprint to move the average.
- Thickness values are referenced at commissioning against factory calibration and an on-site reference; comparisons are valid within consistent material and geometry. The primary output is the trend at each node over time.
- The edge node needs a power source and a communications route off the asset. Sites with neither obvious power nor coverage are worked through case by case.
- Hazardous-area and other certifications: contact HELIX. Certification scope is agreed per deployment.
- The HELIX Sensor Wrap is patent-pending (sensor hardware, deployment methods, signal processing and predictive modeling).

Related documents

Document	Contents
HLX-SPC-2026-002 Rev B	Wrap technical specification — full platform, sensing and data specifications
HLX-ENG-2026-002 Rev A	Wrap installation guide — complete fitting and re-entry procedure (available on request)
HLX-QSG-2026-016	Illustrated wrap installation guide — the eight-step fitting sequence drawn frame by frame
Continuous Wall-Loss Monitoring Pilot	Pilot scope, deliverables and success criteria — issued per engagement
HLX-2026-001	NDT screening & 3D condition mapping case study — Capilano River Hatchery (DFO)

HELIX

HELIX Sensors Inc.
1774 Billington Rd, Bowen Island, BC, Canada
info@helixsensors.com · 236-334-7871 · helixsensors.com

To scope a wrap deployment or a 90-day pilot, book a meeting at helixsensors.com or write to info@helixsensors.com.