INDUSTRIAL

Ultrasonic HTHA Inspection Solutions

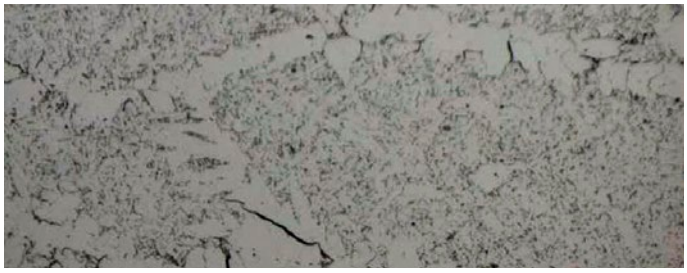
Advanced Imaging with High-Sensitivity Probes

EVIDENT

Improve Asset Safety through Reliable HTHA Detection

High-temperature hydrogen attack (HTHA) is a damage mechanism that poses a serious threat to aging steel infrastructures. Early detection of HTHA damage can help oil, gas, and petrochemical facilities avoid catastrophic failures of critical high-pressure assets. However, HTHA cracks are often too small to reliably detect with standard ultrasonic probes and techniques. Inspectors need to use higher frequencies, stronger focusing, and higher gain with an optimal signal-to-noise ratio (SNR). A combination of techniques is also recommended to increase the probability of detection.

Evident addresses these challenges with easy-to-use HTHA inspection solutions featuring leading-edge Dual Linear Array™ (DLA) probes and versatile pulse-echo probes optimized for HTHA. Combining these probes with TOFD screening and the advanced imaging methods powered by our OmniScan X3 flaw detectors provides asset inspectors with a complete multitechnology inspection strategy.



Micrography image of HTHA damage

Detect and Define Smaller HTHA Cracks with Dual Array Probes

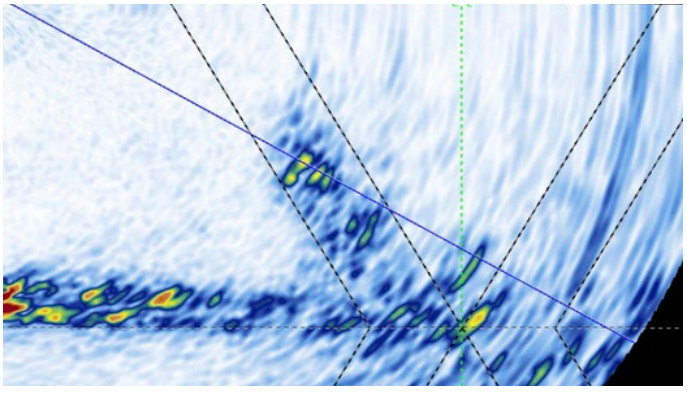
The high frequency ultrasonic waves produced by our Dual Linear Array™ (DLA) probes improve sensitivity and resolution, which increase the probability of detection (POD) for small indications such as HTHA and help you assess damage severity. DLA probes use a pitch-catch configuration, similar to the time-of-flight diffraction (TOFD) technique. They feature two distinct acoustically isolated element arrays, one for transmitting and one for receiving. This configuration improves resolution in the elevation axis and enables the use of shorter delay lines without the adverse echoes commonly experienced with the pulse-echo technique.

A38 and A28 DLA Probes for Angle Beam Inspection

The multiple small elements of these DLA probes increase their beam steering capacity, enabling them to cover a larger portion of the volume of the weld and heat-affected zone (HAZ). Their patented pivoting hinge system enables the transmitting and receiving elements to be as close as possible, which expands the sensitivity on the depth axis, thereby increasing the through-thickness coverage. The pivoting system also conforms the probes to the wedge's roof angle to adjust the focal depth (FD) as needed.

Key Features

- High-resolution 10 MHz dual 64-element (A38) or 32-element arrays (A28)
- Cover more of the weld and HAZ with small elements for wide angle-beam coverage
- Increased through-thickness coverage thanks to the probes' patented pivoting housing



0–89 degree sectorial scan using 64-element focus and the A38 DLA's wide-angle coverage to detect and define HTHA in the weld's heat-affected zone (HAZ)

REX1 DLA Probes for Fast Zero-Degree Inspection

These dual 64-element probes are used at 0 degrees with a 32 mm (1.26 in.) total aperture to achieve optimal coverage, fast scanning, and clear C-scan images of the parent plates when used with an encoder or scanner. The thin integrated wedges of the REX1 DLA probe are designed for minimal high-frequency attenuation, enabling you to achieve sharper focusing through phased array or TFM. The probe's innovative wear-resistant probe stabilization system adapts to pipes as small as 4-inch (101.6 mm) OD.

Key Features

- 10 MHz dual 64-element arrays
- Faster 0-degree scanning with a 32 mm (1.26 in.) total aperture
- Adjustable stabilization and wear protection system

OmniScan X3 64 unit and A32 probe used to perform a PWI scan revealing high-density damage near the back wall

A31 and A32 Pulse-Echo Probes Optimized for HTHA

High sensitivity and definition can also be achieved with the pulse-echo technique thanks to these high-frequency linear arrays with 64 small elements. Enabling simultaneous inspection from both sides of the weld, two 64-element probes achieve high-clarity imaging of small cracks when used with an OmniScan X3 unit. Use these versatile probes to perform TFM and PCI using FMC acquisition or plane wave imaging (PWI), as well as linear, sectorial, and compound scanning.*

*PCI and PWI are available on OmniScan X3 64 models only.

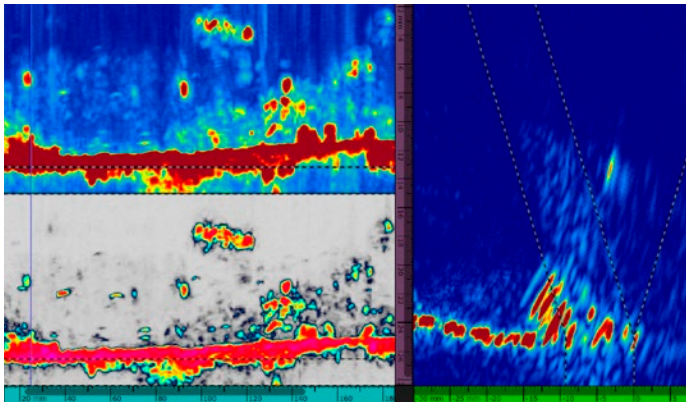
OmniScan™ X3 Series Phased Array Flaw Detectors with Advanced Capabilities

Using a combination of ultrasonic techniques can maximize your probablity of earlier HTHA detection. Time-of-flight diffraction (TOFD), focused phased array (PA) and the total focusing method (TFM) have shown to be particularly effective for this application, especially using Dual Linear Array™ (DLA) probes. Our OmniScan™ X3 series flaw detectors support all probes and techniques needed for a complete and reliable inspection strategy.

With 64-element focus and faster TFM imaging, OmniScan X3 64 units help detect small cracks more effectively and efficiently. They also offer innovative phase coherence imaging (PCI), which enhances small flaws and crack tips.

Easing your inspection workflow and improving data clarity, OmniScan X3 series instruments offer a variety of software tools:

- Integrated DLA probe and scanner configuration
- AIM modeling tool to help plan TFM inspections
- Live TFM envelope, filters, gates and alarms
- Simultaneous multigroup data acquisition and display



Side and end views from a TFM and PCI multigroup scan show extensive HTHA damage, including a cluster of small cracks within the HAZ

Specifications

Wedges for A38 and A28 Probes

The A38 and A28 DLA probes' dedicated angle-beam wedge series are optimized for weld volume and heat-affected zone inspection. The angle of these wedges is set to generate L-waves at a 65-degree nominal incident angle in steel. They feature a roof angle calculated for each AOD diameter from 4 in. to 48 in. (101.6 mm to 1220 mm).

SA38 and SA28 wedges are available in two focus depths (FD) to cover a wide range of thicknesses, from 4 mm to 95 mm (0.16 in. to 3.74 in.). These wedges enable you to fully exploit the A38 probe's extended focusing capabilities.

Ordering Information

Part Number/ Description	Item Number	Frequency (MHz)	Element Configuration	No. of Elements	Pitch (mm)	Active Aperture (mm)	Elevation (mm)	Roof Angle (deg.)	Thickness Range (mm)
10DL32-9.6X5-A28 (FD25 wedge)	Q3301742	10	Dual 32	64	0.3	9.6	5	Set by wedge	4–45
10DL32-9.6X5-A28 (FD60 wedge)	Q3301742	10	Dual 32	64	0.3	9.6	5	Set by wedge	45–95
10DL64-19.2X5-A38 (FD25 wedge)	Q3302412	10	Dual 64	128	0.3	19.2	5	Set by wedge	4–45
10DL64-19.2X5-A38 (FD60 wedge)	Q3302412	10	Dual 64	128	0.3	19.2	5	Set by wedge	45–95
10DL64-32X5-1DEG-REX1-PR	Q3301737	10	Dual 64	128	0.5	32	5	1	30–95
10DL64-32X5-5DEG-REX1-PR	Q3301733	10	Dual 64	128	0.5	32	5	5	4–30
10L64-19.84X10-A31	Q3301607	10	Linear	64	0.31	19.84	10	N/A	3–90
10L64-32X10-A32	Q3300429	10	Linear	64	0.5	32	10	N/A	8–110

Important note: Using phased array probes in direct contact with a surface during inspection can lead to permanent damage. A wedge should always be used.
Although all Dual Linear Array probes are manufactured with 10 MHz piezo-composite, the tested center frequency specification of the REX1 models shifts down to ~9.0 MHz because of attenuation occurring in the integrated wedge.
These probes come standard with an OmniScan™ connector and a 2.5 m (8.2 ft) cable or can be specially fitted with other connectors and cable lengths.

EVIDENT

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